

64-PIN CK505 W/FULLY INTEGRATED VOLTAGE REGULATOR + INTEGRATED SERIES RESISTOR

ICS9LPRS501

Recommended Application:

CK505 compliant clock with fully integrated voltage regulator and Internal series resistor on differential outputs, PCIe Gen 1 compliant

Output Features:

- 2 - CPU differential low power push-pull pairs
- 10 - SRC differential low power push-pull pairs
- 1 - CPU/SRC selectable differential low power push-pull pair
- 1 - SRC/DOT selectable differential low power push-pull pair
- 5 - PCI, 33MHz
- 1 - PCI_F, 33MHz free running
- 1 - USB, 48MHz
- 1 - REF, 14.318MHz

Key Specifications:

- CPU outputs cycle-cycle jitter < 85ps
- SRC output cycle-cycle jitter < 125ps
- PCI outputs cycle-cycle jitter < 250ps
- +/- 100ppm frequency accuracy on CPU & SRC clocks

Features/Benefits:

- Does not require external pass transistor for voltage regulator
- Integrated series resistors on differential outputs, $Z_o=50\Omega$
- Supports spread spectrum modulation, default is 0.5% down spread
- Uses external 14.318MHz crystal, external crystal load caps are required for frequency tuning
- One differential push-pull pair selectable between SRC and two single-ended outputs

Table 1: CPU Frequency Select Table

| FS _L C ² B0b7 | FS _L B ¹ B0b6 | FS _L A ¹ B0b5 | CPU MHz | SRC MHz | PCI MHz | REF MHz | USB MHz | DOT MHz |
|--|--|--|------------|------------|------------|------------|------------|------------|
| 0 | 0 | 0 | 266.66 | 100.00 | 33.33 | 14.318 | 48.00 | 96.00 |
| 0 | 0 | 1 | 133.33 | | | | | |
| 0 | 1 | 0 | 200.00 | | | | | |
| 0 | 1 | 1 | 166.66 | | | | | |
| 1 | 0 | 0 | 333.33 | | | | | |
| 1 | 0 | 1 | 100.00 | | | | | |
| 1 | 1 | 0 | 400.00 | | | | | |
| 1 | 1 | 1 | Reserved | | | | | |

1. FS_LA and FS_LB are low-threshold inputs. Please see V_{IL,FS} and V_{IH,FS} specifications in the Input/Supply/Common Output Parameters Table for correct values. Also refer to the Test Clarification Table.

2. FS_LC is a three-level input. Please see the V_{IL,FS} and V_{IH,FS} specifications in the Input/Supply/Common Output Parameters Table for correct values.

TSSOP Pin Configuration

| | | | |
|----------------|----|----|--------------------|
| PCI0/CR#_A | 1 | 64 | SCLK |
| VDDPCI | 2 | 63 | SDATA |
| PCI1/CR#_B | 3 | 62 | REF0/FSLC/TEST_SEL |
| PCI2/TME | 4 | 61 | VDDREF |
| PCI3 | 5 | 60 | X1 |
| PCI4/SRC5_EN | 6 | 59 | X2 |
| PCI_F5/ITP_EN | 7 | 58 | GNDREF |
| GNDPCI | 8 | 57 | FSLB/TEST_MODE |
| VDD48 | 9 | 56 | CK_PWRGD/PD# |
| USB_48MHz/FSLA | 10 | 55 | VDDCPU |
| GND48 | 11 | 54 | CPUT0 |
| VDD96_IO | 12 | 53 | CPUC0 |
| DOTT_96/SRCT0 | 13 | 52 | GNDCPU |
| DOTC_96/SRCC0 | 14 | 51 | CPUT1_F |
| GND | 15 | 50 | CPUC1_F |
| VDD | 16 | 49 | VDDCPU_IO |
| SRCT1/SE1 | 17 | 48 | NC |
| SRCC1/SE2 | 18 | 47 | CPUT2_ITP/SRCT8 |
| GND | 19 | 46 | CPUC2_ITP/SRCC8 |
| VDDPLL3_IO | 20 | 45 | VDDSRC_IO |
| SRCT2/SATAT | 21 | 44 | SRCT7/CR#_F |
| SRCC2/SATAC | 22 | 43 | SRCC7/CR#_E |
| GNDSRC | 23 | 42 | GNDSRC |
| SRCT3/CR#_C | 24 | 41 | SRCT6 |
| SRCC3/CR#_D | 25 | 40 | SRCC6 |
| VDDSRC_IO | 26 | 39 | VDDSRC |
| SRCT4 | 27 | 38 | PCI_STOP#/SRCT5 |
| SRCC4 | 28 | 37 | CPU_STOP#/SRCC5 |
| GNDSRC | 29 | 36 | VDDSRC_IO |
| SRCT9 | 30 | 35 | SRCC10 |
| SRCC9 | 31 | 34 | SRCT10 |
| SRCC11/CR#_G | 32 | 33 | SRCT11/CR#_H |

TSSOP Pin Description

| PIN # | PIN NAME | TYPE | DESCRIPTION |
|-------|----------------|------|---|
| 1 | PCI0/CR#_A | I/O | 3.3V PCI clock output or Clock Request control A for either SRC0 or SRC2 pair The power-up default is PCI0 output, but this pin may also be used as a Clock Request control of SRC pair 0 or SRC pair 2 via SMBus. Before configuring this pin as a Clock Request Pin, the PCI output must first be disabled in byte 2, bit 0 of SMBus address space. After the PCI output is disabled (high-Z), the pin can then be set to serve as a Clock Request pin for either SRC pair 2 or pair 0 using the CR#_A_EN bit located in byte 5 of SMBus address space. Byte 5, bit 7 0 = PCI0 enabled (default) 1 = CR#_A enabled. Byte 5, bit 6 controls whether CR#_A controls SRC0 or SRC2 pair Byte 5, bit 6 0 = CR#_A controls SRC0 pair (default), 1 = CR#_A controls SRC2 pair |
| 2 | VDDPCI | PWR | Power supply pin for the PCI outputs, 3.3V nominal |
| 3 | PCI1/CR#_B | I/O | 3.3V PCI clock output/Clock Request control B for either SRC1 or SRC4 pair The power-up default is PCI1 output, but this pin may also be used as a Clock Request control of SRC pair 1 or SRC pair 4 via SMBus. Before configuring this pin as a Clock Request Pin, the PCI output must first be disabled in byte 2, bit 1 of SMBus address space. After the PCI output is disabled (high-Z), the pin can then be set to serve as a Clock Request pin for either SRC pair 1 or pair 4 using the CR#_B_EN bit located in byte 5 of SMBus address space. Byte 5, bit 5 0 = PCI1 enabled (default) 1 = CR#_B enabled. Byte 5, bit 6 controls whether CR#_B controls SRC1 or SRC4 pair Byte 5, bit 4 0 = CR#_B controls SRC1 pair (default) 1 = CR#_B controls SRC4 pair |
| 4 | PCI2/TME | I/O | 3.3V PCI clock output / Trusted Mode Enable (TME) Latched Input. This pin is sampled on power-up as follows 0 = Overclocking of CPU and SRC Allowed 1 = Overclocking of CPU and SRC <u>NOT</u> allowed After being sampled on power-up, this pin becomes a 3.3V PCI Output |
| 5 | PCI3 | OUT | 3.3V PCI clock output. |
| 6 | PCI4/SRC5_EN | I/O | 3.3V PCI clock output / SRC5 pair or PCI_STOP#/CPU_STOP# enable strap. On powerup, the logic value on this pin determines if the SRC5 pair is enabled or if CPU_STOP#/PCI_STOP# is enabled (pins 37 and 38). The latched value controls the pin function on pins 37 and 38 as follows 0 = PCI_STOP#/CPU_STOP# 1 = SRC5/SRC5# |
| 7 | PCI_F5/ITP_EN | I/O | Free running PCI clock output and ITP/SRC8 enable strap. This output is not affected by the state of the PCI_STOP# pin. On powerup, the state of this pin determines whether pins 38 and 39 are an ITP or SRC pair. 0 = SRC8/SRC8# 1 = ITP/ITP# |
| 8 | GNDPCI | PWR | Ground for PCI clocks. |
| 9 | VDD48 | PWR | Power supply for USB clock, nominal 3.3V. |
| 10 | USB_48MHz/FSLA | I/O | Fixed 48MHz USB clock output. 3.3V / 3.3V tolerant input for CPU frequency selection. Refer to input electrical characteristics for Vil_FS and Vih_FS values. |
| 11 | GND48 | PWR | Ground pin for the 48MHz outputs. |
| 12 | VDD96_IO | PWR | Power supply for DOT96 outputs, VDD96_IO is 1.05 to 3.3V with +/-5% tolerance |
| 13 | DOTT_96/SRCT0 | OUT | True clock of SRC or DOT96. The power-up default function is SRC0. After powerup, this pin function may be changed to DOT96 via SMBus Byte 1, bit 7 as follows: 0 = SRC0 1 = DOT96 |
| 14 | DOTC_96/SRCC0 | OUT | Complement clock of SRC or DOT96. The power-up default function is SRC0#. After powerup, this pin function may be changed to DOT96# via SMBus Byte 1, bit 7 as follows 0 = SRC0# 1 = DOT96# |
| 15 | GND | PWR | Ground pin for the DOT96 clocks. |
| 16 | VDD | PWR | Power supply for SRC / SE1 and SE2 clocks, 3.3V nominal. |

TSSOP Pin Description (continued)

| PIN # | PIN NAME | TYPE | DESCRIPTION |
|-------|--------------|------|---|
| 17 | SRCT1/SE1 | OUT | True clock of differential SRC1 clock pair / 3.3V single-ended output. The powerup default is 100 MHz SRC, -0.5% downspread. The pin function may be changed via SMBus B1b[4:1] |
| 18 | SRCC1/SE2 | OUT | Complement clock of differential SRC1 clock pair / 3.3V single-ended output. The powerup default is 100 MHz SRC, -0.5% downspread. The pin function may be changed via SMBus B1b[4:1] |
| 19 | GND | PWR | Ground pin for SRC / SE1 and SE2 clocks, PLL3. |
| 20 | VDDPLL3_IO | PWR | Power supply for PLL3 output. VDDPLL3_IO is 1.05 to 3.3V with +/-5% tolerance |
| 21 | SRCT2/SATAT | OUT | True clock of differential SRC/SATA clock pair. |
| 22 | SRCC2/SATAC | OUT | Complement clock of differential SRC/SATA clock pair. |
| 23 | GNDSRC | PWR | Ground pin for SRC clocks. |
| 24 | SRCT3/CR#_C | I/O | True clock of differential SRC clock pair/ Clock Request control C for either SRC0 or SRC2 pair The power-up default is SRCCLK3 output, but this pin may also be used as a Clock Request control of SRC pair 0 or SRC pair 2 via SMBus. Before configuring this pin as a Clock Request Pin, the SRC3 output must first be disabled in byte 4, bit 7 of SMBus address space . After the SRC3 output is disabled, the pin can then be set to serve as a Clock Request pin for either SRC pair 2 or pair 0 using the CR#_C_EN bit located in byte 5 of SMBUs address space. Byte 5, bit 3 0 = SRC3 enabled (default) 1= CR#_C enabled. Byte 5, bit 2 controls whether CR#_C controls SRC0 or SRC2 pair Byte 5, bit 2 0 = CR#_C controls SRC0 pair (default), 1= CR#_C controls SRC2 pair |
| 25 | SRCC3/CR#_D | I/O | Complementary clock of differential SRC clock pair/ Clock Request control D for either SRC1 or SRC4 pair The power-up default is SRCCLK3 output, but this pin may also be used as a Clock Request control of SRC pair 1 or SRC pair 4 via SMBus. Before configuring this pin as a Clock Request Pin, the SRC3 output must first be disabled in byte 4, bit 7 of SMBus address space . After the SRC3 output is disabled, the pin can then be set to serve as a Clock Request pin for either SRC pair 1 or pair 4 using the CR#_D_EN bit located in byte 5 of SMBUs address space. Byte 5, bit 1 0 = SRC3 enabled (default) 1= CR#_D enabled. Byte 5, bit 0 controls whether CR#_D controls SRC1 or SRC4 pair Byte 5, bit 0 0 = CR#_D controls SRC1 pair (default), 1= CR#_D controls SRC4 pair |
| 26 | VDDSRC_IO | PWR | Power supply for SRC clocks. VDDSRC_IO is 1.05 to 3.3V with +/-5% tolerance |
| 27 | SRCT4 | I/O | True clock of differential SRC clock pair 4 |
| 28 | SRCC4 | I/O | Complement clock of differential SRC clock pair 4 |
| 29 | GNDSRC | PWR | Ground pin for SRC clocks. |
| 30 | SRCT9 | OUT | True clock of differential SRC clock pair. |
| 31 | SRCC9 | OUT | Complement clock of differential SRC clock pair. |
| 32 | SRCC11/CR#_G | I/O | SRC11 complement /Clock Request control for SRC9 pair The power-up default is SRC11#, but this pin may also be used as a Clock Request control of SRC9 via SMBus. Before configuring this pin as a Clock Request Pin, the SRC11 output pair must first be disabled in byte 3, bit 7 of SMBus configuration space After the SRC11 output is disabled (high-Z), the pin can then be set to serve as a Clock Request for SRC9 pair using byte 6, bit 5 of SMBus configuration space Byte 6, bit 5 0 = SRC11# enabled (default) 1= CR#_G controls SRC9 |

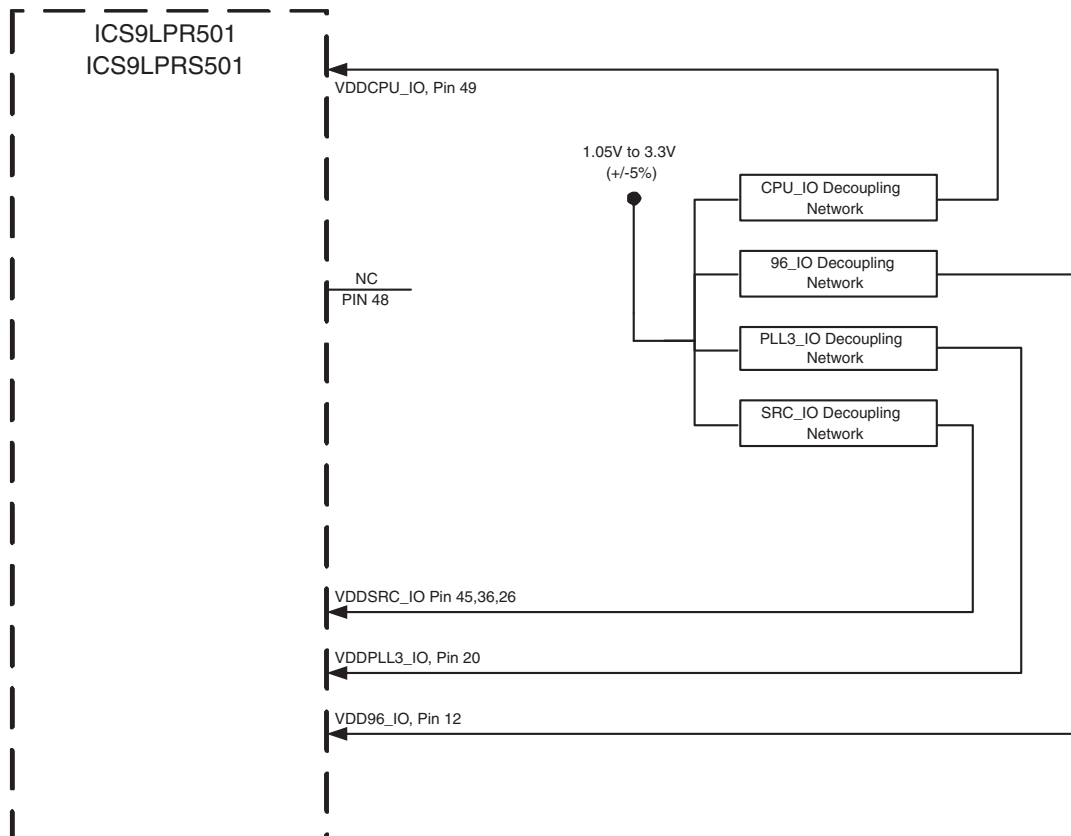
TSSOP Pin Description (Continued)

| PIN # | PIN NAME | TYPE | DESCRIPTION |
|-------|-----------------|------|---|
| 33 | SRCT11/CR#_H | I/O | SRC11 true or Clock Request control H for SRC10 pair The power-up default is SRC11, but this pin may also be used as a Clock Request control of SRC10 via SMBus. Before configuring this pin as a Clock Request Pin, the SRC11 output pair must first be disabled in byte 3 bit 7 of SMBus configuration space After the SRC11 output is disabled (high-Z), the pin can then be set to serve as a Clock Request for SRC10 pair using byte 6, bit 4 of SMBus configuration space Byte 6, bit 4 0 = SRC11 enabled (default) 1 = CR#_H controls SRC10. |
| 34 | SRCT10 | OUT | True clock of differential SRC clock pair. |
| 35 | SRCC10 | OUT | Complement clock of differential SRC clock pair. |
| 36 | VDDSRC_IO | PWR | Power supply for SRC outputs. VDDSRC_IO is 1.05 to 3.3V with +/-5% tolerance |
| 37 | CPU_STOP#/SRCC5 | I/O | Stops all CPU Clocks, except those set to be free running clocks / Complement clock of differential SRC pair. The function of this pin is set up by the power-up strap on pin 6, PCI4/SRC5_EN. The logic value sampled on pin 6 at power-up sets the function as follows: 0 = CPU_STOP# 1 = SRC5 In AMT mode 3 bits are shifted in from the ICH to set the FSC, FSB, FSA values |
| 38 | PCI_STOP#/SRCT5 | I/O | Stops all PCI Clocks, except those set to be free running clocks / Complement clock of differential SRC pair. The function of this pin is set up by the power-up strap on pin 6, PCI4/SRC5_EN. The logic value sampled on pin 6 at power-up sets the function as follows: 0 = PCI_STOP# 1 = SRC5# In AMT mode, this pin is a clock input which times the FSC, FSB, FSA bits shifted in on pin 37. |
| 39 | VDDSRC | PWR | VDD pin for SRC internal circuits, 3.3V nominal |
| 40 | SRCC6 | OUT | Complement clock of low power differential SRC clock pair. |
| 41 | SRCT6 | OUT | True clock of low power differential SRC clock pair. |
| 42 | GNDSRC | PWR | Ground for SRC clocks |
| 43 | SRCC7/CR#_E | I/O | SRC7 complement or Clock Request control E for SRC6 pair The power-up default is SRC7#, but this pin may also be used as a Clock Request control of SRC6 via SMBus. Before configuring this pin as a Clock Request Pin, the SRC7 output pair must first be disabled in byte 3, bit 3 of SMBus configuration space . After the SRC output is disabled (high-Z), the pin can then be set to serve as a Clock Request for SRC6 pair using byte 6, bit 7 of SMBus configuration space Byte 6, bit 7 0 = SRC7# enabled (default) 1 = CR#_E controls SRC6. |
| 44 | SRCT7/CR#_F | I/O | SRC7 true or Clock Request control 8 for SRC8 pair The power-up default is SRC7, but this pin may also be used as a Clock Request control of SRC8 via SMBus. Before configuring this pin as a Clock Request Pin, the SRC7 output pair must first be disabled in byte 3, bit 3 of SMBus configuration space After the SRC output is disabled (high-Z), the pin can then be set to serve as a Clock Request for SRC8 pair using byte 6, bit 6 of SMBus configuration space Byte 6, bit 6 0 = SRC7# enabled (default) 1 = CR#_F controls SRC8. |
| 45 | VDDSRC_IO | PWR | Power supply for SRC outputs. VDDSRC_IO is 1.05 to 3.3V with +/-5% tolerance |
| 46 | CPUC2_ITP/SRCC8 | OUT | Complement clock of low power differential CPU2/Complement clock of differential SRC pair. The function of this pin is determined by the latched input value on pin 7, PCIF5/ITP_EN on powerup. The function is as follows: Pin 7 latched input Value 0 = SRC8# 1 = ITP# |
| 47 | CPUT2_ITP/SRCT8 | OUT | True clock of low power differential CPU2/True clock of differential SRC pair. The function of this pin is determined by the latched input value on pin 7, PCIF5/ITP_EN on powerup. The function is as follows: Pin 7 latched input Value 0 = SRC8 1 = ITP |
| 48 | NC | N/A | No Connect |

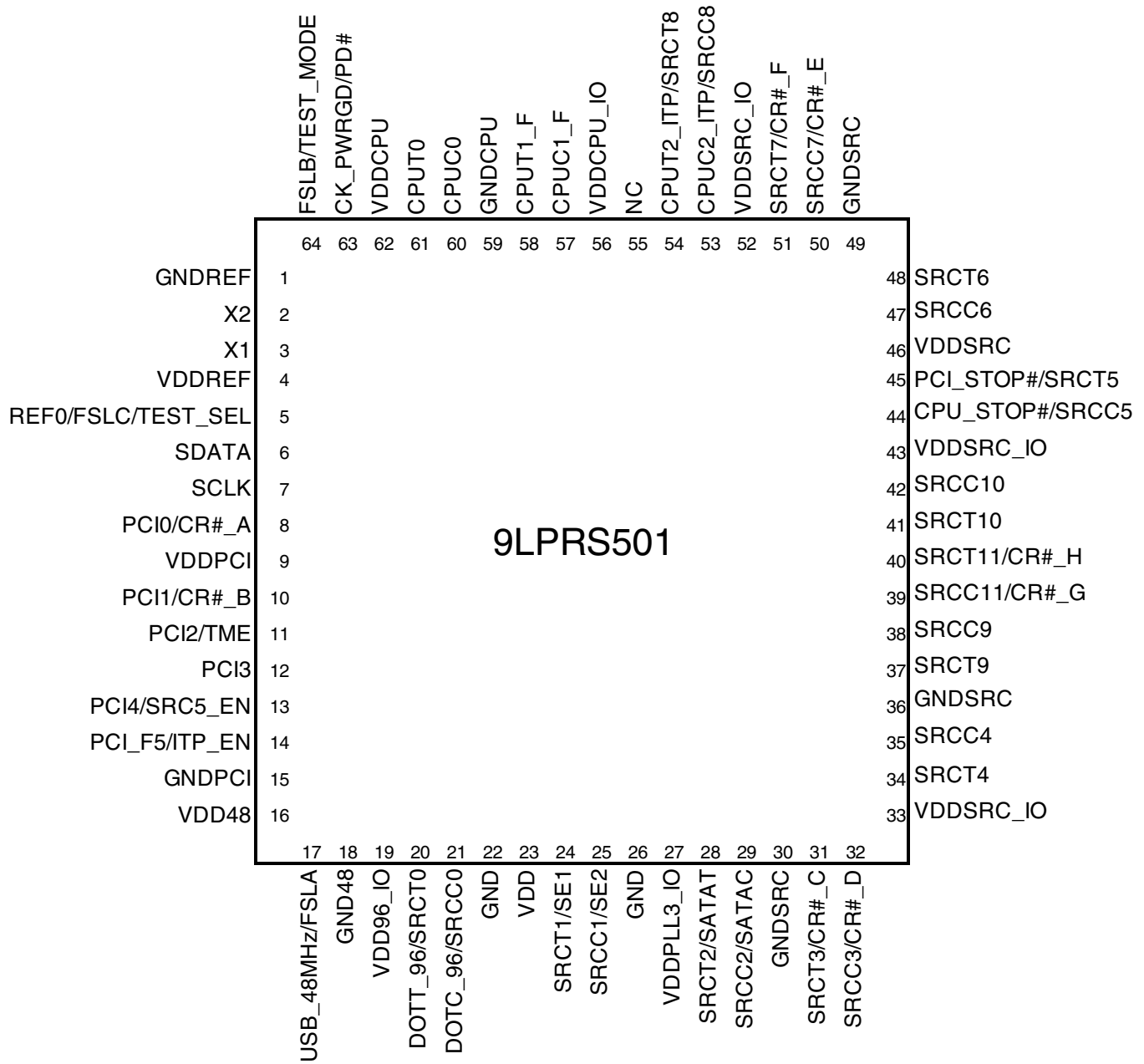
TSSOP Pin Description (Continued)

| PIN # | PIN NAME | TYPE | DESCRIPTION |
|-------|--------------------|------|--|
| 49 | VDDCPU_IO | PWR | Supply for CPU outputs. VDDCPU_IO is 1.05 to 3.3V with +/-5% tolerance |
| 50 | CPUC1_F | OUT | Complement clock of low power differential CPU clock pair. This clock will be free-running during iAMT. |
| 51 | CPUC1_F | OUT | True clock of low power differential CPU clock pair. This clock will be free-running during iAMT. |
| 52 | GNDCPU | PWR | Ground Pin for CPU Outputs |
| 53 | CPUC0 | OUT | Complement clock of low power differential CPU clock pair. |
| 54 | CPUC0 | OUT | True clock of low power differential CPU clock pair. |
| 55 | VDDCPU | PWR | Power Supply 3.3V nominal. |
| 56 | CK_PWRGD/PD# | IN | Notifies CK505 to sample latched inputs, or iAMT entry/exit, or PWRDWN# mode |
| 57 | FSLB/TEST_MODE | IN | 3.3V tolerant input for CPU frequency selection. Refer to input electrical characteristics for V_{i_FS} and V_{ih_FS} values. TEST_MODE is a real time input to select between Hi-Z and REF/N divider mode while in test mode. Refer to Test Clarification Table. |
| 58 | GNDREF | PWR | Ground pin for crystal oscillator circuit |
| 59 | X2 | OUT | Crystal output, nominally 14.318MHz. |
| 60 | X1 | IN | Crystal input, Nominally 14.318MHz. |
| 61 | VDDREF | PWR | Power pin for the REF outputs, 3.3V nominal. |
| 62 | REF0/FSLC/TEST_SEL | I/O | 3.3V 14.318MHz reference clock/3.3V tolerant low threshold input for CPU frequency selection. Refer to input electrical characteristics for V_{i_FS} and V_{ih_FS} values/ TEST_SEL: 3-level latched input to enable test mode. Refer to Test Clarification Table. |
| 63 | SDATA | I/O | Data pin for SMBus circuitry, 5V tolerant. |
| 64 | SCLK | IN | Clock pin of SMBus circuitry, 5V tolerant. |

Fully Integrated Regulator Connection for Desktop/Mobile Applications



MLF Pin Configuration



MLF Pin Description

| PIN # | PIN NAME | TYPE | DESCRIPTION |
|-------|--------------------|------|--|
| 1 | GNDREF | PWR | Ground pin for crystal oscillator circuit |
| 2 | X2 | OUT | Crystal output, nominally 14.318MHz. |
| 3 | X1 | IN | Crystal input, Nominally 14.318MHz. |
| 4 | VDDREF | PWR | Power pin for the REF outputs, 3.3V nominal. |
| 5 | REF0/FSLC/TEST_SEL | I/O | 3.3V 14.318MHz reference clock/3.3V tolerant low threshold input for CPU frequency selection. Refer to input electrical characteristics for V_{IL_FS} and V_{IH_FS} values/ TEST_SEL: 3-level latched input to enable test mode. Refer to Test Clarification Table. |
| 6 | SDATA | I/O | Data pin for SMBus circuitry, 5V tolerant. |
| 7 | SCLK | IN | Clock pin of SMBus circuitry, 5V tolerant. |
| 8 | PCI0/CR#_A | I/O | 3.3V PCI clock output or Clock Request control A for either SRC0 or SRC2 pair The power-up default is PCI0 output, but this pin may also be used as a Clock Request control of SRC pair 0 or SRC pair 2 via SMBus. Before configuring this pin as a Clock Request Pin, the PCI output must first be disabled in byte 2, bit 0 of SMBus address space . After the PCI output is disabled (high-Z), the pin can then be set to serve as a Clock Request pin for either SRC pair 2 or pair 0 using the CR#_A_EN bit located in byte 5 of SMBUs address space. Byte 5, bit 7 0 = PCI0 enabled (default) 1 = CR#_A enabled. Byte 5, bit 6 controls whether CR#_A controls SRC0 or SRC2 pair Byte 5, bit 6 0 = CR#_A controls SRC0 pair (default), 1 = CR#_A controls SRC2 pair |
| 9 | VDDPCI | PWR | Power supply pin for the PCI outputs, 3.3V nominal |
| 10 | PCI1/CR#_B | I/O | 3.3V PCI clock output/Clock Request control B for either SRC1 or SRC4 pair The power-up default is PCI1 output, but this pin may also be used as a Clock Request control of SRC pair 1 or SRC pair 4 via SMBus. Before configuring this pin as a Clock Request Pin, the PCI output must first be disabled in byte 2, bit 1 of SMBus address space . After the PCI output is disabled (high-Z), the pin can then be set to serve as a Clock Request pin for either SRC pair 1 or pair 4 using the CR#_B_EN bit located in byte 5 of SMBUs address space. Byte 5, bit 5 0 = PCI1 enabled (default) 1 = CR#_B enabled. Byte 5, bit 6 controls whether CR#_B controls SRC1 or SRC4 pair Byte 5, bit 4 0 = CR#_B controls SRC1 pair (default) 1 = CR#_B controls SRC4 pair |
| 11 | PCI2/TME | I/O | 3.3V PCI clock output / Trusted Mode Enable (TME) Latched Input. This pin is sampled on power-up as follows 0 = Overclocking of CPU and SRC Allowed 1 = Overclocking of CPU and SRC <u>NOT</u> allowed After being sampled on power-up, this pin becomes a 3.3V PCI Output |
| 12 | PCI3 | OUT | 3.3V PCI clock output. |
| 13 | PCI4/SRC5_EN | I/O | 3.3V PCI clock output / SRC5 pair or PCI_STOP#/CPU_STOP# enable strap. On powerup, the logic value on this pin determines if the SRC5 pair is enabled or if CPU_STOP#/PCI_STOP# is enabled (pins 29 and 30). The latched value controls the pin function on pins 29 and 30 as follows 0 = PCI_STOP#/CPU_STOP# 1 = SRC5/SRC5# |
| 14 | PCI_F5/ITP_EN | I/O | Free running PCI clock output and ITP/SRC8 enable strap. This output is not affected by the state of the PCI_STOP# pin. On powerup, the state of this pin determines whether pins 38 and 39 are an ITP or SRC pair. 0 =SRC8/SRC8# 1 = ITP/ITP# |
| 15 | GNDPCI | PWR | Ground for PCI clocks. |
| 16 | VDD48 | PWR | Power supply for USB clock, nominal 3.3V. |

MLF Pin Description (Continued)

| PIN # | PIN NAME | TYPE | DESCRIPTION |
|-------|----------------|------|---|
| 17 | USB_48MHz/FSLA | I/O | Fixed 48MHz USB clock output. 3.3V/ 3.3V tolerant input for CPU frequency selection. Refer to input electrical characteristics for Vil_FS and Vih_FS values. |
| 18 | GND48 | PWR | Ground pin for the 48MHz outputs. |
| 19 | VDD96_IO | PWR | Power supply for DOT96 outputs, VDD96_IO is 1.05 to 3.3V with +/-5% tolerance |
| 20 | DOTT_96/SRCT0 | OUT | True clock of SRC or DOT96. The power-up default function is SRC0. After powerup, this pin function may be changed to DOT96 via SMBus Byte 1, bit 7 as follows: 0= SRC0 1=DOT96 |
| 21 | DOTC_96/SRCC0 | OUT | Complement clock of SRC or DOT96. The power-up default function is SRC0#. After powerup, this pin function may be changed to DOT96# via SMBus Byte 1, bit 7 as follows 0= SRC0# 1=DOT96# |
| 22 | GND | PWR | Ground pin for the DOT96 clocks. |
| 23 | VDD | PWR | Power supply for SRC / SE1 and SE2 clocks, 3.3V nominal. |
| 24 | SRCT1/SE1 | OUT | True clock of differential SRC1 clock pair / 3.3V single-ended output. The powerup default is 100 MHz SRC, -0.5% downspread. The pin function may be changed via SMBus B1b[4:1] |
| 25 | SRCC1/SE2 | OUT | Complement clock of differential SRC1 clock pair / 3.3V single-ended output. The powerup default is 100 MHz SRC, -0.5% downspread. The pin function may be changed via SMBus B1b[4:1] |
| 26 | GND | PWR | Ground pin for SRC / SE1 and SE2 clocks, PLL3. |
| 27 | VDDPLL3_IO | PWR | Power supply for PLL3 output. VDDPLL3_IO is 1.05 to 3.3V with +/-5% tolerance |
| 28 | SRCT2/SATAT | OUT | True clock of differential SRC/SATA clock pair. |
| 29 | SRCC2/SATAC | OUT | Complement clock of differential SRC/SATA clock pair. |
| 30 | GNDSRC | PWR | Ground pin for SRC clocks. |
| 31 | SRCT3/CR#_C | I/O | True clock of differential SRC clock pair/ Clock Request control C for either SRC0 or SRC2 pair The power-up default is SRCCLK3 output, but this pin may also be used as a Clock Request control of SRC pair 0 or SRC pair 2 via SMBus. Before configuring this pin as a Clock Request Pin, the SRC3 output must first be disabled in byte 4, bit 7 of SMBus address space . After the SRC3 output is disabled, the pin can then be set to serve as a Clock Request pin for either SRC pair 2 or pair 0 using the CR#_C_EN bit located in byte 5 of SMBUS address space. Byte 5, bit 3 0 = SRC3 enabled (default) 1= CR#_C enabled. Byte 5, bit 2 controls whether CR#_C controls SRC0 or SRC2 pair Byte 5, bit 2 0 = CR#_C controls SRC0 pair (default), 1= CR#_C controls SRC2 pair |
| 32 | SRCC3/CR#_D | I/O | Complementary clock of differential SRC clock pair/ Clock Request control D for either SRC1 or SRC4 pair The power-up default is SRCCLK3 output, but this pin may also be used as a Clock Request control of SRC pair 1 or SRC pair 4 via SMBus. Before configuring this pin as a Clock Request Pin, the SRC3 output must first be disabled in byte 4, bit 7 of SMBus address space . After the SRC3 output is disabled, the pin can then be set to serve as a Clock Request pin for either SRC pair 1 or pair 4 using the CR#_D_EN bit located in byte 5 of SMBUS address space. Byte 5, bit 1 0 = SRC3 enabled (default) 1= CR#_D enabled. Byte 5, bit 0 controls whether CR#_D controls SRC1 or SRC4 pair Byte 5, bit 0 0 = CR#_D controls SRC1 pair (default), 1= CR#_D controls SRC4 pair |

MLF Pin Description (Continued)

| PIN # | PIN NAME | TYPE | DESCRIPTION |
|-------|-----------------|------|--|
| 33 | VDDSRC_IO | PWR | Power supply for SRC clocks. VDDSRC_IO is 1.05 to 3.3V with +/-5% tolerance |
| 34 | SRCT4 | I/O | True clock of differential SRC clock pair 4 |
| 35 | SRCC4 | I/O | Complement clock of differential SRC clock pair 4 |
| 36 | GNDSRC | PWR | Ground pin for SRC clocks. |
| 37 | SRCT9 | OUT | True clock of differential SRC clock pair. |
| 38 | SRCC9 | OUT | Complement clock of differential SRC clock pair. |
| 39 | SRCC11/CR#_G | I/O | SRC11 complement /Clock Request control for SRC9 pair The power-up default is SRC11#, but this pin may also be used as a Clock Request control of SRC9 via SMBus. Before configuring this pin as a Clock Request Pin, the SRC11 output pair must first be disabled in byte 3, bit 7 of SMBus configuration space After the SRC11 output is disabled (high-Z), the pin can then be set to serve as a Clock Request for SRC9 pair using byte 6, bit 5 of SMBus configuration space Byte 6, bit 5 0 = SRC11# enabled (default) 1 = CR#_G controls SRC9 |
| 40 | SRCT11/CR#_H | I/O | SRC11 true or Clock Request control H for SRC10 pair The power-up default is SRC11, but this pin may also be used as a Clock Request control of SRC10 via SMBus. Before configuring this pin as a Clock Request Pin, the SRC11 output pair must first be disabled in byte 3, bit 6 of SMBus configuration space After the SRC11 output is disabled (high-Z), the pin can then be set to serve as a Clock Request for SRC10 pair using byte 6, bit 4 of SMBus configuration space Byte 6, bit 4 0 = SRC11 enabled (default) 1 = CR#_H controls SRC10. |
| 41 | SRCT10 | OUT | True clock of differential SRC clock pair. |
| 42 | SRCC10 | OUT | Complement clock of differential SRC clock pair. |
| 43 | VDDSRC_IO | PWR | Power supply for SRC outputs. VDDSRC_IO is 1.05 to 3.3V with +/-5% tolerance |
| 44 | CPU_STOP#/SRCC5 | I/O | Stops all CPU Clocks, except those set to be free running clocks / Complement clock of differential SRC pair. The function of this pin is set up by the power-up strap on pin 6, PCI4/SRC5_EN. The logic value sampled on pin 6 at power-up sets the function as follows: 0= CPU_STOP# 1 = SRC5 In AMT mode 3 bits are shifted in from the ICH to set the FSC, FSB, FSA values |
| 45 | PCI_STOP#/SRCT5 | I/O | Stops all PCI Clocks, except those set to be free running clocks / Complement clock of differential SRC pair. The function of this pin is set up by the power-up strap on pin 6, PCI4/SRC5_EN. The logic value sampled on pin 6 at power-up sets the function as follows: 0= PCI_STOP# 1 = SRC5# In AMT mode, this pin is a clock input which times the FSC, FSB, FSA bits shifted in on pin 37. |
| 46 | VDDSRC | PWR | VDD pin for SRC internal circuits, 3.3V nominal |
| 47 | SRCC6 | OUT | Complement clock of low power differential SRC clock pair. |
| 48 | SRCT6 | OUT | True clock of low power differential SRC clock pair. |

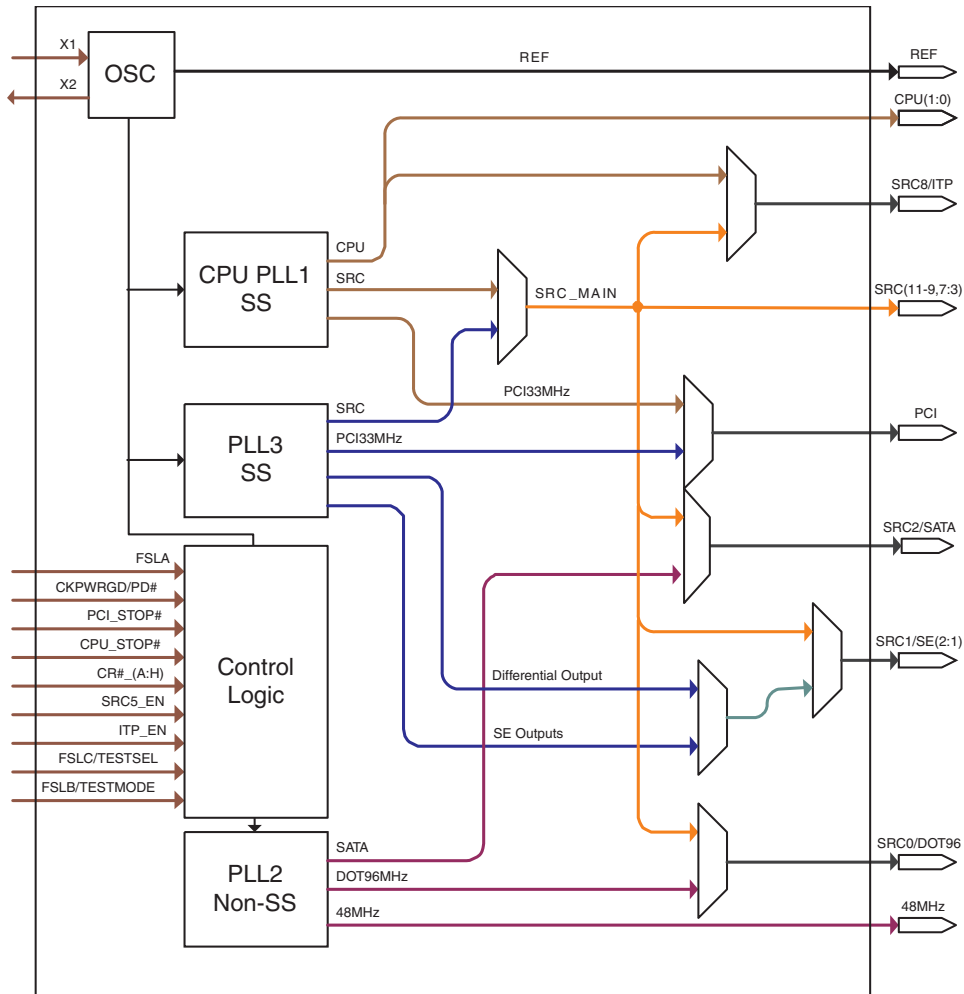
MLF Pin Description (Continued)

| PIN # | PIN NAME | TYPE | DESCRIPTION |
|-------|-----------------|------|--|
| 49 | GNDSRC | PWR | Ground for SRC clocks |
| 50 | SRCC7/CR#_E | I/O | SRC7 complement or Clock Request control E for SRC6 pair The power-up default is SRC7#, but this pin may also be used as a Clock Request control of SRC6 via SMBus. Before configuring this pin as a Clock Request Pin, the SRC7 output pair must first be disabled in byte 3, bit 3 of SMBus configuration space. After the SRC output is disabled (high-Z), the pin can then be set to serve as a Clock Request for SRC6 pair using byte 6, bit 7 of SMBus configuration space Byte 6, bit 7 0 = SRC7# enabled (default) 1 = CR#_E controls SRC6. |
| 51 | SRCT7/CR#_F | I/O | SRC7 true or Clock Request control 8 for SRC8 pair The power-up default is SRC7, but this pin may also be used as a Clock Request control of SRC8 via SMBus. Before configuring this pin as a Clock Request Pin, the SRC7 output pair must first be disabled in byte 3, bit 3 of SMBus configuration space. After the SRC output is disabled (high-Z), the pin can then be set to serve as a Clock Request for SRC8 pair using byte 6, bit 6 of SMBus configuration space Byte 6, bit 6 0 = SRC7# enabled (default) 1 = CR#_F controls SRC8. |
| 52 | VDDSRC_IO | PWR | Power supply for SRC outputs. VDDSRC_IO is 1.05 to 3.3V with +/-5% tolerance |
| 53 | CPUC2_ITP/SRCC8 | OUT | Complement clock of low power differential CPU2/Complement clock of differential SRC pair. The function of this pin is determined by the latched input value on pin 7, PCIF5/ITP_EN on powerup. The function is as follows: Pin 7 latched input Value 0 = SRC8# 1 = ITP# |
| 54 | CPUT2_ITP/SRCT8 | OUT | True clock of low power differential CPU2/True clock of differential SRC pair. The function of this pin is determined by the latched input value on pin 7, PCIF5/ITP_EN on powerup. The function is as follows: Pin 7 latched input Value 0 = SRC8 1 = ITP |
| 55 | NC | N/A | No Connect |
| 56 | VDDCPU_IO | PWR | Supply for CPU outputs. VDDCPU_IO is 1.05 to 3.3V with +/-5% tolerance |
| 57 | CPUC1_F | OUT | Complement clock of low power differential CPU clock pair. This clock will be free-running during iAMT. |
| 58 | CPUT1_F | OUT | True clock of low power differential CPU clock pair. This clock will be free-running during iAMT. |
| 59 | GNDCPU | PWR | Ground Pin for CPU Outputs |
| 60 | CPUC0 | OUT | Complement clock of low power differential CPU clock pair. |
| 61 | CPUT0 | OUT | True clock of low power differential CPU clock pair. |
| 62 | VDDCPU | PWR | Power Supply 3.3V nominal. |
| 63 | CK_PWRGD/PD# | IN | Notifies CK505 to sample latched inputs, or iAMT entry/exit, or PWRDWN# mode |
| 64 | FSLB/TEST_MODE | IN | 3.3V tolerant input for CPU frequency selection. Refer to input electrical characteristics for V_{il_FS} and V_{ih_FS} values. TEST_MODE is a real time input to select between Hi-Z and REF/N divider mode while in test mode. Refer to Test Clarification Table. |

General Description

ICS9LPRS501 follows Intel CK505 Yellow Cover specification. This clock synthesizer provides a single chip solution for next generation Intel processors and Intel chipsets. ICS9LPRS501 is driven with a 14.318MHz crystal. It also provides a tight ppm accuracy output for Serial ATA and PCI-Express support.

Functional Block Diagram



Power Groups

| Pin Number | | Description | |
|------------|------------|----------------------|-------------------|
| VDD | GND | | |
| 49 | 52 | CPUCLK | Low power outputs |
| 55 | 52 | Master Clock, Analog | |
| 26, 36, 45 | 23, 29, 42 | SRCCLK | Low power outputs |
| 39 | 23, 29, 42 | | PLL 1 |
| 20 | 19 | PLL3/SE | Low power outputs |
| 16 | 19 | | PLL 3 |
| 12 | 11 | DOT 96Mhz | Low power outputs |
| 9 | 11 | USB 48 | |
| 61 | 58 | Xtal, REF | |
| 2 | 8 | PCICLK | |

Absolute Maximum Ratings - DC Parameters

| PARAMETER | SYMBOL | CONDITIONS | MIN | TYP | MAX | UNITS | Notes |
|---|-------------------|-------------------------------------|-----------|-----|------|-------|-------|
| Maximum Supply Voltage | VDDxxx | Supply Voltage | | | 4.6 | V | 7 |
| Maximum Supply Voltage | VDDxxx_IO | Low-Voltage Differential I/O Supply | | | 3.8 | V | 7 |
| Maximum Input Voltage | V _{IH} | 3.3V Inputs | | | 4.6 | V | 4,5,7 |
| Minimum Input Voltage | V _{IL} | Any Input | GND - 0.5 | | | V | 4,7 |
| Case Temperature | T _{case} | | | | 115 | °C | |
| Thermal Resistance from Die to Ambient Air | J _A | | | | 32.5 | °C/W | |
| Thermal Resistance from Die to Package Case | J _C | | | | 68.2 | °C/W | |
| Storage Temperature | T _s | - | -65 | | 150 | °C | 4,7 |
| Input ESD protection | ESD prot | Human Body Model | 2000 | | | V | 6,7 |

¹Guaranteed by design and characterization, not 100% tested in production.

²Operation under these conditions is neither implied, nor guaranteed.

³Maximum input voltage is not to exceed VDD

AC Electrical Characteristics - Low Power Differential Outputs

| PARAMETER | SYMBOL | CONDITIONS | MIN | TYP | MAX | UNITS | NOTES |
|----------------------------|-----------|--------------------------|------|-------|------|-------|-------|
| Rising Edge Slew Rate | tSLR | Averaging on | 2.5 | 3.35 | 4 | V/ns | 2, 3 |
| Falling Edge Slew Rate | tFLR | Averaging on | 2.5 | 3.30 | 4 | V/ns | 2, 3 |
| Slew Rate Variation | tSLVAR | Averaging on | | | 20 | % | 1, 10 |
| Differential Voltage Swing | VSWING | Averaging off | 300 | | | mV | 2 |
| Crossing Point Voltage | VXABS | Averaging off | 300 | 405.5 | 550 | mV | 1,4,5 |
| Crossing Point Variation | VXABSVAR | Averaging off | | 60 | 140 | mV | 1,4,9 |
| Maximum Output Voltage | VHIGH | Averaging off | | 894 | 1150 | mV | 1,7 |
| Minimum Output Voltage | VLOW | Averaging off | -300 | 59.5 | | mV | 1,8 |
| Duty Cycle | DCYC | Averaging on | 45 | 51.0 | 55 | % | 2 |
| CPU[1:0] Skew | CPUSKEW10 | Differential Measurement | | 47 | 100 | ps | 1 |
| CPU[2_ITP:0] Skew | CPUSKEW20 | Differential Measurement | | 125 | 150 | ps | 1 |
| SRC[10:0] Skew | SRCSEW | Differential Measurement | | 704 | 3000 | ps | 1,6 |

NOTES on DIF Output AC Specs: (unless otherwise noted, guaranteed by design and characterization, not 100% tested in production).

¹Measurement taken for single ended waveform on a component test board (not in system)

²Measurement taken from differential waveform on a component test board. (not in system)

³Slew rate emasured through V_{swing} voltage range centered about differential zero

⁴V_{cross} is defined at the voltage where Clock = Clock#, measured on a component test board (not in system)

⁵Only applies to the differential rising edge (Clock rising, Clock# falling)

⁶Total distributed intentional SRC to SRC skew.

⁷The max voltage including overshoot.

⁸The min voltage including undershoot.

⁹The total variation of all V_{cross} measurements in any particular system. Note this is a subset of V_{cross} min/mas (V_{Cross} absolute) allowed. The intent is to limit V_{cross} induced modulation by setting C_{cross_delta} to be smaller than V_{Cross} absolute.

¹⁰Matching applies to rising edge rate for Clock and falling edge rate for Clock#. It is measured using a +/-75mV window centered on the average cross point where Clock rising meets Clock# falling. The median cross point is used to calculate the voltage thresholds the oscilloscope is to use for the edge rate calculations.

Clock Jitter Specs - Low Power Differential Outputs

| PARAMETER | SYMBOL | CONDITIONS | MIN | TYP | MAX | UNITS | NOTES |
|------------------------------|----------|--------------------------|-----|------|-----|-------|-------|
| CPU Jitter - Cycle to Cycle | CPUJC2C | Differential Measurement | | 58.1 | 85 | ps | 1 |
| SRC Jitter - Cycle to Cycle | SRCJC2C | Differential Measurement | | 36.2 | 125 | ps | 1,2 |
| SATA Jitter - Cycle to Cycle | SATAJC2C | Differential Measurement | | 46.8 | 125 | ps | 1 |
| DOT Jitter - Cycle to Cycle | DOTJC2C | Differential Measurement | | 73.0 | 250 | ps | 1 |

NOTES on DIF Output Jitter: (unless otherwise noted, guaranteed by design and characterization, not 100% tested in production).

¹Jitter specs are specified as measured on a clock characterization board. System designers need to take special care not to use these numbers, as the in-system performance will be somewhat degraded. The receiver EMTS (chispet or CPU) will have the receiver jitter specs as measured in a real system.

²Phase jitter requirement: The SRC outputs will meet the reference clock jitter requirements from the PCI Express Gen1 Base Spec. The test is performed on a component test board under quiet conditions with all outputs on. Jitter analysis is performed using the standardized tool provided by the PCI SIG.

Electrical Characteristics - Input/Supply/Common Output DC Parameters

| PARAMETER | SYMBOL | CONDITIONS | MIN | TYP | MAX | UNITS | Notes |
|--|-----------------------------------|---|-----------------------|----------|-----------------------|-------|-------|
| Ambient Operating Temp | T _{ambient} | - | 0 | 25 | 70 | °C | |
| Supply Voltage | VDD _{xxx} | Supply Voltage | 3.135 | 3.3 | 3.465 | V | |
| Supply Voltage | VDD _{xxx} _IO | Low-Voltage Differential I/O Supply | 0.9975 | 1.05 | 3.465 | V | 10 |
| Input High Voltage | V _{IHSE} | Single-ended 3.3V inputs | 2.2 | | V _{DD} + 0.3 | V | 3 |
| Input Low Voltage | V _{ILSE} | Single-ended 3.3V inputs | V _{SS} - 0.3 | | 0.8 | V | 3 |
| Low Threshold Input-High Voltage FSC = Test Mode | V _{IH_FSC_TEST} | 3.3 V +/-5% | 2 | | | V | 8 |
| Low Threshold Input-FSC = '1' Voltage | V _{IH_FSC_1} | 3.3 V +/-5% | 0.7 | | 1.5 | V | 8 |
| Low Threshold Input-FSA,FSB = '1' Voltage | V _{IH_FSUB_1} | 3.3 V +/-5% | 0.7 | | | V | |
| Low Threshold Input-Low Voltage | V _{IL_FS} | 3.3 V +/-5% | V _{SS} - 0.3 | | 0.35 | V | |
| Input Leakage Current | I _{IN} | V _{IN} = V _{DD} , V _{IN} = GND | -5 | | 5 | uA | 2 |
| Input Leakage Current | I _{INRES} | Inputs with pull up or pull down resistors V _{IN} = V _{DD} , V _{IN} = GND | -200 | | 200 | uA | |
| Output High Voltage | V _{OHSSE} | Single-ended outputs, I _{OH} = -1mA | 2.4 | | | V | |
| Output Low Voltage | V _{OLSE} | Single-ended outputs, I _{OL} = 1 mA | | | 0.4 | V | |
| Operating Supply Current | I _{DDP3.3} | Full Active, C _L = Full load; IDD 3.3V | | 135 | 200 | mA | |
| | I _{DDPIO} | Full Active, C _L = Full load; IDD IO | | 72 | 80 | mA | |
| iAMT Mode Current | I _{DDI_{AMT}3.3} | M1 mode, 3.3V Rail | | 53 | 65 | mA | |
| | I _{DDIAMTIO} | M1 Mode, IO Rail | | 7 | 10 | mA | |
| Powerdown Current | I _{DDP3.3} | Power down mode, 3.3V Rail, B63b0 = '1' | | 22 | 25 | mA | |
| | I _{DDPIO} | Power down mode, IO Rail | | 0.01 | 0.1 | mA | |
| Input Frequency | F _I | V _{DD} = 3.3 V | | 14.31818 | 15 | MHz | |
| Pin Inductance | L _{pin} | | | | 7 | nH | |
| Input Capacitance | C _{IN} | Logic Inputs | 1.5 | | 5 | pF | |
| | C _{OUT} | Output pin capacitance | | | 6 | pF | |
| | C _{INX} | X1 & X2 pins | | | 6 | pF | |
| Clk Stabilization | T _{STAB} | From VDD Power-Up or de-assertion of PD to 1st clock | | 1.2 | 1.8 | ms | |
| Tdrive_CR_off | T _{DRCROFF} | Output stop after CR deasserted | | | 400 | ns | |
| Tdrive_CR_on | T _{DRCRON} | Output run after CR asserted | | | 0 | us | |
| Tdrive_CPU | T _{DRSRC} | CPU output enable after PCI_STOP# de-assertion | | | 10 | ns | |
| Tfall_SE | T _{FALL} | Fall/rise time of all 3.3V control inputs from 20-80%. Inputs must be monotonic | | | 10 | ns | 1 |
| Trise_SE | T _{RISE} | | | | 10 | ns | 1 |
| SMBus Voltage | V _{DD} | | 2.7 | | 5.5 | V | |
| Low-level Output Voltage | V _{OL_{SMB}} | @ I _{PULLUP} | | | 0.4 | V | |
| Current sinking at V _{OL_{SMB}} = 0.4 V | I _{PULLUP} | SMB Data Pin | 4 | | | mA | |
| SCLK/SDATA Clock/Data Rise Time | T _{RI2C} | (Max VIL - 0.15) to (Min VIH + 0.15) | | | 1000 | ns | |
| SCLK/SDATA Clock/Data Fall Time | T _{FI2C} | (Min VIH + 0.15) to (Max VIL - 0.15) | | | 300 | ns | |
| Maximum SMBus Operating Frequency | F _{SMBUS} | | | | 100 | kHz | |
| Spread Spectrum Modulation Frequency | f _{SSMOD} | Triangular Modulation | 30 | 32.54 | 33 | kHz | |

NOTES on DC Parameters: (unless otherwise noted, guaranteed by design and characterization, not 100% tested in production).

¹Signal is required to be monotonic in this region.

²input leakage current does not include inputs with pull-up or pull-down resistors

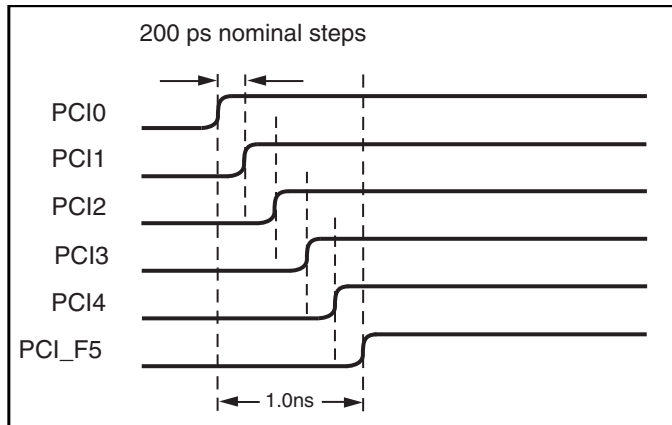
³3.3V referenced inputs are: PCI_STOP#, CPU_STOP#, TME, SRC5_EN, ITP_EN, SCLKL, SDATA, TESTMODE, TESTSEL, CKPWRGD and CR# inputs if selected.

⁴Intentionally blank

Electrical Characteristics - PCICLK/PCICLK_F

| PARAMETER | SYMBOL | CONDITIONS | MIN | TYP | MAX | UNITS | NOTES |
|------------------------------|----------------------|--------------------------------|----------|------|----------|-------|-------|
| Long Accuracy | ppm | see Tperiod min-max values | -100 | 0 | 100 | ppm | 1,2 |
| Clock period | T _{period} | 33.33MHz output no spread | 29.99700 | | 30.00300 | ns | 2 |
| | | 33.33MHz output spread | 30.08421 | | 30.23459 | ns | 2 |
| Absolute min/max period | T _{abs} | 33.33MHz output no spread | 29.49700 | | 30.50300 | ns | 2 |
| | | 33.33MHz output nominal/spread | 29.56617 | | 30.58421 | ns | 2 |
| Rising Edge Slew Rate | t _{SLR} | Measured from 0.8 to 2.0 V | 1 | 1.71 | 4 | V/ns | 1 |
| Falling Edge Slew Rate | t _{FLR} | Measured from 2.0 to 0.8 V | 1 | 1.78 | 4 | V/ns | 1 |
| Pin to Pin Skew | t _{skew} | V _T = 1.5 V | | | 250 | ps | 2 |
| Intentional PCI to PCI delay | t _{skew} | V _T = 1.5 V | 100 | 187 | 300 | ps | 2 |
| Duty Cycle | d _{t1} | V _T = 1.5 V | 45 | 51 | 55 | % | 2 |
| Jitter, Cycle to cycle | t _{jyc-cyc} | V _T = 1.5 V | | 103 | 500 | ps | 2 |

Intentional PCI Clock to Clock Delay



Electrical Characteristics - USB48MHz

| PARAMETER | SYMBOL | CONDITIONS | MIN | TYP | MAX | UNITS | NOTES |
|-------------------------|----------------------|----------------------------|----------|-------|----------|-------|-------|
| Long Accuracy | ppm | see Tperiod min-max values | -100 | 0 | 100 | ppm | 2,4 |
| Clock period | T _{period} | 48.00MHz output nominal | 20.83125 | | 20.83542 | ns | 2,3 |
| Absolute min/max period | T _{abs} | 48.00MHz output nominal | 20.48125 | | 21.18542 | ns | 2 |
| CLK High Time | T _{HIGH} | | 8.216563 | | 11.15198 | V | |
| CLK Low time | T _{LOW} | | 7.816563 | | 10.95198 | V | |
| Rising Edge Slew Rate | t _{SLR} | Measured from 0.8 to 2.0 V | 1 | 1.2 | 2 | V/ns | 1 |
| Falling Edge Slew Rate | t _{FLR} | Measured from 2.0 to 0.8 V | 1 | 1.3 | 2 | V/ns | 1 |
| Duty Cycle | d _{t1} | V _T = 1.5 V | 45 | 50.8% | 55 | % | 2 |
| Jitter, Cycle to cycle | t _{jyc-cyc} | V _T = 1.5 V | | 132.2 | 350 | ps | 2 |

Electrical Characteristics - REF-14.318MHz

| PARAMETER | SYMBOL | CONDITIONS | MIN | TYP | MAX | UNITS | Notes |
|-------------------------|----------|----------------------------|----------|------|----------|-------|-------|
| Long Accuracy | ppm | see Tperiod min-max values | -100 | 0 | 100 | ppm | 2, 4 |
| Clock period | Tperiod | 14.318MHz output nominal | 69.82033 | | 69.86224 | ns | 2, 3 |
| Absolute min/max period | Tabs | 14.318MHz output nominal | 69.83400 | | 70.84800 | ns | 2 |
| CLK High Time | THIGH | | 29.97543 | | 38.46654 | V | |
| CLK Low time | TLOW | | 29.57543 | | 38.26654 | V | |
| Rising Edge Slew Rate | tSLR | Measured from 0.8 to 2.0 V | 1 | 1.4 | 4 | V/ns | 1 |
| Falling Edge Slew Rate | tFLR | Measured from 2.0 to 0.8 V | 1 | 1.7 | 4 | V/ns | 1 |
| Duty Cycle | dt1 | V _T = 1.5 V | 45 | 53.1 | 55 | % | 2 |
| Jitter, Cycle to cycle | tjyc-cyc | V _T = 1.5 V | | 138 | 1000 | ps | 2 |

Electrical Characteristics - SE1/2=25MHz

| PARAMETER | SYMBOL | CONDITIONS | MIN | TYP | MAX | UNITS | NOTES |
|-------------------------|-----------------------|-------------------------------------|----------|------|----------|-------|-------|
| Long Accuracy | ppm | see Tperiod min-max values | -100 | 0 | 100 | ppm | 1,2 |
| Clock period | T _{period} | 25.00MHz output nominal | 39.99600 | | 40.00400 | ns | 1 |
| Absolute min/max period | T _{abs} | 25.00MHz output nominal | 39.32360 | | 40.67640 | ns | 1 |
| Rising Edge Slew Rate | t _{SLR} | Measured from 0.8 to 2.0 V | 1 | 1.2 | 2 | V/ns | 1 |
| Falling Edge Slew Rate | t _{FLR} | Measured from 2.0 to 0.8 V | 1 | 1.3 | 2 | V/ns | 1 |
| Duty Cycle | d ₁ | V _T = 1.5 V | 45 | 50.8 | 55 | % | 1 |
| Jitter, Cycle to cycle | t _{jCyc-cyc} | V _T = 1.5 V | | 60 | 500 | ps | 1 |
| Jitter, Long Term | t _{LTJ} | V _T = 1.5 V @ 10us delay | | 780 | 1000 | ps | 1 |

NOTES on SE outputs: (unless otherwise noted, guaranteed by design and characterization, not 100% tested in production).

¹Edge rate in system is measured from 0.8V to 2.0V.

²Duty cycle, Period and Jitter are measured with respect to 1.5V

³The average period over any 1us period of time

⁴Using frequency counter with the measurement interval equal or greater than 0.15s, target frequencies are 14.318180 MHz, 33.333333MHz and 48.000000MHz

Table 1: CPU Frequency Select Table

| FS _L C ² B0b7 | FS _L B ¹ B0b6 | FS _L A ¹ B0b5 | CPU MHz | SRC MHz | PCI MHz | REF MHz | USB MHz | DOT MHz |
|--|--|--|------------|------------|------------|------------|------------|------------|
| 0 | 0 | 0 | 266.66 | 100.00 | 33.33 | 14.318 | 48.00 | 96.00 |
| 0 | 0 | 1 | 133.33 | | | | | |
| 0 | 1 | 0 | 200.00 | | | | | |
| 0 | 1 | 1 | 166.66 | | | | | |
| 1 | 0 | 0 | 333.33 | | | | | |
| 1 | 0 | 1 | 100.00 | | | | | |
| 1 | 1 | 0 | 400.00 | | | | | |
| 1 | 1 | 1 | Reserved | | | | | |

1. FS_LA and FS_LB are low-threshold inputs. Please see V_{IL_FS} and V_{IH_FS} specifications in the Input/Supply/Common Output Parameters Table for correct values.

Also refer to the Test Clarification Table.

2. FS_LC is a three-level input. Please see the V_{IL_FS} and V_{IH_FS} specifications in the Input/Supply/Common Output Parameters Table for correct values.

Table 2: PLL3 Quick Configuration

| B1b4 | B1b3 | B1b2 | B1b1 | Pin 17 | Pin 18 | Spread | Comment |
|------|------|------|------|----------------|--------|------------------|------------------------------------|
| | | | | MHz | MHz | % | |
| 0 | 0 | 0 | 0 | PLL 3 disabled | | | |
| 0 | 0 | 0 | 1 | 100.00 | 100.00 | 0.5% Down Spread | SRCCLK1 from SRC_MAIN |
| 0 | 0 | 1 | 0 | 100.00 | 100.00 | 0.5% Down Spread | Only SRCCLK1 from PLL3 |
| 0 | 0 | 1 | 1 | 100.00 | 100.00 | 1% Down Spread | Only SRCCLK1 from PLL3 |
| 0 | 1 | 0 | 0 | 100.00 | 100.00 | 1.5% Down Spread | Only SRCCLK1 from PLL3 |
| 0 | 1 | 0 | 1 | 100.00 | 100.00 | 2% Down Spread | Only SRCCLK1 from PLL3 |
| 0 | 1 | 1 | 0 | 100.00 | 100.00 | 2.5% Down Spread | Only SRCCLK1 from PLL3 |
| 0 | 1 | 1 | 1 | N/A | N/A | N/A | N/A |
| 1 | 0 | 0 | 0 | 24.576 | 24.576 | None | 24.576Mhz on SE1 and SE2 |
| 1 | 0 | 0 | 1 | 24.576 | 98.304 | None | 24.576Mhz on SE1, 98.304Mhz on SE2 |
| 1 | 0 | 1 | 0 | 98.304 | 98.304 | None | 98.304Mhz on SE1 and SE2 |
| 1 | 0 | 1 | 1 | 27.000 | 27.000 | None | 27Mhz on SE1 and SE2 |
| 1 | 1 | 0 | 0 | 25.000 | 25.000 | None | 25Mhz on SE1 and SE2 |
| 1 | 1 | 0 | 1 | N/A | N/A | N/A | N/A |
| 1 | 1 | 1 | 0 | N/A | N/A | N/A | N/A |
| 1 | 1 | 1 | 1 | N/A | N/A | N/A | N/A |

Table 3: IO_Vout select table

| B9b2 | B9b1 | B9b0 | IO_Vout |
|------|------|------|---------|
| 0 | 0 | 0 | 0.3V |
| 0 | 0 | 1 | 0.4V |
| 0 | 1 | 0 | 0.5V |
| 0 | 1 | 1 | 0.6V |
| 1 | 0 | 0 | 0.7V |
| 1 | 0 | 1 | 0.8V |
| 1 | 1 | 0 | 0.9V |
| 1 | 1 | 1 | 1.0V |

Table 4: Device ID table

| B8b7 | B8b6 | B8b5 | B8b4 | Comment |
|------|------|------|------|------------------|
| 0 | 0 | 0 | 0 | 56 pin TSSOP/QFN |
| 0 | 0 | 0 | 1 | 64 pin TSSOP/QFN |
| 0 | 0 | 1 | 0 | Reserved |
| 0 | 0 | 1 | 1 | Reserved |
| 0 | 1 | 0 | 0 | Reserved |
| 0 | 1 | 0 | 1 | Reserved |
| 0 | 1 | 1 | 0 | Reserved |
| 0 | 1 | 1 | 1 | Reserved |
| 1 | 0 | 0 | 0 | Reserved |
| 1 | 0 | 0 | 1 | Reserved |
| 1 | 0 | 1 | 0 | Reserved |
| 1 | 0 | 1 | 1 | Reserved |
| 1 | 1 | 0 | 0 | Reserved |
| 1 | 1 | 0 | 1 | Reserved |
| 1 | 1 | 1 | 0 | Reserved |
| 1 | 1 | 1 | 1 | Reserved |

PCI_STOP# Power Management

| SMBus OE Bit | PCI_STOP# | Stop Drive Mode | Single-ended Clocks | | Differential Clocks (Except CPU) | |
|--------------|-----------|-----------------|---------------------|--------------|-------------------------------------|--------------|
| | | | Stoppable | Free running | Stoppable | Free running |
| Enable | 1 | X | Running | Running | Running | Running |
| | 0 | 0 | Low | Low | CK= High CK# = Low | Running |
| | | 1 | | | CK= Pull down CK# = Low | Running |
| Disable | X | X | Low | | CK= Pull down, CK# = Low | |

CPU_STOP# Power Management

| SMBus OE Bit | PCI_STOP# | Stop Drive Mode | Differential Clocks | |
|--------------|-----------|-----------------|----------------------------|--------------|
| | | | Stoppable | Free running |
| Enable | 1 | X | Running | Running |
| | 0 | 0 | CK= High CK# = Low | Running |
| | | 1 | CK= Pull down CK# = Low | Running |
| Disable | X | X | Low | |

CR# Power Management

| SMBus OE Bit | CR# | Stop Drive Mode | Differential Clocks | |
|--------------|-----|-----------------|---------------------------|--------------|
| | | | Stoppable | Free running |
| Enable | 1 | X | Running | Running |
| | 0 | | CK= Pull down, CK# = Low | |
| Disable | X | | CK = Pull down, CK# = Low | |

PD# Power Management

| Device State | Single-ended Clocks | | Differential Clocks (Except CPU1) | CPU1 |
|--|---------------------|-----------------|--------------------------------------|----------------------------|
| | w/o Latched input | w/Latched input | | |
| Latches Open | Low | Hi-Z | CK= Pull down, CK# = Low | CK= Pull down, CK# = Low |
| Power Down | | | CK= Pull down CK# = Low | CK= Pull down CK# = Low |
| M1 | | | CK= Pull down CK# = Low | Running |
| Virtual Power Cycle to Latches Open | | | CK= Pull down, CK# = Low | CK= Pull down, CK# = Low |

General SMBus serial interface information for the ICS9LPRS501

How to Write:

- Controller (host) sends a start bit.
- Controller (host) sends the write address D2_(H)
- ICS clock will **acknowledge**
- Controller (host) sends the beginning byte location = N
- ICS clock will **acknowledge**
- Controller (host) sends the data byte count = X
- ICS clock will **acknowledge**
- Controller (host) starts sending **Byte N through Byte N + X - 1**
- ICS clock will **acknowledge** each byte **one at a time**
- Controller (host) sends a Stop bit

How to Read:

- Controller (host) will send start bit.
- Controller (host) sends the write address D2_(H)
- ICS clock will **acknowledge**
- Controller (host) sends the beginning byte location = N
- ICS clock will **acknowledge**
- Controller (host) will send a separate start bit.
- Controller (host) sends the read address D3_(H)
- ICS clock will **acknowledge**
- ICS clock will send the data byte count = X
- ICS clock sends **Byte N + X - 1**
- ICS clock sends **Byte 0 through byte X (if X_(H) was written to byte 8).**
- Controller (host) will need to acknowledge each byte
- Controller (host) will send a not acknowledge bit
- Controller (host) will send a stop bit

| Index Block Write Operation | | |
|---------------------------------|-----------|----------------------|
| Controller (Host) | | ICS (Slave/Receiver) |
| T | starT bit | |
| Slave Address D2 _(H) | | |
| WR | WRite | |
| | | ACK |
| Beginning Byte = N | | |
| | | ACK |
| Data Byte Count = X | | |
| | | ACK |
| Beginning Byte N | | X Byte |
| | ○ | |
| | ○ | |
| | ○ | |
| | ○ | |
| Byte N + X - 1 | | |
| | | ACK |
| P | stoP bit | |

| Index Block Read Operation | | | |
|---------------------------------|-----------------|----------------------|------------------|
| Controller (Host) | | ICS (Slave/Receiver) | |
| T | starT bit | | |
| Slave Address D2 _(H) | | | |
| WR | WRite | | |
| | | ACK | |
| Beginning Byte = N | | | |
| | | ACK | |
| RT | Repeat starT | | |
| Slave Address D3 _(H) | | | |
| RD | ReaD | | |
| | | ACK | |
| | | Data Byte Count = X | |
| ACK | | | |
| ACK | | X Byte | |
| | | | Beginning Byte N |
| | ○ | | |
| | ○ | | |
| | ○ | | |
| | | Byte N + X - 1 | |
| N | Not acknowledge | | |
| P | stoP bit | | |

Byte 0 FS Readback and PLL Selection Register

| Bit | Pin | Name | Description | Type | 0 | 1 | Default |
|-----|-----|--------------|--|------|--|-------------------------|---------|
| 7 | - | FSLC | CPU Freq. Sel. Bit (Most Significant) | R | See Table 1 : CPU Frequency Select Table | | Latch |
| 6 | - | FSLB | CPU Freq. Sel. Bit | R | | | Latch |
| 5 | - | FSLA | CPU Freq. Sel. Bit (Least Significant) | R | | | Latch |
| 4 | - | iAMT_EN | Set via SMBus or dynamically by CK505 if detects dynamic M1 | RW | Legacy Mode | iAMT Enabled | 0 |
| 3 | | Reserved | Reserved | RW | | | 0 |
| 2 | - | SRC_Main_SEL | Select source for SRC Main | RW | SRC Main = PLL1 | SRC Main = PLL3 | 0 |
| 1 | - | SATA_SEL | Select source for SATA clock | RW | SATA = SRC_Main | SATA = PLL2 See Note | 0 |
| 0 | - | PD_Restore | 1 = on Power Down de-assert return to last known state 0 = clear all SMBus configurations as if cold power-on and go to latches open state This bit is ignored and treated as '1' if device is in iAMT mode. | RW | Configuration Not Saved | Configuration Saved | 1 |

Note: If setting Byte 0, bit 1 to 1 to make SATA non-spreading, Byte63, bit 1 must be set to '1' first to turn on the SATA PLL.

Byte 1 DOT96 Select and PLL3 Quick Config Register

| Bit | Pin | Name | Description | Type | 0 | 1 | Default |
|-----|-------|--------------|--------------------------------|------|---|-------------------|---------|
| 7 | 13/14 | SRC0_SEL | Select SRC0 or DOT96 | RW | SRC0 | DOT96 | 0 |
| 6 | - | PLL1_SSC_SEL | Select 0.5% down or center SSC | RW | Down spread | Center spread | 0 |
| 5 | | PLL3_SSC_SEL | Select 0.5% down or center SSC | RW | Down spread | Center spread | 0 |
| 4 | | PLL3_CF3 | PLL3 Quick Config Bit 3 | RW | See Table 2: PLL3 Quick Configuration Only applies if Byte 0, bit 2 = 0. | | 0 |
| 3 | | PLL3_CF2 | PLL3 Quick Config Bit 2 | RW | | | 0 |
| 2 | | PLL3_CF1 | PLL3 Quick Config Bit 1 | RW | | | 0 |
| 1 | | PLL3_CF0 | PLL3 Quick Config Bit 0 | RW | | | 1 |
| 0 | | PCI_SEL | PCI_SEL | RW | PCI from PLL1 | PCI from SRC_MAIN | 1 |

Byte 2 Output Enable Register

| Bit | Pin | Name | Description | Type | 0 | 1 | Default |
|-----|-----|----------|---|------|-----------------|----------------|---------|
| 7 | | REF_OE | Output enable for REF, if disabled output is Hi-Z | RW | Output Disabled | Output Enabled | 1 |
| 6 | | USB_OE | Output enable for USB | RW | Output Disabled | Output Enabled | 1 |
| 5 | | PCIF5_OE | Output enable for PCI5 | RW | Output Disabled | Output Enabled | 1 |
| 4 | | PCI4_OE | Output enable for PCI4 | RW | Output Disabled | Output Enabled | 1 |
| 3 | | PCI3_OE | Output enable for PCI3 | RW | Output Disabled | Output Enabled | 1 |
| 2 | | PCI2_OE | Output enable for PCI2 | RW | Output Disabled | Output Enabled | 1 |
| 1 | | PCI1_OE | Output enable for PCI1 | RW | Output Disabled | Output Enabled | 1 |
| 0 | | PCI0_OE | Output enable for PCI0 | RW | Output Disabled | Output Enabled | 1 |

Byte 3 Output Enable Register

| Bit | Pin | Name | Description | Type | 0 | 1 | Default |
|-----|-----|-------------|-------------------------------|------|-----------------|----------------|---------|
| 7 | | SRC11_OE | Output enable for SRC11 | RW | Output Disabled | Output Enabled | 1 |
| 6 | | SRC10_OE | Output enable for SRC10 | RW | Output Disabled | Output Enabled | 1 |
| 5 | | SRC9_OE | Output enable for SRC9 | RW | Output Disabled | Output Enabled | 1 |
| 4 | | SRC8/ITP_OE | Output enable for SRC8 or ITP | RW | Output Disabled | Output Enabled | 1 |
| 3 | | SRC7_OE | Output enable for SRC7 | RW | Output Disabled | Output Enabled | 1 |
| 2 | | SRC6_OE | Output enable for SRC6 | RW | Output Disabled | Output Enabled | 1 |
| 1 | | SRC5_OE | Output enable for SRC5 | RW | Output Disabled | Output Enabled | 1 |
| 0 | | SRC4_OE | Output enable for SRC4 | RW | Output Disabled | Output Enabled | 1 |

Byte 4 Output Enable and Spread Spectrum Disable Register

| Bit | Pin | Name | Description | Type | 0 | 1 | Default |
|-----|-----|---------------|---------------------------------|------|-----------------|----------------|---------|
| 7 | | SRC3_OE | Output enable for SRC3 | RW | Output Disabled | Output Enabled | 1 |
| 6 | | SATA/SRC2_OE | Output enable for SATA/SRC2 | RW | Output Disabled | Output Enabled | 1 |
| 5 | | SRC1_OE | Output enable for SRC1 | RW | Output Disabled | Output Enabled | 1 |
| 4 | | SRC0/DOT96_OE | Output enable for SRC0/DOT96 | RW | Output Disabled | Output Enabled | 1 |
| 3 | | CPU1_OE | Output enable for CPU1 | RW | Output Disabled | Output Enabled | 1 |
| 2 | | CPU0_OE | Output enable for CPU0 | RW | Output Disabled | Output Enabled | 1 |
| 1 | | PLL1_SSC_ON | Enable PLL1's spread modulation | RW | Spread Disabled | Spread Enabled | 1 |
| 0 | | PLL3_SSC_ON | Enable PLL3's spread modulation | RW | Spread Disabled | Spread Enabled | 1 |

Byte 5 Clock Request Enable/Configuration Register

| Bit | Pin | Name | Description | Type | 0 | 1 | Default |
|-----|-----|-----------|--|------|---------------|---------------|---------|
| 7 | | CR#_A_EN | Enable CR#_A (clk req), PCI0_OE must be = 1 for this bit to take effect | RW | Disable CR#_A | Enable CR#_A | 0 |
| 6 | | CR#_A_SEL | Sets CR#_A to control either SRC0 or SRC2 | RW | CR#_A -> SRC0 | CR#_A -> SRC2 | 0 |
| 5 | | CR#_B_EN | Enable CR#_B (clk req) | RW | Disable CR#_B | Enable CR#_B | 0 |
| 4 | | CR#_B_SEL | Sets CR#_B -> SRC1 or SRC4 | RW | CR#_B -> SRC1 | CR#_B -> SRC4 | 0 |
| 3 | | CR#_C_EN | Enable CR#_C (clk req) | RW | Disable CR#_C | Enable CR#_C | 0 |
| 2 | | CR#_C_SEL | Sets CR#_C -> SRC0 or SRC2 | RW | CR#_C -> SRC0 | CR#_C -> SRC2 | 0 |
| 1 | | CR#_D_EN | Enable CR#_D (clk req) | RW | Disable CR#_D | Enable CR#_D | 0 |
| 0 | | CR#_D_SEL | Sets CR#_D -> SRC1 or SRC4 | RW | CR#_D -> SRC1 | CR#_D -> SRC4 | 0 |

Byte 6 Clock Request Enable/Configuration and Stop Control Register

| Bit | Pin | Name | Description | Type | 0 | 1 | Default |
|-----|-----|-------------------------|---|------|---------------|-----------------------------------|---------|
| 7 | | CR#_E_EN | Enable CR#_E (clk req) -> SRC6 | RW | Disable CR#_E | Enable CR#_E | 0 |
| 6 | | CR#_F_EN | Enable CR#_F (clk req) -> SRC8 | RW | Disable CR#_F | Enable CR#_F | 0 |
| 5 | | CR#_G_EN | Enable CR#_G (clk req) -> SRC9 | RW | Disable CR#_G | Enable CR#_G | 0 |
| 4 | | CR#_H_EN | Enable CR#_H (clk req) -> SRC10 | RW | Disable CR#_H | Enable CR#_H | 0 |
| 3 | | Reserved | Reserved | RW | | | 0 |
| 2 | | Reserved | Reserved | RW | | | 0 |
| 1 | | SSCD_STP_CRTL (SRC1) | If set, SSCD (SRC1) stops with PCI_STOP# | RW | Free Running | Stops with PCI_STOP# assertion | 0 |
| 0 | | SRC_STP_CRTL | If set, SRCs (except SRC1) stop with PCI_STOP# | RW | Free Running | Stops with PCI_STOP# assertion | 0 |

Byte 7 Vendor ID/ Revision ID

| Bit | Pin | Name | Description | Type | 0 | 1 | Default |
|-----|-----|-----------------|---------------------|------|-----------------|---|---------|
| 7 | | Rev Code Bit 3 | Revision ID | R | Vendor specific | | X |
| 6 | | Rev Code Bit 2 | | R | | | X |
| 5 | | Rev Code Bit 1 | | R | | | X |
| 4 | | Rev Code Bit 0 | | R | | | X |
| 3 | | Vendor ID bit 3 | | R | | | 0 |
| 2 | | Vendor ID bit 2 | R | 0 | | | |
| 1 | | Vendor ID bit 1 | ICS is 0001, binary | R | | | 0 |
| 0 | | Vendor ID bit 0 | | R | | | 1 |

Byte 8 Device ID and Output Enable Register

| Bit | Pin | Name | Description | Type | 0 | 1 | Default |
|-----|-----|------------|--|------|---------------------|---------|---------|
| 7 | | Device ID3 | Table of Device identifier codes, used for differentiating between CK505 package options, etc. | R | See Device ID Table | | 0 |
| 6 | | Device ID2 | | R | | | 0 |
| 5 | | Device ID1 | | R | | | 0 |
| 4 | | Device ID0 | | R | | | 1 |
| 3 | | Reserved | Reserved | RW | - | - | 0 |
| 2 | | Reserved | Reserved | RW | - | - | 0 |
| 1 | | SE1_OE | Output enable for SE1 | RW | Disabled | Enabled | 0 |
| 0 | | SE2_OE | Output enable for SE2 | RW | Disabled | Enabled | 0 |

Byte 9 Output Control Register

| Bit | Pin | Name | Description | Type | 0 | 1 | Default |
|-----|-----|------------------|--|------|--|-----------------------------------|---------|
| 7 | | PCIF5_STOP_EN | Allows control of PCIF5 with assertion of PCI_STOP# | RW | Free running | Stops with PCI_STOP# assertion | 0 |
| 6 | | TME_Readback | Trusted Mode Enable (TME) strap status | R | normal operation | no overlocking | 0 |
| 5 | | Reserved | Reserved | RW | - | - | 1 |
| 4 | | Test Mode Select | Allows test select, ignores REF/FSC/TestSel | RW | Outputs HI-Z | Outputs = REF/N | 0 |
| 3 | | Test Mode Entry | Allows entry into test mode, ignores FSB/TestMode | RW | Normal operation | Test mode | 0 |
| 2 | | IO_VOUT2 | IO Output Voltage Select (Most Significant Bit) | RW | See Table 3: V_IO Selection (Default is 0.8V) | | 1 |
| 1 | | IO_VOUT1 | IO Output Voltage Select | RW | | | 0 |

Byte 10 CK505 Rev 0.85 Functions (ICS Rev H Silicon and Higher)

| Bit | Pin | Name | Description | Type | 0 | 1 | Default |
|-----|-----|-------------------|---|------|----------------------|--------------|---------|
| 7 | | SRC5_EN Readback | Readback of SRC5 enable latch | R | CPU/PCI Stop Enabled | SRC5 Enabled | Latch |
| 6 | | Reserved | Reserved | RW | TBD | TBD | 0 |
| 5 | | Reserved | | RW | TBD | TBD | 0 |
| 4 | | Reserved | | RW | TBD | TBD | 0 |
| 3 | | Reserved | | RW | TBD | TBD | 0 |
| 2 | | Reserved | | RW | TBD | TBD | 0 |
| 1 | | CPU 1 Stop Enable | Enables control of CPU1 with CPU_STOP# | RW | Free Running | Stoppable | 1 |
| 0 | | CPU 0 Stop Enable | Enables control of CPU 0 with CPU_STOP# | RW | Free Running | Stoppable | 1 |

Byte 11 CK505 Rev 1.0 functions (ICS Rev P silicon and higher)

| Bit | Pin | Name | Description | Type | 0 | 1 | Default |
|-----|-----|------------------|---|------|---------------------|----------------------|---------|
| 7 | | Reserved | Reserved | RW | TBD | TBD | 0 |
| 6 | | Reserved | | RW | TBD | TBD | 0 |
| 5 | | Reserved | | RW | TBD | TBD | 0 |
| 4 | | Reserved | | RW | TBD | TBD | 0 |
| 3 | | CPU2_iAMT_EN | Enables CPU2(ITP) output in iAMT state (M1) | RW | Off in iAMT | Free running in iAMT | 0 |
| 2 | | CPU1_iAMT_EN | Enables CPU1 output in iAMT state (M1) | RW | Off in iAMT | Free running in iAMT | 1 |
| 1 | | PCIe-Gen2 | PCIe-Gen2 status | R | PCIe Gen1 compliant | PCIe Gen2 compliant | 0 |
| 0 | | CPU2 Stop Enable | Enables control of CPU2(ITP) with CPU_STOP# | RW | Free Running | Stoppable | 1 |

Byte 12 Byte Count Register

| Bit | Pin | Name | Description | Type | 0 | 1 | Default |
|-----|-----|----------|-------------------------------|------|---|---|---------|
| 7 | | Reserved | Read Back byte count register | RW | | | 0 |
| 6 | | Reserved | | RW | | | 0 |
| 5 | | BC5 | | RW | | | 0 |
| 4 | | BC4 | | RW | | | 0 |
| 3 | | BC3 | | RW | | | 1 |
| 2 | | BC2 | | RW | | | 1 |
| 1 | | BC1 | | RW | | | 0 |
| 0 | | BC0 | | RW | | | 1 |

Byte 13 CK505 PLL1 M/N Programming Register

| Bit | Pin | Name | Description | Type | 0 | 1 | Default |
|-----|-----|--------|--|------|---|---|---------|
| 7 | | N Div8 | N Divider 8 | RW | - | - | X |
| 6 | | N Div9 | N Divider 9 | RW | - | - | X |
| 5 | | M Div5 | The decimal representation of M Div (5:0) is equal to reference divider value. Default at power up = latch-in or Byte 0 Rom table. | RW | - | - | X |
| 4 | | M Div4 | | RW | - | - | X |
| 3 | | M Div3 | | RW | - | - | X |
| 2 | | M Div2 | | RW | - | - | X |
| 1 | | M Div1 | | RW | - | - | X |
| 0 | | M Div0 | | RW | - | - | X |

Byte 14 CK505 PLL1 M/N Programming Register

| Bit | Pin | Name | Description | Type | 0 | 1 | Default |
|-----|-----|--------|--|------|---|---|---------|
| 7 | | N Div7 | The decimal representation of N Div (9:0) is equal to VCO divider value. Default at power up = latch-in or Byte 0 Rom table. | RW | - | - | X |
| 6 | | N Div6 | | RW | - | - | X |
| 5 | | N Div5 | | RW | - | - | X |
| 4 | | N Div4 | | RW | - | - | X |
| 3 | | N Div3 | | RW | - | - | X |
| 2 | | N Div2 | | RW | - | - | X |
| 1 | | N Div1 | | RW | - | - | X |
| 0 | | N Div0 | | RW | - | - | X |

Byte 15 CK505 PLL1 Spread Spectrum Control Register

| Bit | Pin | Name | Description | Type | 0 | 1 | Default |
|-----|-----|------|--|------|---|---|---------|
| 7 | | SSP7 | These Spread Spectrum bits will program the spread percentage. Contact ICS for the correct values. | RW | - | - | X |
| 6 | | SSP6 | | RW | - | - | X |
| 5 | | SSP5 | | RW | - | - | X |
| 4 | | SSP4 | | RW | - | - | X |
| 3 | | SSP3 | | RW | - | - | X |
| 2 | | SSP2 | | RW | - | - | X |
| 1 | | SSP1 | | RW | - | - | X |
| 0 | | SSP0 | | RW | - | - | X |

Byte 16 CK505 PLL1 Spread Spectrum Control Register

| Bit | Pin | Name | Description | Type | 0 | 1 | Default |
|-----|-----|----------|--|------|---|---|---------|
| 7 | | Reserved | Reserved | RW | - | - | 0 |
| 6 | | SSP14 | These Spread Spectrum bits will program the spread percentage. Contact ICS for the correct values. | RW | - | - | X |
| 5 | | SSP13 | | RW | - | - | X |
| 4 | | SSP12 | | RW | - | - | X |
| 3 | | SSP11 | | RW | - | - | X |
| 2 | | SSP10 | | RW | - | - | X |
| 1 | | SSP9 | | RW | - | - | X |
| 0 | | SSP8 | | RW | - | - | X |

Byte 17 CK505 PLL3 M/N Programming Register

| Bit | Pin | Name | Description | Type | 0 | 1 | Default |
|-----|-----|--------|--|------|---|---|---------|
| 7 | | N Div8 | N Divider 8 | RW | - | - | X |
| 6 | | N Div9 | N Divider 9 | RW | - | - | X |
| 5 | | M Div5 | The decimal representation of M Div (5:0) is equal to reference divider value. Default at power up = latch-in or Byte 0 Rom table. | RW | - | - | X |
| 4 | | M Div4 | | RW | - | - | X |
| 3 | | M Div3 | | RW | - | - | X |
| 2 | | M Div2 | | RW | - | - | X |
| 1 | | M Div1 | | RW | - | - | X |
| 0 | | M Div0 | | RW | - | - | X |

Byte 18 CK505 PLL3 M/N Programming Register

| Bit | Pin | Name | Description | Type | 0 | 1 | Default |
|-----|-----|--------|--|------|---|---|---------|
| 7 | | N Div7 | The decimal representation of N Div (9:0) is equal to VCO divider value. Default at power up = latch-in or Byte 0 Rom table. | RW | - | - | X |
| 6 | | N Div6 | | RW | - | - | X |
| 5 | | N Div5 | | RW | - | - | X |
| 4 | | N Div4 | | RW | - | - | X |
| 3 | | N Div3 | | RW | - | - | X |
| 2 | | N Div2 | | RW | - | - | X |
| 1 | | N Div1 | | RW | - | - | X |
| 0 | | N Div0 | | RW | - | - | X |

Byte 19 CK505 PLL3 Spread Spectrum Control Register

| Bit | Pin | Name | Description | Type | 0 | 1 | Default |
|-----|-----|------|--|------|---|---|---------|
| 7 | | SSP7 | These Spread Spectrum bits will program the spread percentage. Contact ICS for the correct values. | RW | - | - | X |
| 6 | | SSP6 | | RW | - | - | X |
| 5 | | SSP5 | | RW | - | - | X |
| 4 | | SSP4 | | RW | - | - | X |
| 3 | | SSP3 | | RW | - | - | X |
| 2 | | SSP2 | | RW | - | - | X |
| 1 | | SSP1 | | RW | - | - | X |
| 0 | | SSP0 | | RW | - | - | X |

Byte 20 CK505 PLL3 Spread Spectrum Control Register

| Bit | Pin | Name | Description | Type | 0 | 1 | Default |
|-----|-----|----------|--|------|---|---|---------|
| 7 | | Reserved | Reserved | RW | - | - | 0 |
| 6 | | SSP14 | These Spread Spectrum bits will program the spread percentage. Contact ICS for the correct values. | RW | - | - | X |
| 5 | | SSP13 | | RW | - | - | X |
| 4 | | SSP12 | | RW | - | - | X |
| 3 | | SSP11 | | RW | - | - | X |
| 2 | | SSP10 | | RW | - | - | X |
| 1 | | SSP9 | | RW | - | - | X |
| 0 | | SSP8 | | RW | - | - | X |

Byte 21 M/N Enables

| Bit | Pin | Name | Description | Type | 0 | 1 | Default |
|-----|-----|--------------------|-------------|------|---------|--------|---------|
| 7 | | Reserved | | RW | | | 0 |
| 6 | | Reserved | | RW | | | 0 |
| 5 | | Reserved | | RW | | | 0 |
| 4 | | Reserved | | RW | | | 0 |
| 3 | | Reserved | | RW | | | 0 |
| 2 | | Reserved | | RW | | | 0 |
| 1 | | M/N Enable CPU | | RW | Disable | Enable | 0 |
| 0 | | M/N Enable SRC/PCI | | RW | Disable | Enable | 0 |

Byte 22 CPU M/N Programming

| Bit | Pin | Name | Description | Type | 0 | 1 | Default |
|-----|-----|-------------|-----------------------|------|---|---|---------|
| 7 | | N Div bit 8 | PLL 1 M/N Programming | RW | - | - | X |
| 6 | | N Div bit 9 | (Intel PLL1 CPU) | RW | - | - | X |
| 5 | | M Div Bit 5 | | RW | - | - | X |
| 4 | | M Div Bit 4 | | RW | - | - | X |
| 3 | | M Div Bit 3 | | RW | - | - | X |
| 2 | | M Div Bit 2 | | RW | - | - | X |
| 1 | | M Div Bit 1 | | RW | - | - | X |
| 0 | | M Div Bit 0 | | RW | - | - | X |

Byte 23 CPU M/N Programming

| Bit | Pin | Name | Description | Type | 0 | 1 | Default |
|-----|-----|-------------|-----------------------|------|---|---|---------|
| 7 | | N Div bit 7 | PLL 1 M/N Programming | RW | - | - | X |
| 6 | | N Div bit 6 | (Intel PLL1 CPU) | RW | - | - | X |
| 5 | | N Div bit 5 | | RW | - | - | X |
| 4 | | N Div bit 4 | | RW | - | - | X |
| 3 | | N Div bit 3 | | RW | - | - | X |
| 2 | | N Div bit 2 | | RW | - | - | X |
| 1 | | N Div bit 1 | | RW | - | - | X |
| 0 | | N Div Bit 0 | | RW | - | - | X |

Bytes 24-62 Reserved**Byte 63 Special Power Management Features (Rev P Silicon and Higher)**

| Bit | Pin | Name | Description | RW | 0 | 1 | Default |
|-----|-----|-----------------|-----------------------------------|----|-----|----|---------|
| 7 | | Reserved | | RW | | | 0 |
| 6 | | Reserved | | RW | | | 0 |
| 5 | | Reserved | | RW | | | 0 |
| 4 | | Reserved | | RW | | | 0 |
| 3 | | Reserved | | RW | | | 0 |
| 2 | | Reserved | | RW | | | 0 |
| 1 | | SATA PLL | Power Management Feature | RW | off | on | Note |
| 0 | | XTAL PD Control | Controls XTAL on/off in legacy PD | RW | off | on | 1 |

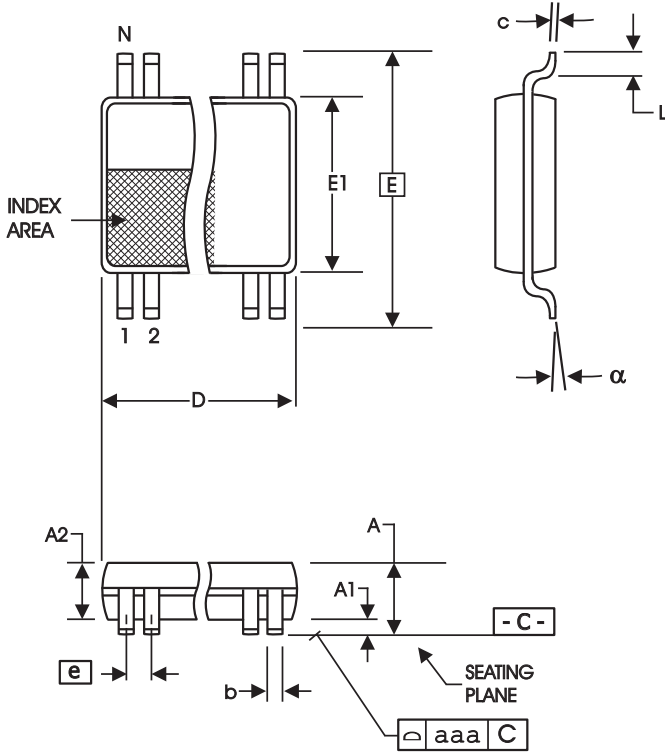
Note: Default is "off" for Rev P Silicon and higher.

Test Clarification Table

| Comments | HW | | SW | | OUTPUT |
|---|-----------------------------|------------------------------|---------------------------|--------------------------|--------|
| | FSLC/ TEST_SEL HW PIN | FSLB/ TEST_MODE HW PIN | TEST ENTRY BIT B9b3 | REF/N or HI-Z B9b4 | |
| | <2.0V | X | 0 | 0 | NORMAL |
| Power-up w/ TEST_SEL = 1 to enter test mode Cycle power to disable test mode FSLC./TEST_SEL -->3-level latched input If power-up w/ V>2.0V then use TEST_SEL If power-up w/ V<2.0V then use FSLC FSLB/TEST_MODE -->low Vth input TEST_MODE is a real time input | >2.0V | 0 | X | 0 | HI-Z |
| | >2.0V | 0 | X | 1 | REF/N |
| | >2.0V | 1 | X | 0 | REF/N |
| | >2.0V | 1 | X | 1 | REF/N |
| If TEST_SEL HW pin is 0 during power-up, test mode can be invoked through B9b3. If test mode is invoked by B9b3, only B9b4 is used to select HI-Z or REF/N FSLB/TEST_Mode pin is not used. Cycle power to disable test mode, one shot control | <2.0V | X | 1 | 0 | HI-Z |
| | <2.0V | X | 1 | 1 | REF/N |

B9b3: 1= ENTER TEST MODE, Default = 0 (NORMAL OPERATION)

B9b4: 1= REF/N, Default = 0 (HI-Z)



6.10 mm. Body, 0.50 mm. Pitch TSSOP
(240 mil) (20 mil)

| SYMBOL | In Millimeters | | In Inches | |
|--------|-------------------|------|-------------------|------|
| | COMMON DIMENSIONS | | COMMON DIMENSIONS | |
| | MIN | MAX | MIN | MAX |
| A | -- | 1.20 | -- | .047 |
| A1 | 0.05 | 0.15 | .002 | .006 |
| A2 | 0.80 | 1.05 | .032 | .041 |
| b | 0.17 | 0.27 | .007 | .011 |
| c | 0.09 | 0.20 | .0035 | .008 |
| D | SEE VARIATIONS | | SEE VARIATIONS | |
| E | 8.10 BASIC | | 0.319 BASIC | |
| E1 | 6.00 | 6.20 | .236 | .244 |
| e | 0.50 BASIC | | 0.020 BASIC | |
| L | 0.45 | 0.75 | .018 | .030 |
| N | SEE VARIATIONS | | SEE VARIATIONS | |
| alpha | 0° | 8° | 0° | 8° |
| aaa | -- | 0.10 | -- | .004 |

VARIATIONS

| N | D mm. | | D (inch) | |
|----|-------|-------|----------|------|
| | MIN | MAX | MIN | MAX |
| 64 | 16.90 | 17.10 | .665 | .673 |

Reference Doc.: JEDEC Publication 95, MO-153

10-0039

Revision History

| Rev. | Issue Date | Description | Page # |
|------|------------|--|--------------------------|
| A | 2/15/2008 | 1. Updated PLL3 Configuration Table. 2. Release to Final. | - |
| B | 4/25/2008 | Updated note on Byte 63. | 24 |
| C | 9/3/2008 | 1. Updated Electrical Table. 2. Updated SMBus Byte 9. | 12, 21 |
| D | 9/30/2008 | Added case temperature | 12 |
| E | 11/12/2008 | Added Electrical table for SE1/2=25MHz. | 15 |
| F | 2/23/2009 | Updated note under Byte 63 table. | 24 |
| G | 5/19/2011 | 1. Updated Electrical Tables to latest CK505 format 2. Added note to SMBus byte 0 clarifying interaction with Byte 63 3. Updated ordering information to latest format | 12-15, 20, 22, 26, 27 |

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Corporate Headquarters

Integrated Device Technology, Inc.
6024 Silver Creek Valley Road
San Jose, CA 95138
United States
800 345 7015
+408 284 8200 (outside U.S.)

Asia Pacific and Japan

Integrated Device Technology
Singapore (1997) Pte. Ltd.
Reg. No. 199707558G
435 Orchard Road
#20-03 Wisma Atria
Singapore 238877
+65 6 887 5505

Europe

IDT Europe, Limited
Prime House
Barnett Wood Lane
Leatherhead, Surrey
United Kingdom KT22 7DE
+44 1372 363 339



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