



**THE DATASHEET OF
STP08C596B1**



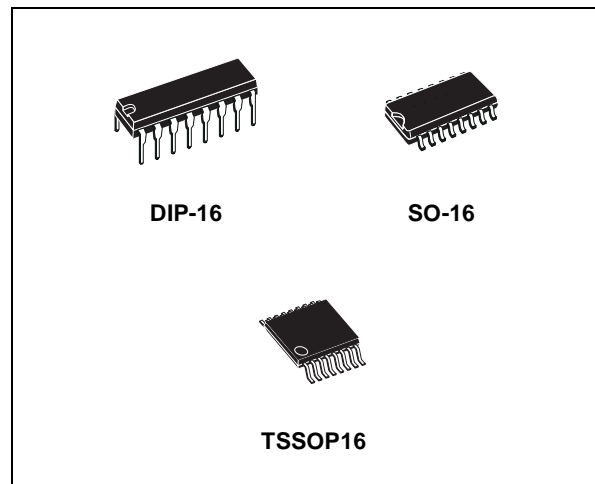
8-BIT CONSTANT CURRENT LED SINK DRIVER

- 8 CONSTANT CURRENT OUTPUT CHANNELS
- ADJUSTABLE OUTPUT CURRENT THROUGH EXTERNAL RESISTOR
- SERIAL DATA IN/PARALLEL DATA OUT
- SERIAL OUT CHANGE STATE ON THE FALLING EDGES OF CLOCK
- OUTPUT CURRENT: 15-120 mA
- 25 MHz CLOCK FREQ.
- AVAILABLE IN HIGH THERMAL TSSOP EXPOSED PAD
- EFFICIENCY PACKAGE

DESCRIPTION

The STP08C596 is a monolithic, medium-voltage, low current power 8-bit shift register designed for LED panel display. The STP08C596 contains a 8-bit serial-in, parallel-out shift register that feeds a 8-bit D-type storage register. In the output stage, sixteen regulated current sources were designed to provide 15-120mA constant current to drive the LEDs.

Compared with the STPIC6C595, the device provides great flexibility and improved performance in LED panel system design.



Trough an external resistor, users may adjust the STP08C596 output current, controlling in this way the light intensity of LEDs.

The STP08C596 guarantees 16V output driving capability, allowing users to connect more LEDs in series. The high clock frequency, 25 MHz, also satisfies the system requirement of high volume data transmission.

Table 1: Order Codes

| Part Number | Temp. Range | Package | Comments |
|--------------|----------------|-----------------------|---------------------|
| STP08C596B1 | -40°C to 125°C | DIP-16 | 25 part per tube |
| STP08C596M | -40°C to 125°C | SO-16 (Tube) | 50 parts per tube |
| STP08C596MTR | -40°C to 125°C | SO-16 (Tape & Reel) | 1000 parts per reel |
| STP08C596TTR | -40°C to 125°C | TSSOP16 (Tape & Reel) | 2500 parts per reel |

Table 2: Current Accuracy

| Output Voltage | Current accuracy | | Output Current |
|----------------|------------------|-------------|----------------|
| | Between bits | Between ICs | |
| ≥ 0.7V | TYP. ± 3% | ± 10% | 15 to 120 mA |

Figure 1: Pin Connection

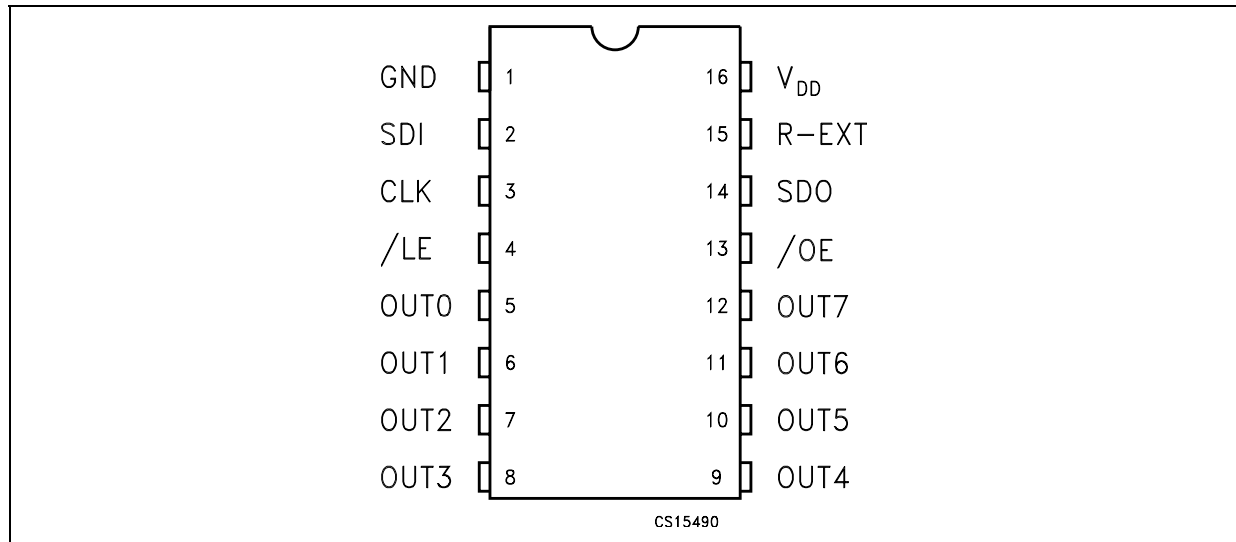


Table 3: Pin Description

| PIN N° | Symbol | Name and Function |
|--------|-----------------|---|
| 1 | GND | Ground Terminal |
| 2 | SDI | Serial data input terminal |
| 3 | CLK | Clock input terminal |
| 4 | /LE | Latch input terminal |
| 5-12 | OUT 0-7 | Output terminal |
| 13 | /OE | Output enable input terminal (active low) |
| 14 | SDO | Serial data out terminal |
| 15 | R-EXT | Constant Current programming |
| 16 | V _{DD} | 5V Supply voltage terminal |

Table 4: Absolute Maximum Ratings

| Symbol | Parameter | Value | Unit |
|------------------|-----------------------------|------------------------------|------|
| V _{DD} | Supply Voltage | 0 to 7 | V |
| V _O | Output Voltage | -0.5 to 16 | V |
| I _O | Output Current | 120 | mA |
| V _I | Input Voltage | -0.4 to V _{DD} +0.4 | V |
| I _{GND} | GND Terminal Current | 980 | mA |
| f _{CLK} | Clock Frequency | 25 | MHz |
| T _{OPR} | Operating Temperature Range | -40 to +125 | °C |
| T _{STG} | Storage Temperature Range | -55 to +150 | °C |

Absolute Maximum Ratings are those values beyond which damage to the device may occur. Functional operation under these condition is not implied.

Table 5: Thermal Data

| Symbol | Parameter | DIP-16 | SO-16 | TSSOP16 | Unit |
|---------------|-------------------------------------|--------|-------|---------|------|
| $R_{thj-amb}$ | Thermal Resistance Junction-ambient | 90 | 125 | 140 | °C/W |

Table 6: Recommended Operating Conditions

| Symbol | Parameter | Test Conditions | Min. | Typ. | Max. | Unit |
|----------------|----------------------|--------------------------|-------------------|------|--------------|------|
| V_{DD} | Supply Voltage | | 4.5 | 5.0 | 5.5 | V |
| V_O | Output Voltage | | | | 16.0 | V |
| I_O | Output Current | OUTn | 15 | | 120 | mA |
| I_{OH} | Output Current | SERIAL-OUT | | | +1 | mA |
| I_{OL} | Output Current | SERIAL-OUT | | | -1 | mA |
| V_{IH} | Input Voltage | | $0.7V_{DD}$ | | $V_{DD}+0.3$ | V |
| V_{IL} | Input Voltage | | -0.3 | | $0.3V_{DD}$ | V |
| t_{wLAT} | /LE Pulse Width | $V_{DD} = 3.0$ to $3.6V$ | 20 | | | ns |
| t_{wCLK} | CLK Pulse Width | | 20 | | | ns |
| t_{wEN} | /OE Pulse Width | | 400 | | | ns |
| $t_{SETUP(D)}$ | Setup Time for DATA | | 20 | | | ns |
| $t_{HOLD(D)}$ | Hold Time for DATA | | 15 | | | ns |
| $t_{SETUP(L)}$ | Setup Time for LATCH | | 15 | | | ns |
| f_{CLK} | Clock Frequency | | Cascade Operation | | | 25 |

Table 7: Electrical Characteristics ($V_{DD}=5V$, $T = 25^{\circ}C$, unless otherwise specified.)

| Symbol | Parameter | Test Conditions | Min. | Typ. | Max. | Unit |
|------------------|--|--|---------------|------|-------------|------------|
| V_{IH} | Input Voltage High Level | | $0.7V_{DD}$ | | V_{DD} | V |
| V_{IL} | Input Voltage Low Level | | GND | | $0.3V_{DD}$ | V |
| I_{OH} | Output Leakage Current | $V_{OH} = 16V$ | | | 10 | μA |
| V_{OL} | Output Voltage (Serial-OUT) | $I_{OL} = 1mA$ | | | 0.4 | V |
| V_{OH} | Output Voltage (Serial-OUT) | $I_{OH} = -1mA$ | $V_{DD}-0.4V$ | | | V |
| I_{OL1} | Output Current | $V_O = 0.7V$ $R_{EXT} = 910\ \Omega$ | 20.6 | 20.7 | 20.9 | mA |
| I_{OL2} | | $V_O = 0.7V$ $R_{EXT} = 360\ \Omega$ | 50.6 | 51.0 | 51.5 | mA |
| ΔI_{OL1} | Output Current Error between bit (All Output ON) | $V_O = 0.7V$ $R_{EXT} = 910\ \Omega$ | | | ± 3 | % |
| ΔI_{OL2} | | $V_O = 0.7V$ $R_{EXT} = 360\ \Omega$ | | | ± 3 | % |
| $R_{SIN(up)}$ | Pull-up Resistor | | 150 | 300 | 600 | K Ω |
| $R_{SIN(down)}$ | Pull-down Resistor | | 100 | 200 | 400 | K Ω |
| $I_{DD(OFF1)}$ | Supply Current (OFF) | $R_{EXT} = OPEN$ OUT 0 to 7 = OFF | | 0.3 | 0.6 | mA |
| $I_{DD(OFF2)}$ | | $R_{EXT} = 470\ \Omega$ OUT 0 to 7 = OFF | | 5.5 | 7.7 | |
| $I_{DD(OFF3)}$ | | $R_{EXT} = 250\ \Omega$ OUT 0 to 7 = OFF | | 10.1 | 14.1 | |
| $I_{DD(ON1)}$ | Supply Current (ON) | $R_{EXT} = 470\ \Omega$ OUT 0 to 7 = ON | | 5.5 | 7.7 | |
| $I_{DD(ON2)}$ | | $R_{EXT} = 250\ \Omega$ OUT 0 to 7 = ON | | 10.1 | 14.1 | |

Table 8: Switching Characteristics ($V_{DD}=5V$, $T = 25^{\circ}C$, unless otherwise specified.)

| Symbol | Parameter | Test Conditions | Min. | Typ. | Max. | Unit |
|------------|--|--|------|------|------|------|
| t_{PLH1} | Propagation Delay Time, CLK-OUTn, /LE = H, /OE = L | $V_{DD} = 5V$ $V_{IH} = V_{DD}$ | | 200 | 280 | ns |
| t_{PLH2} | Propagation Delay Time, /LE-OUTn, /OE = L | $V_{IL} = GND$ $C_L = 13pF$ | | 160 | 250 | ns |
| t_{PLH3} | Propagation Delay Time, /OE-OUTn, /LE = H | $I_O = 40mA$ $V_L = 3V$ | | 145 | 200 | ns |
| t_{PLH} | Propagation Delay Time, CLK-SDO | $R_{EXT} = 470\ \Omega$ $R_L = 65\ \Omega$ | | 15 | 30 | ns |
| t_{PHL1} | Propagation Delay Time, CLK-OUTn, /LE = H, /OE = L | | | 15 | 30 | ns |
| t_{PHL2} | Propagation Delay Time, /LE-OUTn, /OE = L | | | 15 | 30 | ns |
| t_{PHL3} | Propagation Delay Time, /OE-OUTn, /LE = H | | | 45 | 60 | ns |
| t_{PHL} | Propagation Delay Time, CLK-SDO | | | 15 | 300 | ns |
| t_r | Output Rise Time | | | 160 | 200 | ns |
| t_f | Output Fall Time | | | 15 | 25 | ns |

EQUIVALENT CIRCUIT OF INPUTS AND OUTPUTS

Figure 2: \overline{OE} Terminal

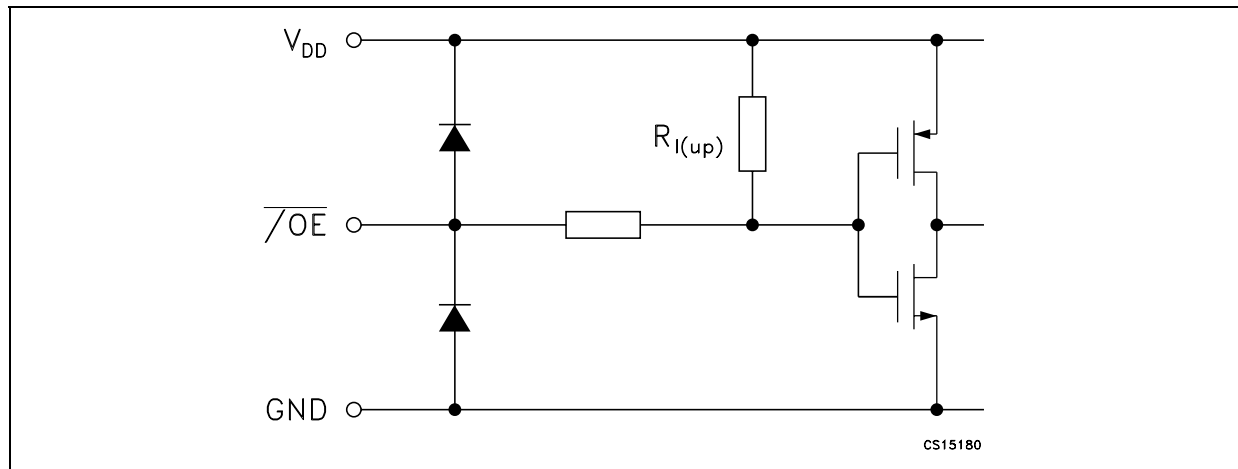


Figure 3: /LE Terminal

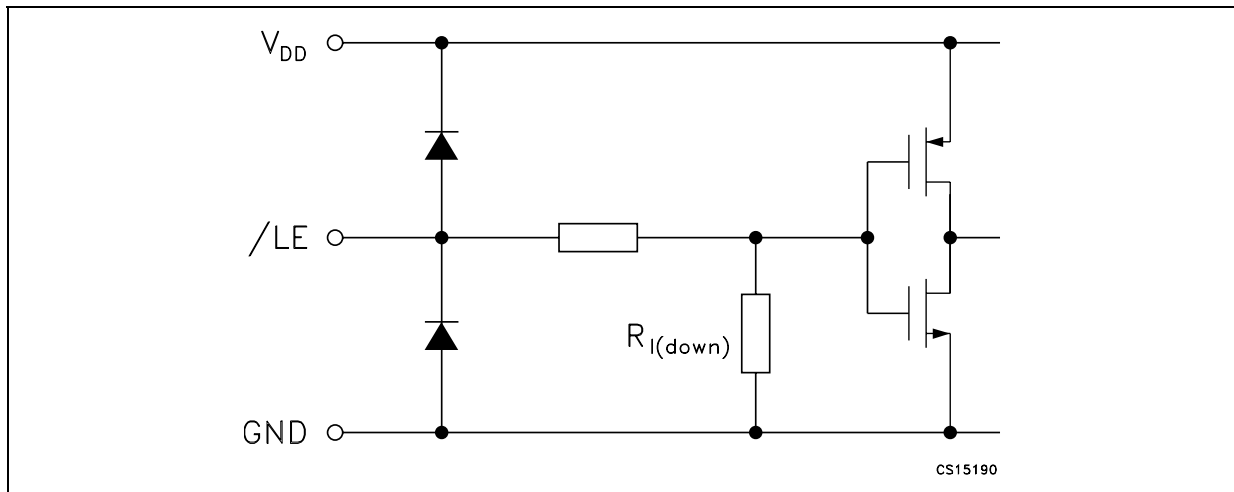


Figure 4: CLK, SDI Terminal

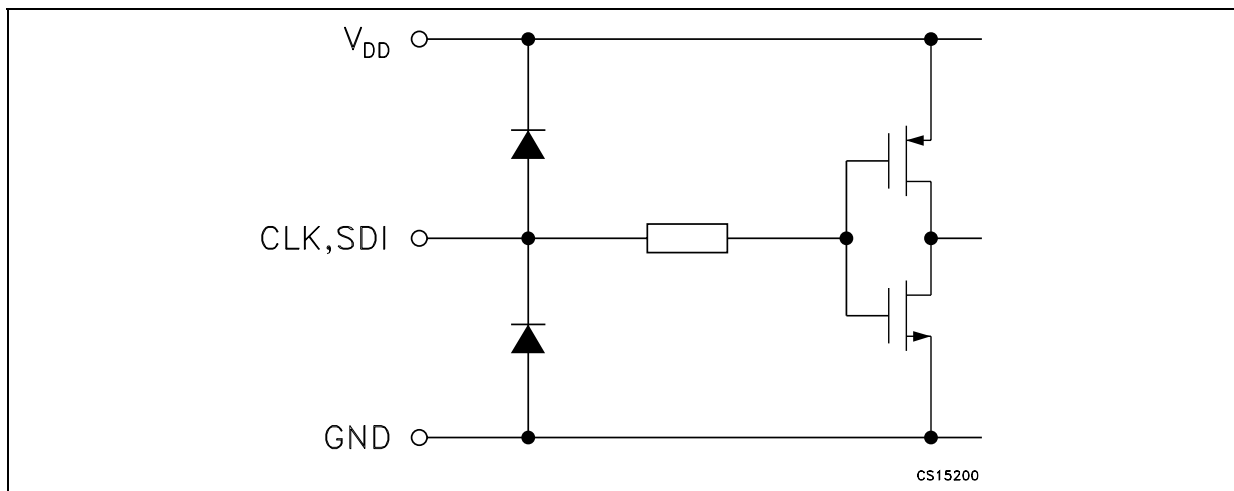


Figure 5: SDO Terminal

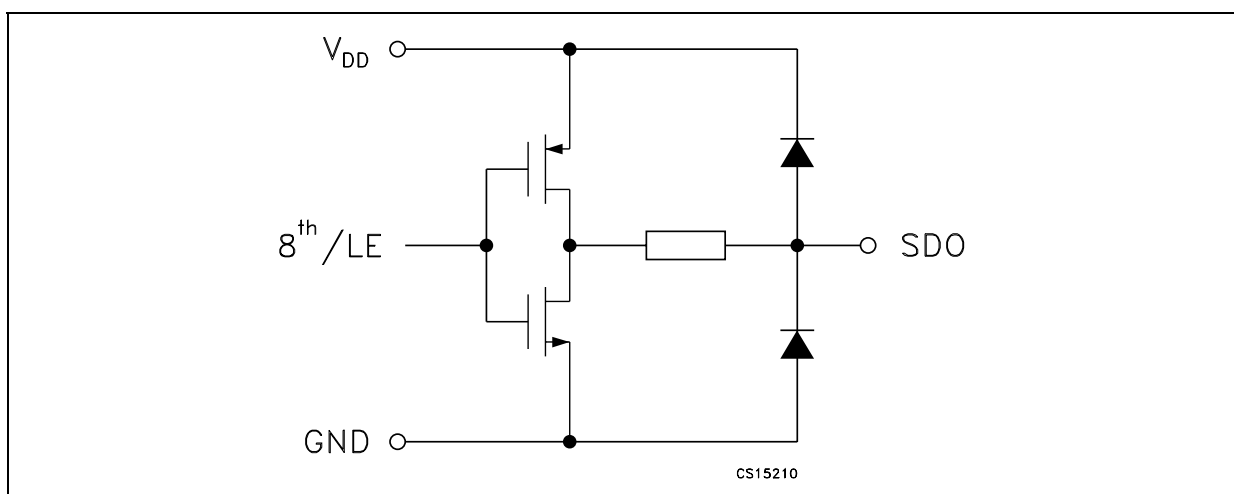


Figure 6: Block Diagram

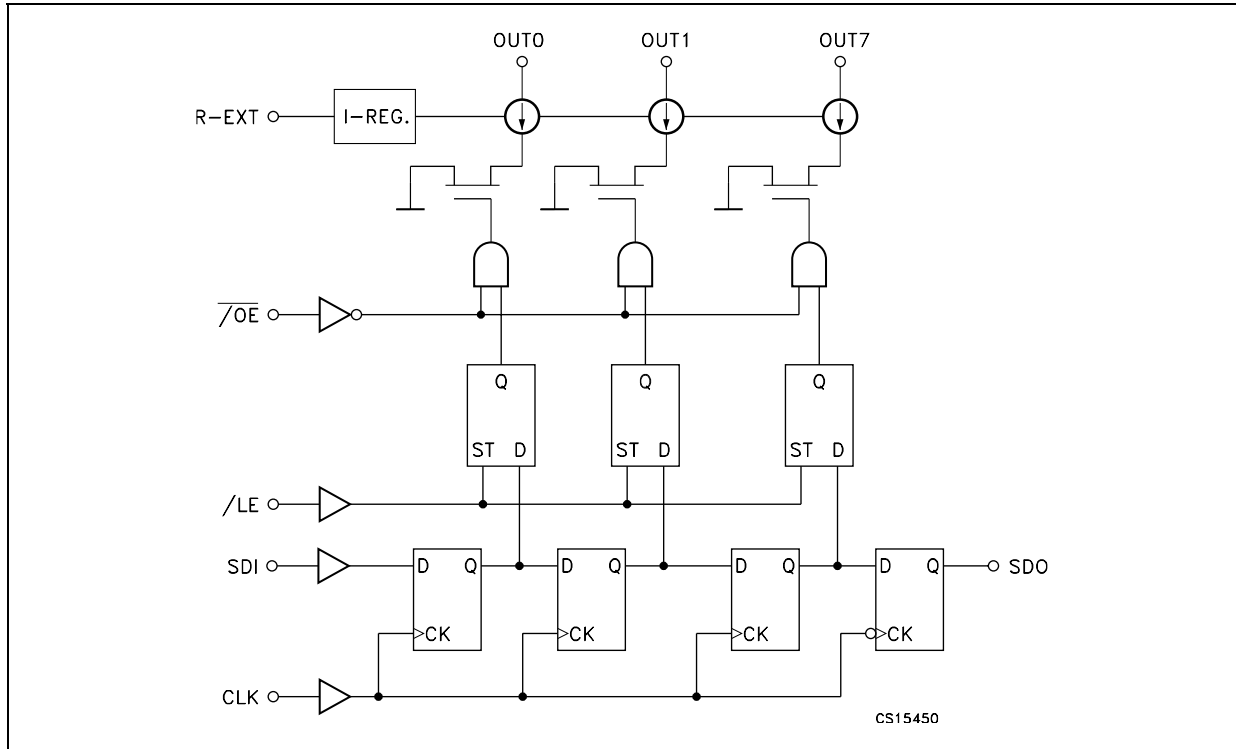


Figure 7: Timing Diagram

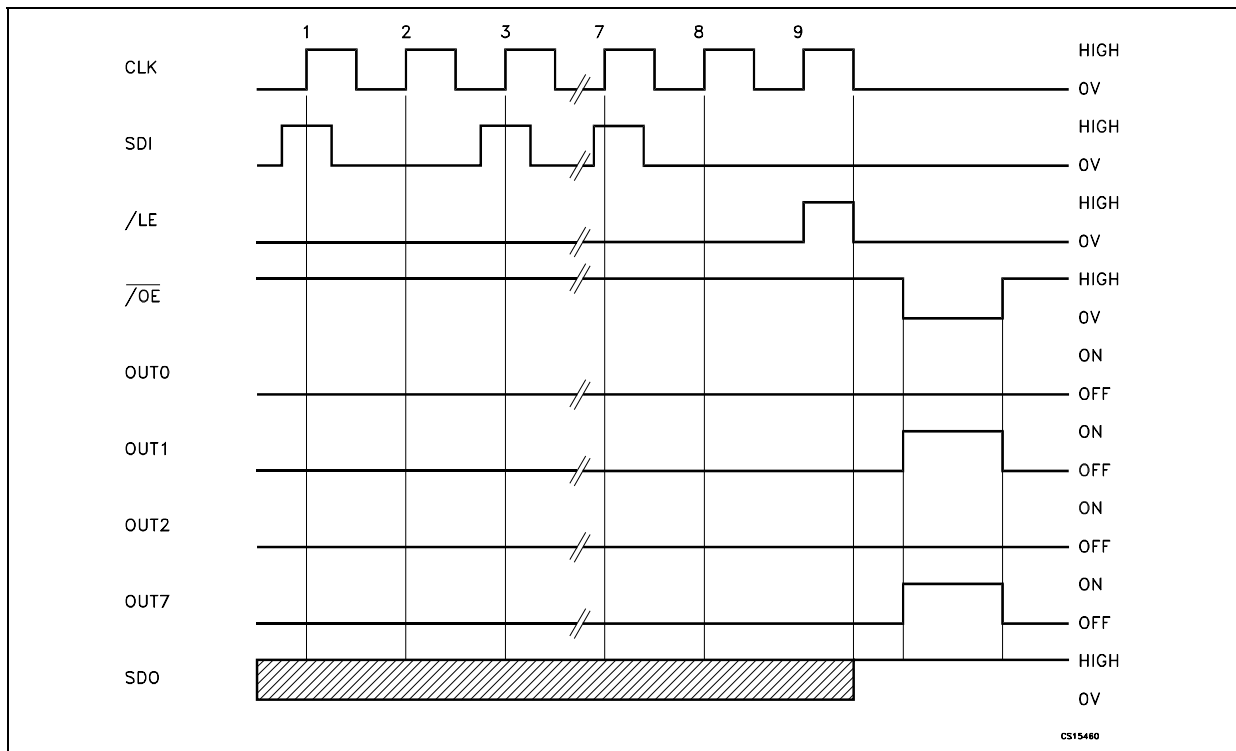


Figure 8: Clock, Serial-In, Serial-Out

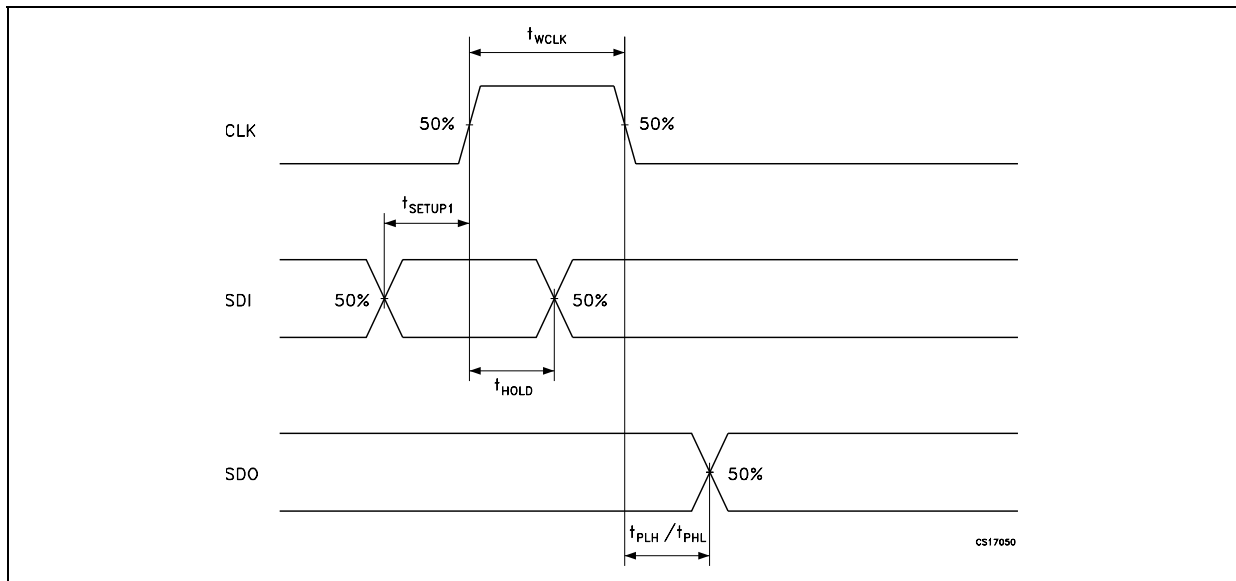


Figure 9: Clock, Serial-In, Latch, Enable, Outputs

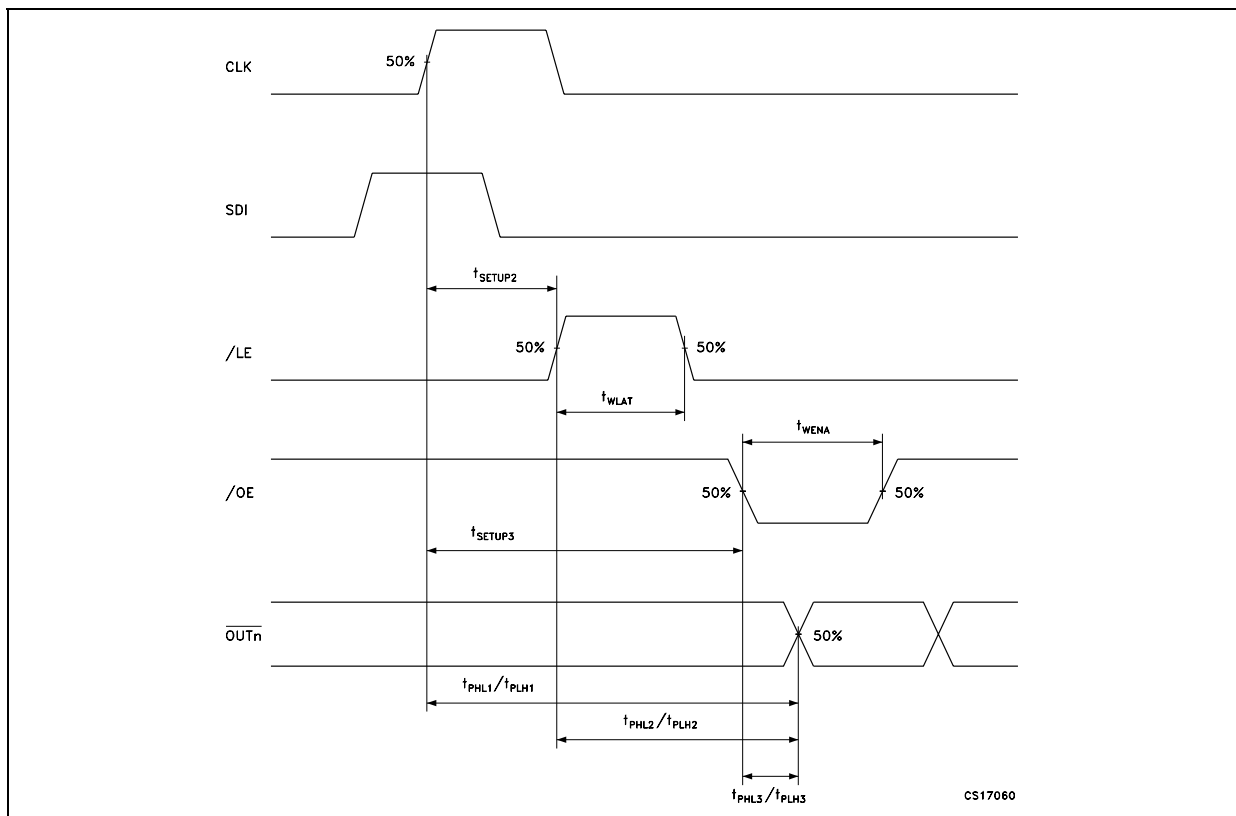
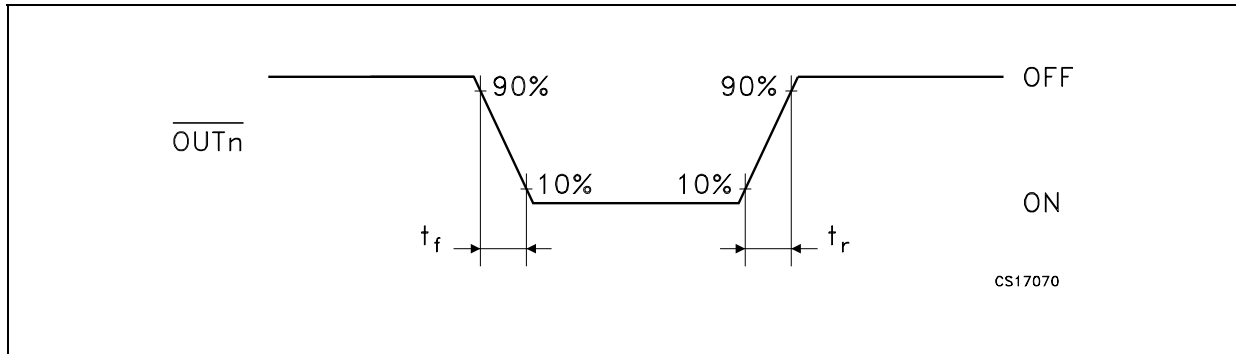


Figure 10: Outputs



TEST CIRCUIT

Figure 11: DC Characteristic

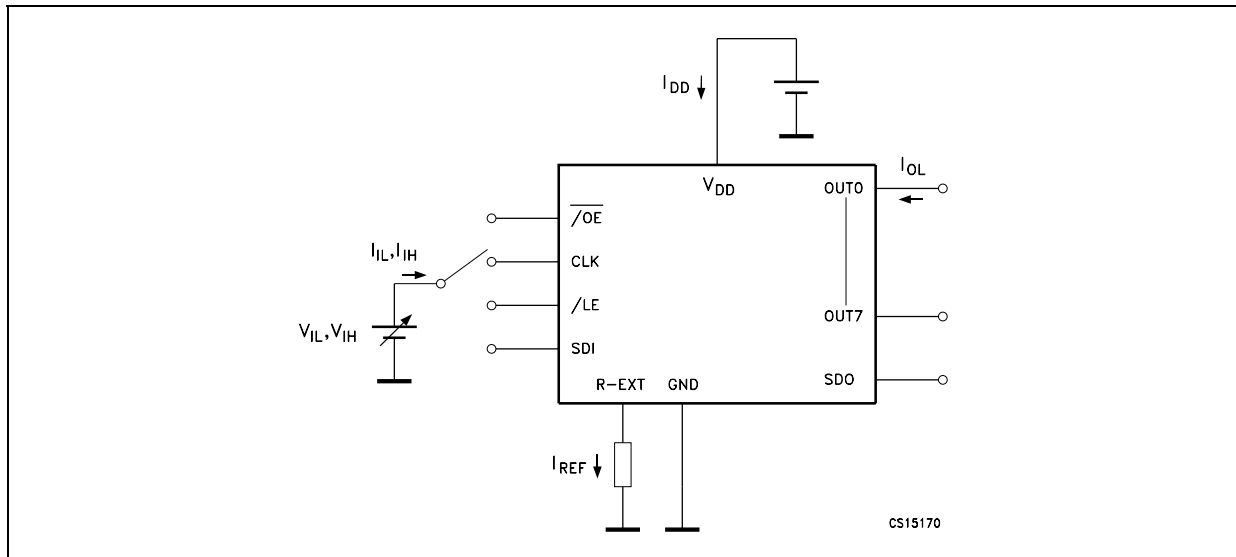


Figure 12: AC Characteristic

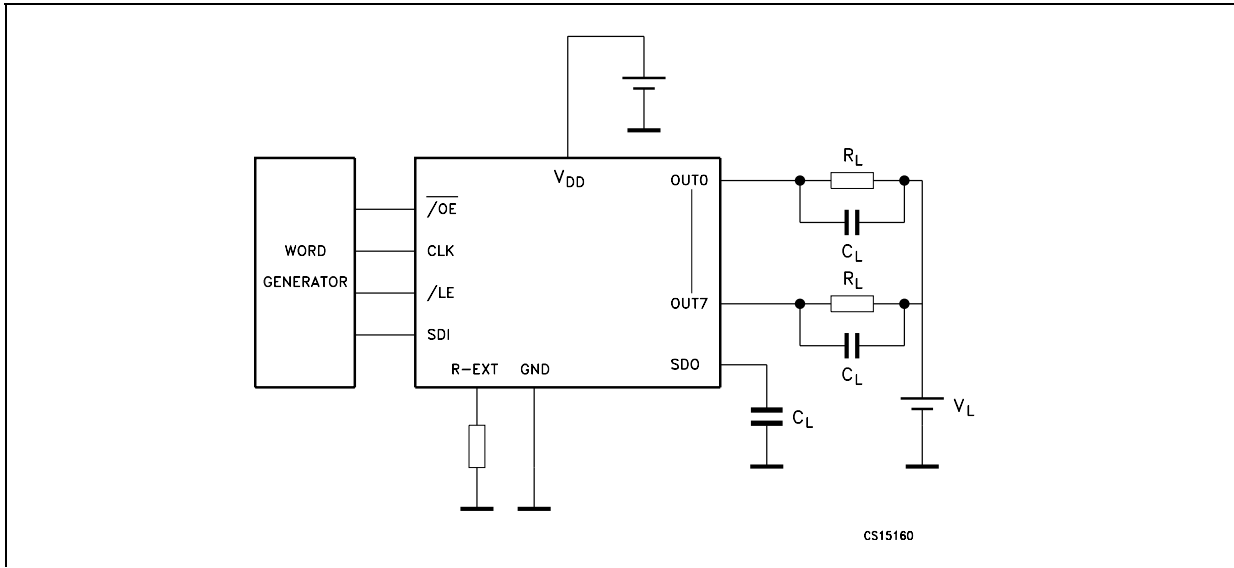


Figure 13: Output Current- R_{EXT} Resistor

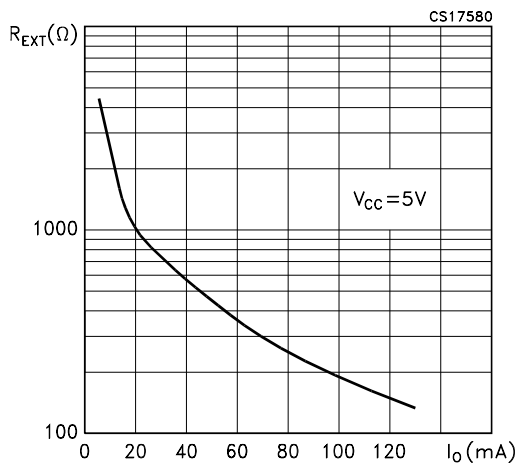
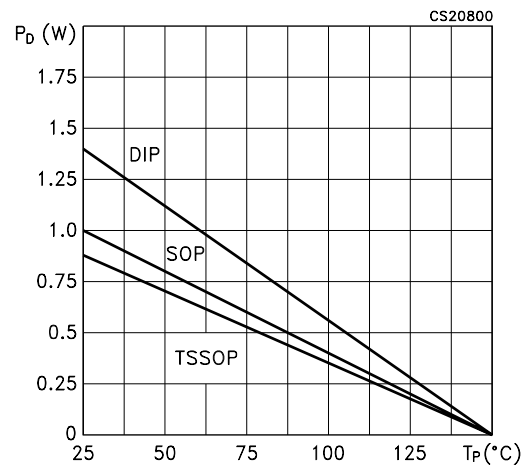
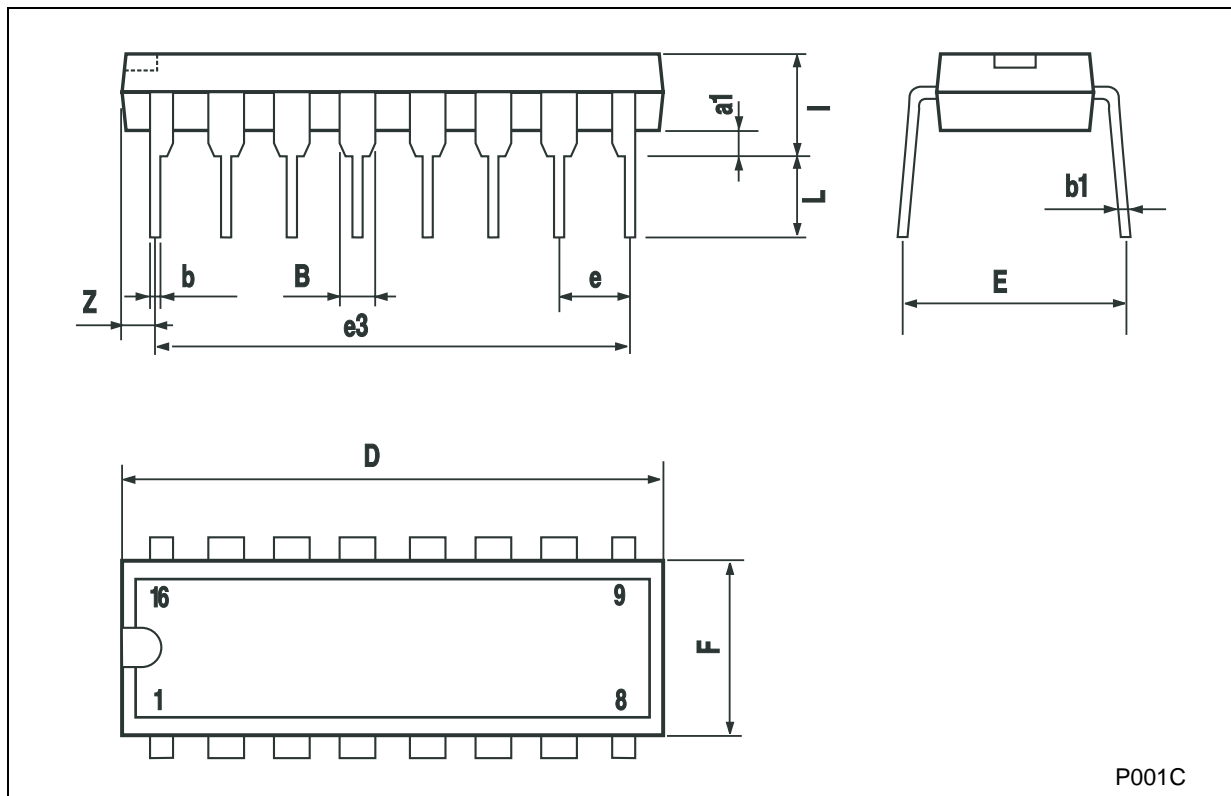


Figure 14: Power Dissipation vs Temperature Package



Plastic DIP-16 (0.25) MECHANICAL DATA

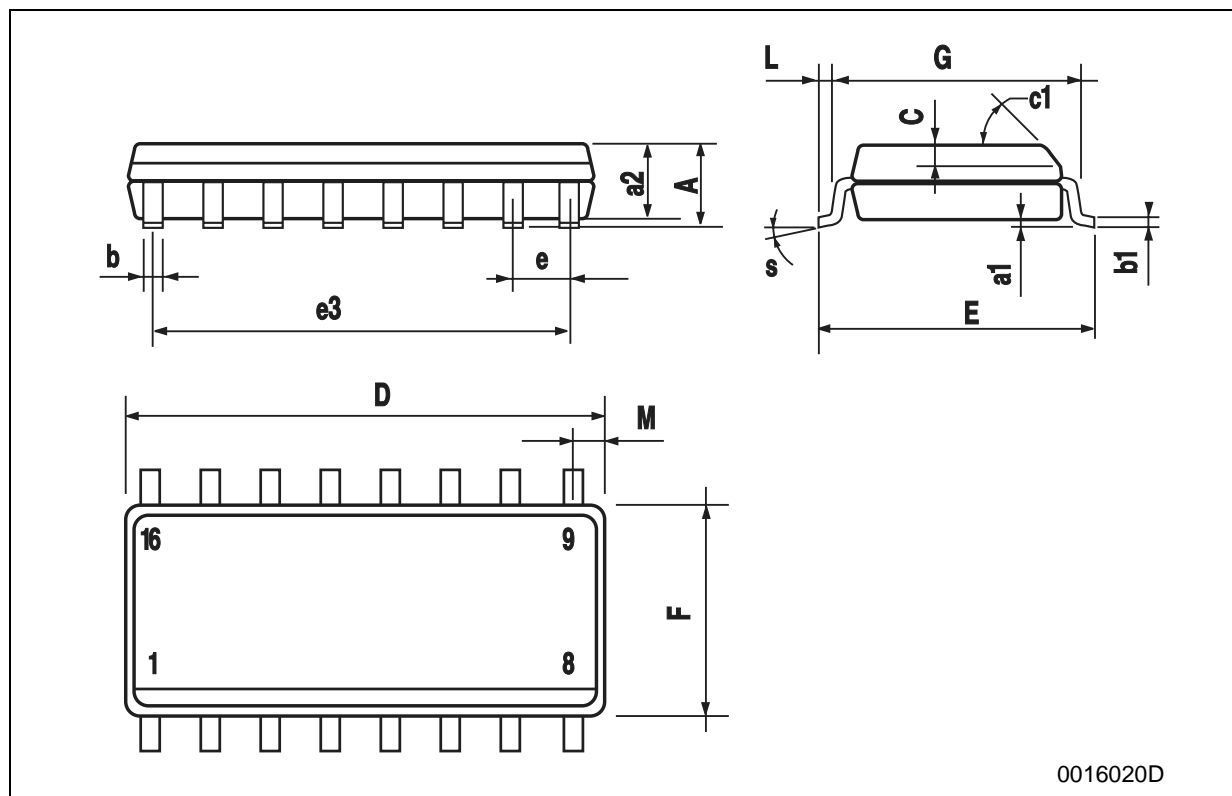
| DIM. | mm. | | | inch | | |
|------|------|-------|------|-------|-------|-------|
| | MIN. | TYP | MAX. | MIN. | TYP. | MAX. |
| a1 | 0.51 | | | 0.020 | | |
| B | 0.77 | | 1.65 | 0.030 | | 0.065 |
| b | | 0.5 | | | 0.020 | |
| b1 | | 0.25 | | | 0.010 | |
| D | | | 20 | | | 0.787 |
| E | | 8.5 | | | 0.335 | |
| e | | 2.54 | | | 0.100 | |
| e3 | | 17.78 | | | 0.700 | |
| F | | | 7.1 | | | 0.280 |
| I | | | 5.1 | | | 0.201 |
| L | | 3.3 | | | 0.130 | |
| Z | | | 1.27 | | | 0.050 |



P001C

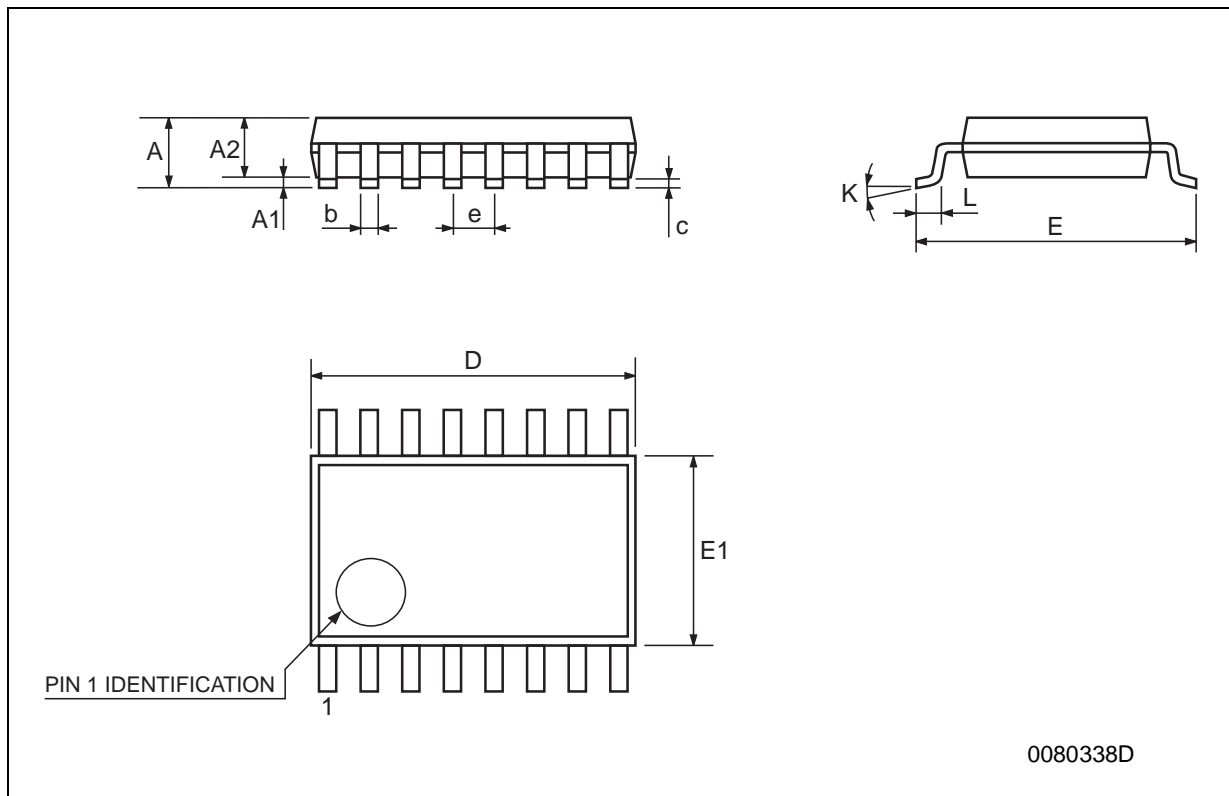
SO-16 MECHANICAL DATA

| DIM. | mm. | | | inch | | |
|------|------------|------|------|-------|-------|-------|
| | MIN. | TYP | MAX. | MIN. | TYP. | MAX. |
| A | | | 1.75 | | | 0.068 |
| a1 | 0.1 | | 0.25 | 0.004 | | 0.010 |
| a2 | | | 1.64 | | | 0.063 |
| b | 0.35 | | 0.46 | 0.013 | | 0.018 |
| b1 | 0.19 | | 0.25 | 0.007 | | 0.010 |
| C | | 0.5 | | | 0.019 | |
| c1 | 45° (typ.) | | | | | |
| D | 9.8 | | 10 | 0.385 | | 0.393 |
| E | 5.8 | | 6.2 | 0.228 | | 0.244 |
| e | | 1.27 | | | 0.050 | |
| e3 | | 8.89 | | | 0.350 | |
| F | 3.8 | | 4.0 | 0.149 | | 0.157 |
| G | 4.6 | | 5.3 | 0.181 | | 0.208 |
| L | 0.5 | | 1.27 | 0.019 | | 0.050 |
| M | | | 0.62 | | | 0.024 |
| S | 8° (max.) | | | | | |



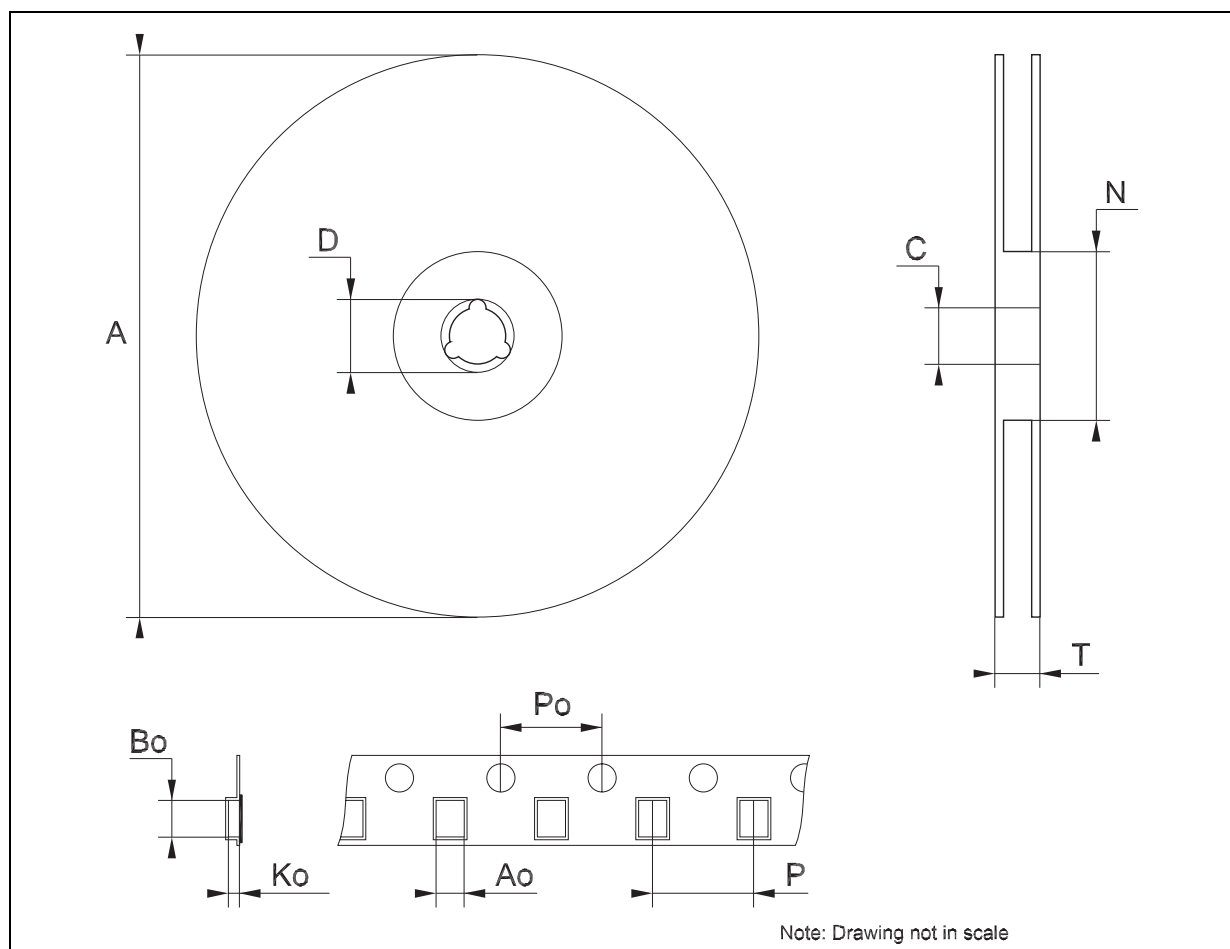
TSSOP16 MECHANICAL DATA

| DIM. | mm. | | | inch | | |
|------|------|----------|------|-------|------------|--------|
| | MIN. | TYP | MAX. | MIN. | TYP. | MAX. |
| A | | | 1.2 | | | 0.047 |
| A1 | 0.05 | | 0.15 | 0.002 | 0.004 | 0.006 |
| A2 | 0.8 | 1 | 1.05 | 0.031 | 0.039 | 0.041 |
| b | 0.19 | | 0.30 | 0.007 | | 0.012 |
| c | 0.09 | | 0.20 | 0.004 | | 0.0079 |
| D | 4.9 | 5 | 5.1 | 0.193 | 0.197 | 0.201 |
| E | 6.2 | 6.4 | 6.6 | 0.244 | 0.252 | 0.260 |
| E1 | 4.3 | 4.4 | 4.48 | 0.169 | 0.173 | 0.176 |
| e | | 0.65 BSC | | | 0.0256 BSC | |
| K | 0° | | 8° | 0° | | 8° |
| L | 0.45 | 0.60 | 0.75 | 0.018 | 0.024 | 0.030 |



Tape & Reel SO-16 MECHANICAL DATA

| DIM. | mm. | | | inch | | |
|------|------|-----|------|-------|------|--------|
| | MIN. | TYP | MAX. | MIN. | TYP. | MAX. |
| A | | | 330 | | | 12.992 |
| C | 12.8 | | 13.2 | 0.504 | | 0.519 |
| D | 20.2 | | | 0.795 | | |
| N | 60 | | | 2.362 | | |
| T | | | 22.4 | | | 0.882 |
| Ao | 6.45 | | 6.65 | 0.254 | | 0.262 |
| Bo | 10.3 | | 10.5 | 0.406 | | 0.414 |
| Ko | 2.1 | | 2.3 | 0.082 | | 0.090 |
| Po | 3.9 | | 4.1 | 0.153 | | 0.161 |
| P | 7.9 | | 8.1 | 0.311 | | 0.319 |



Tape & Reel TSSOP16 MECHANICAL DATA

| DIM. | mm. | | | inch | | |
|------|------|-----|------|-------|------|--------|
| | MIN. | TYP | MAX. | MIN. | TYP. | MAX. |
| A | | | 330 | | | 12.992 |
| C | 12.8 | | 13.2 | 0.504 | | 0.519 |
| D | 20.2 | | | 0.795 | | |
| N | 60 | | | 2.362 | | |
| T | | | 22.4 | | | 0.882 |
| Ao | 6.7 | | 6.9 | 0.264 | | 0.272 |
| Bo | 5.3 | | 5.5 | 0.209 | | 0.217 |
| Ko | 1.6 | | 1.8 | 0.063 | | 0.071 |
| Po | 3.9 | | 4.1 | 0.153 | | 0.161 |
| P | 7.9 | | 8.1 | 0.311 | | 0.319 |

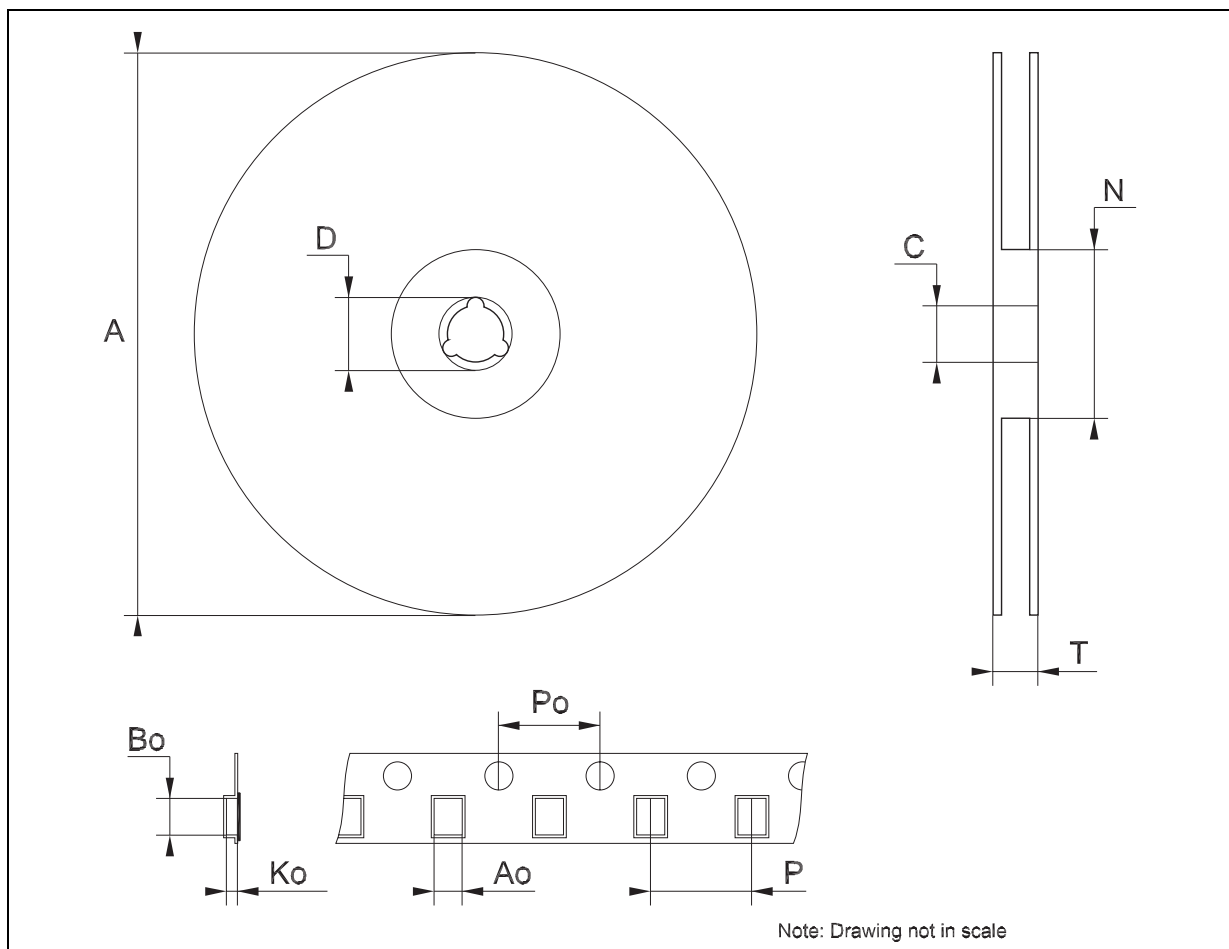


Table 9: Revision History

| Date | Revision | Description of Changes |
|-------------|----------|--|
| 03-Aug-2004 | 6 | Package TSSOP (Exposed Pad) removed. Table 8 - pag. 4 data changed. Figure 14 - pag. 10 changed. |
| 23-Feb-2005 | 7 | Mistake on Table 7 - I _{DDOFF} and I _{DDON} OUT 0 to 15 ==> OUT 0 to 7. |

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