THE DATASHEET OF

TLC7703QPW

www.win-source.net 0086-755-83957316

Micropower Supply Voltage Supervisors

Check for Samples: TLC7701, TLC7725, TLC7703 , TLC7733, TLC7705

FEATURES

- **Power-On Reset Generator**
- **Automatic Reset Generation After Voltage Drop**
- **Precision Voltage Sensor**
- **Temperature-Compensated Voltage Reference**
- **Programmable Delay Time by External Capacitor**
- **Supply Voltage Range . . . 2 V to 6 V**
- **Defined RESET Output from V_{DD} ≥ 1 V**
- **Power-Down Control Support for Static RAM With Battery Backup**
- **Maximum Supply Current of 16 µA**
- **Power Saving Totem-Pole Outputs**
- **Temperature Range . . . Up to –55°C to 125°C**

APPLICATIONS

- **Medical Imaging**

DESCRIPTION

The TLC77xx family of micropower supply voltage supervisors provide reset control, primarily in microcomputer and microprocessor systems.

During power-on, $\overline{\text{RESET}}$ is asserted when V_{DD} reaches 1 V. After minimum V_{DD} (≥2 V) is established, the circuit monitors SENSE voltage and keeps the reset outputs active as long as SENSE voltage ($V_{I(SENSE)}$) remains below the threshold voltage. An internal timer delays return of the output to the inactive state to ensure proper system reset. The delay time, t_d, is determined by an external capacitor:

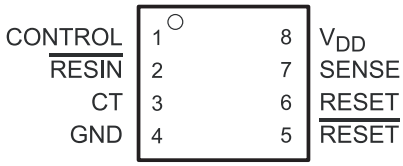
$$t_d = 2.1 \times 10^4 \times C_T$$

Where

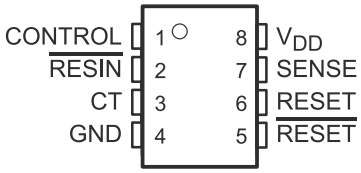
C_T is in farads

t_d is in seconds

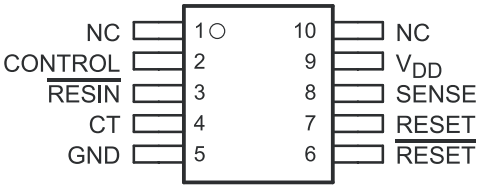
DRB PACKAGE
(TOP VIEW)



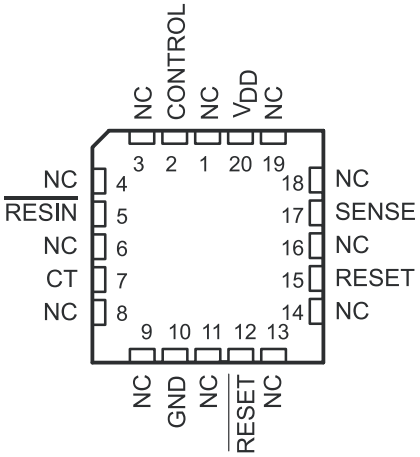
D, JG, P OR PW PACKAGE
(TOP VIEW)



U PACKAGE
(TOP VIEW)



FK PACKAGE
(TOP VIEW)



Except for the TLC7701, which can be customized with two external resistors, each supervisor has a fixed sense threshold voltage set by an internal voltage divider. When SENSE voltage drops below the threshold voltage, the outputs become active and stay in that state until SENSE voltage returns above threshold voltage and the delay time, t_d, has expired.

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These devices have limited built-in ESD protection. The leads should be shorted together or the device placed in conductive foam during storage or handling to prevent electrostatic damage to the MOS gates.

DESCRIPTION (CONTINUED)

In addition to the power-on-reset and undervoltage-supervisor function, the TLC77xx adds power-down control support for static RAM. When CONTROL is tied to GND, RESET will act as active high. The voltage monitor contains additional logic intended for control of static memories with battery backup during power failure. By driving the chip select ($\overline{CS}$) of the memory circuit with the RESET output of the TLC77xx and with the CONTROL driven by the memory bank select signal ($\overline{CSH1}$) of the microprocessor (see Figure 10), the memory circuit is automatically disabled during a power loss. (In this application the TLC77xx power has to be supplied by the battery.)

The TLC77xxI is characterized for operation over a temperature range of –40°C to 85°C; the TLC77xxQ is characterized for operation over a temperature range of –40°C to 125°C; and the TLC77xxM is characterized for operation over the full Military temperature range of –55°C to 125°C.

The 3x3 mm DRB package is also available as a non-magnetic package for medical imaging application.

AVAILABLE OPTIONS

T_A	THRESHOLD VOLTAGE (V)	PACKAGED DEVICES						
		SMALL OUTLINE (D)(1)	CHIP CARRIER (FK)	CERAMIC DIP (JG)	CERAMIC DUAL FLATPACK (U)	PLASTIC DIP (P)	THIN SHRINK SMALL OUTLINE (PW)(2)	SMALL OUTLINE NO LEAD (DRB)
–40°C to 85°C	1.1	TCLC7701ID	—	—	—	TCLC7701IP	TCLC7701IPWR	—
	2.25	TLC7725ID	—	—	—	TLC7725IP	TLC7725IPWR	—
	2.63	TLC7703ID	—	—	—	TLC7703IP	TLC7703IPWR	—
	2.93	TLC7733ID	—	—	—	TLC7733IP	TLC7733IPWR	—
	4.55	TLC7705ID	—	—	—	TLC7705IP	TLC7705IPWR	—
	1.1	TLC7701IDBR	—	—	—	—	—	TLC7701IDRBT-NM
–40°C to 125°C	1.1	TLC7701QD	—	—	—	TLC7701QP	TLC7701QPWR	—
	2.25	TLC7725QD	—	—	—	TLC7725QP	TLC7725QPWR	—
	2.63	TLC7703QD	—	—	—	TLC7703QP	TLC7703QPWR	—
	2.93	TLC7733QD	—	—	—	TLC7733QP	TLC7733QPWR	—
	4.55	TLC7705QD	—	—	—	TLC7705QP	TLC7705QPWR	—
–55°C to 125°C	2.93	—	—	—	—	—	—	—
	4.55	—	—	—	—	—	—	—

(1) The D package is available taped and reeled. Add the suffix R to the device type when ordering (e.g., TLC7705QDR).
(2) The PW package is only available left-end taped and reeled (indicated by the R suffix on the device type; e.g., TLC7705QPWR).

Table 1. FUNCTION TABLE

CONTROL	$\overline{RESIN}$	$V_{I(SENSE)} > V_{IT+}$	RESET	$\overline{RESET}$
L	L	False	H	L
L	L	True	H	L
L	H	False	H	L
L	H	True	L(1)	H(1)
H	L	False	H	L
H	L	True	H	L
H	H	False	H	L
H	H	True	H	H(1)

(1) RESET and $\overline{RESET}$ states shown are valid for $t > t_d$.

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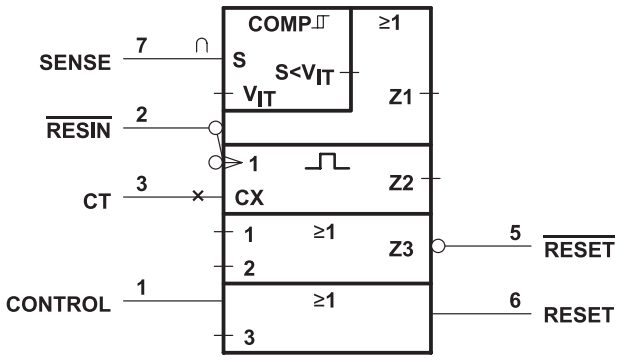
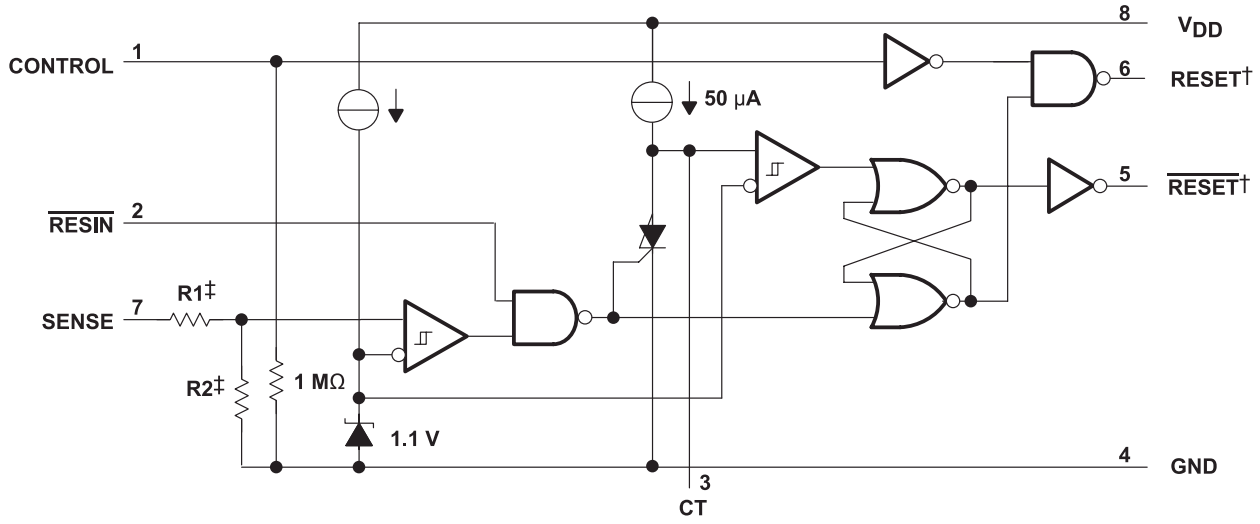
LOGIC SYMBOL



(1) This symbol is in accordance with ANSI/IEEE Std 91-1984 and IEC Publication 617-12.

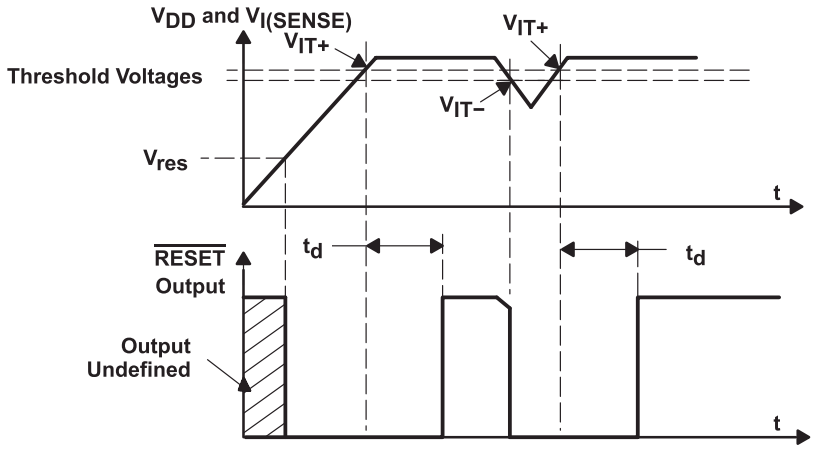
FUNCTIONAL BLOCK DIAGRAM



† Outputs are totem-pole configuration. External pullup or pulldown resistors are not required.
‡ Nominal values:

	R1 (Typ)	R2 (Typ)
TLC7701	0	∞
TLC7725	600 kΩ	600 kΩ
TLC7703	698 kΩ	502 kΩ
TLC7733	750 kΩ	450 kΩ
TLC7705	910 kΩ	290 kΩ

TIMING DIAGRAM



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ABSOLUTE MAXIMUM RATINGS(1)

over operating free-air temperature range (unless otherwise noted)

			VALUE	UNIT
V_{DD}	Supply voltage(2)		7	V
	Input voltage range, CONTROL, RESIN, SENSE(2)		–0.3 to 7	V
I_{OL}	Maximum low output current		10	mA
I_{OH}	Maximum high output current,		–10	mA
I_{IK}	Input clamp current, (VI < 0 or VI > VDD)		±10	mA
I_{OK}	Output clamp current, (VO 0 or VO > VDD)		±10	mA
	Continuous total power dissipation		See Dissipation Rating Table	
T_A	Operating free-air temperature range	TL77xxI	–40 to 84	°C
		TL77xxQ	–40 to 125	°C
		TL77xxM	–55 to 125	°C
T_{stg}	Storage temperature range		–65 to 150	°C

(1) Stresses beyond those listed under "absolute maximum ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated under "recommended operating conditions" is not implied. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.
(2) All voltage values are with respect to GND.

DISSIPATION RATINGS

PACKAGE	$T_A \le 25°C$ POWER RATING	DERATING FACTOR ABOVE $T_A = 25°C$	$T_A = 85°C$ POWER RATING	$T_A = 125°C$ POWER RATING
D	725 mW	5.8 mW/°C	377 mW	145 mW
DRB				
FK	1375 mW	11.0 mW/°C	715 mW	275 mW
JG	1050 mW	8.4 mW/°C	546 mW	210 mW
P	1000 mW	8.0 mW/°C	520 mW	200 mW
PW	525 mW	4.2 mW/°C	273 mW	105 mW
U	700 mW	5.5 mW/°C	370 mW	150 mW

RECOMMENDED OPERATING CONDITIONS

at specified temperature range

			MIN	MAX	UNIT
V_{DD}	Supply voltage		2	6	V
V_I	Input voltage		0	V_{DD}	V
V_{IH}	High-level input voltage at $\overline{\text{RESIN}}$ and CONTROL(1)		$0.7\times V_{DD}$		V
V_{IL}	Low-level input voltage at $\overline{\text{RESIN}}$ and CONTROL(1)			$0.2\times V_{DD}$	V
I_{OH}	High-level output current			–2	mA
I_{OL}	Low-level output current			2	mA
Δt/ΔV	input transition rise and fall rate at $\overline{\text{RESIN}}$ and CONTROL			100	ns/ V
T_A	Operating free-air temperature range	TLC77xxI	–40	85	°C
		TLC77xxQ	–40	125	
		TLC77xxM	–55	125	

(1) To ensure a low supply current, V_{IL} should be kept <0.3 V and $V_{IH} > V_{DD}$ –0.3 V.

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ELECTRICAL CHARACTERISTICS

over recommended operating conditions(1) (unless otherwise noted)

PARAMETER				TEST CONDITIONS	TLC77xx			UNIT
					MIN	TYP	MAX	
V_{OH}	High-level output voltage	I_{OH} = –20 µA		V_{DD} = 2 V	1.8			V
				V_{DD} = 2.7 V	2.5			
				V_{DD} = 4.5 V	4.3			
		I_{OH} = 2 –mA		V_{DD} = 4.5 V	3.7			
V_{OL}	Low-Level output voltage	I_{OL} = 20 µA		V_{DD} = 2 V			0.2	V
				V_{DD} = 2.7 V			0.2	
				V_{DD} = 4.5 V			0.2	
		I_{OL} = 2 mA		V_{DD} = 4.5 V			0.5	
$V_{IT–}$	Negative-going input threshold voltage, SENSE(2)		TCLC7701	V_{DD} = 2 V to 6 V	1.04	1.1	1.16	mV
			TLC7725		2.18	2.25	2.32	
			TLC7703		2.56	2.63	2.70	
			TLC7733		2.86	2.93	3	
			TLC7705		4.47	4.55	4.63	
V_{hus}	Hysteresis voltage, SENSE		TCLC7701	V_{DD} = 2 V to 6 V		30		mV
			TLC7725			70		
			TLC7703					
			TLC7733					
			TLC7705					
V_{res}	Power-up reset voltage(3)			I_{OL} = 20 µA			1	V
I_I	Input current	$\overline{RESIN}$		V_I = 0 V to V_{DD}			2	µA
		CONTROL		V_I = V_{DD}		7	15	
		SENSE		V_I = 5 V		5	10	
		SENSE, TLC7701 only		V_I = 5 V			2	
I_{DD}	Supply current			$\overline{RESIN}$ = V_{DD}, SENSE = V_{DD} ≥ V_{IT}max + 0.2 V, CONTROL = 0 V, Outputs open		9	16	µA
$I_{DD(d)}$	Supply current during t_d			VDD = 5 V, V_{CT} = 0, $\overline{RESIN}$ = V_{DD}, SENSE = V_{DD}, CONTROL = 0 V, Outputs open		120	150	µA
C_I	Input capacitance, SENSE			V_I = 0 V to V_{DD}		50		pF

(1) All characteristics are measured with C_T = 0.1 µF.
(2) To ensure best stability of the threshold voltage, a bypass capacitor (ceramic, 0.1 mF) should be connected near the supply terminals.
(3) The lowest supply voltage at which $\overline{RESET}$ becomes active. The symbol V_{res} is not currently listed within EIA or JEDEC standards for semiconductor symbology. Rise time of V_{DD}≥ 15 µs/V.

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ELECTRICAL CHARACTERISTICS

over recommended operating conditions(1) (unless otherwise noted)

PARAMETER			TEST CONDITIONS		TLC77xxM			UNIT
					MIN	TYP(2)	MAX	
V_{OH}	High-level output voltage	I_{OH} = –20 µA	V_{DD} = 2 V	T_A = 25°C	1.8			V
				T_A = –55°C to 125°C	1.7			
			V_{DD} = 2.7 V	T_A = 25°C	2.5			V
				T_A = –55°C to 125°C	2.3			
			V_{DD} = 4.5 V	T_A = 25°C	4.3			V
				T_A = –55°C to 125°C	4.2			
		I_{OH} = –2 µA	V_{DD} = 4.5 V	T_A = 25°C	3.7			V
				T_A = –55°C to 125°C	3.6			
V_{OL}	Low-level output voltage	I_{OL} = –20 µA	V_{DD} = 2 V	T_A = 25°C			0.2	V
				T_A = –55°C to 125°C			0.2	
			V_{DD} = 2.7 V	T_A = 25°C			0.2	V
				T_A = –55°C to 125°C			0.2	
			V_{DD} = 4.5 V	T_A = 25°C			0.2	V
				T_A = –55°C to 125°C			0.2	
		I_{OL} = 2 mA	V_{DD} = 4.5 V	T_A = 25°C			0.5	V
				T_A = –55°C to 125°C			0.5	
V_{IT-}	Negative-going input threshold voltage, SENSE (3)	TLC7733	V_{DD} = 2 V to 6 V		2.86	2.93	3.1	V
		TLC7705			4.3	4.5	4.8	
V_{hys}	Hysteresis voltage, SENSE		V_{DD} = 2 V to 6 V			70		mV
V_{res}	Power-up reset voltage(2)		I_{OL} = 20 µA				1	V
I_I	Input current	$\overline{RESIN}$	V_I = 0 V to V_{DD}				2	µA
		CONTROL	V_I = V_{DD}			7	15	
		SENSE	V_I = 5 V			5	10	
		SENSE, TLC7701 only	V_I = 5 V				2	
I_{DD}	Supply current		$\overline{RESIN}$ = VDD, SENSE = $V_{DD} \geq V_{IT}$max + 0.2 V, CONTROL = 0 V, Outputs open			9	16	µA
$I_{DD(d)}$	Supply current during t_d	TLC7733	V_{CT} = 0 , $\overline{RESIN}$ = V_{DD}, CONTROL = 0 V, SENSE = V_{DD}, Outputs open	V_{DD} = 3.3 V			250	µA
		TLC7705		V_{DD} = 5 V		120	150	
C_I	Input capacitance, SENSE		V_I = 0 V to V_{DD}			50		pF

(1) All characteristics are measured with C_T = 0.1 µF.
(2) Typical values apply at T_A = 25°C.
(3) To ensure best stability of the threshold voltage, a bypass capacitor (ceramic, 0.1 mF) should be connected near the supply terminals.

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SWITCHING CHARACTERISTICS

at V_{DD} = 5 V, R_L = 2 kΩ, C_L = 50 pF, T_A = 25°C (unless otherwise noted)

PARAMETER		MEASURED		TEST CONDITIONS	TLC77xx			UNIT
		FROM (INPUT)	TO (OUTPUT)		MIN	TYP	MAX	
t_d	Delay time	$V_{I(SENSE)} \geq V_{IT+}$	RESET and $\overline{\text{RESET}}$	$\overline{\text{RESIN}}$ = 0.7 × V_{DD}, CONTROL = 0.2 × V_{DD}, C_T = 100 nF, T_A = Full range, See timing diagram	1.1	2.1	4.2	ms
t_{PLH}	Propagation delay time, low-to-high-level output	SENSE	$\overline{\text{RESET}}$	V_{IH} = V_{IT+}max + 0.2 V, V_{IL} = V_{IT-}min – 0.2 V, $\overline{\text{RESIN}}$ = 0.7 × V_{DD}, CONTROL = 0.2 × V_{DD}, CT = NC(1)			20	µs
t_{PHL}	Propagation delay time, high-to-low-level output						5	
t_{PLH}	Propagation delay time, low-to-high-level output		RESET				5	
t_{PHL}	Propagation delay time, high-to-low-level output						20	
t_{PLH}	Propagation delay time, low-to-high-level output	$\overline{\text{RESIN}}$	$\overline{\text{RESET}}$	V_{IH} = 0.7 × V_{DD}, V_{IL} = 0.2 × V_{DD}, SENSE = V_{IT+}max + 0.2 V, CONTROL = 0.2 × V_{DD}, CT = NC(1)			20	µs
t_{PHL}	Propagation delay time, high-to-low-level output						40	ns
t_{PLH}	Propagation delay time, low-to-high-level output		RESET				45	ns
t_{PHL}	Propagation delay time, high-to-low-level output						20	µs
t_{PLH}	Propagation delay time, low-to-high-level output	CONTROL	RESET	V_{IH} = 0.7 × V_{DD}, V_{IL} = 0.2 × V_{DD}, SENSE = V_{IT+}max + 0.2 V, RESIN = 0.7 × V_{DD}, CT = NC(1)			38	ns
t_{PHL}	Propagation delay time, high-to-low-level output						38	ns
	Low-level minimum pulse duration to switch RESET and $\overline{\text{RESET}}$	SENSE		V_{IH} = V_{IT+}max + 0.2 V, V_{IL} = V_{IT-}min –0.2 V,				
		$\overline{\text{RESIN}}$		V_{IL} = 0.2 × V_{DD}, V_{IH} = 0.7 × V_{DD}				
t_r	Rise time		RESET and $\overline{\text{RESET}}$	10% to 90%				
t_f	Fall time			90% to 10%				

(1) NC = No capacitor, and includes up to 100-pF probe and jig capacitance.

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SWITCHING CHARACTERISTICS

at V_{DD} = 5 V, R_L = 2 kΩ, C_L = 50 pF, T_A = 25°C (unless otherwise noted)

PARAMETER		MEASURED		TEST CONDITIONS	T_A	TLC77xxM			UNIT
		FROM (INPUT)	TO (OUTPUT)			MIN	TYP	MAX	
t_d	Delay time	$V_{I(SENSE)} \geq V_{IT+}$	RESET and $\overline{\text{RESET}}$	RESIN = 2.7 V, CONTROL = 0.4 V, C_T = 100 nF, See timing diagram	Full range	1.1	2.1	4.2	ms
t_{PLH}	Propagation delay time, low-to-high-level output	SENSE	$\overline{\text{RESET}}$	$V_{IH} = V_{IT+}$max + 0.2 V, $V_{IL} = V_{IT-min}$ - 0.2 V, $\overline{\text{RESIN}}$ = 2.7 V, CONTROL = 0.4 V, CT = NC(1)	25°C			20	µs
					Full range			24	
			RESET		25°C			5	µs
					Full range			7	
t_{PHL}	Propagation delay time, high-to-low-level output	SENSE	$\overline{\text{RESET}}$	$V_{IH} = V_{IT+}$max + 0.2 V, $V_{IL} = V_{IT-min}$ - 0.2 V, $\overline{\text{RESIN}}$ = 2.7 V, CONTROL = 0.4 V, CT = NC(1)	25°C			5	µs
					Full range			7	
			RESET		25°C			20	µs
					Full range			24	
t_{PLH}	Propagation delay time, low-to-high-level output	$\overline{\text{RESIN}}$	$\overline{\text{RESET}}$	V_{IH} = 2.7 V, V_{IL} = 0.4 V, SENSE = V_{IT+}max + 0.2 V, CONTROL = 0.4 V, CT = NC(1)	25°C			20	µs
					Full range			24	
			RESET		25°C			45	ns
					Full range			65	
t_{PHL}	Propagation delay time, high-to-low-level output	$\overline{\text{RESIN}}$	$\overline{\text{RESET}}$	V_{IH} = 2.7 V, V_{IL} = 0.4 V, SENSE = V_{IT+}max + 0.2 V, CONTROL = 0.4 V, CT = NC(1)	25°C			40	ns
					Full range			60	
			RESET		25°C			20	µs
					Full range			24	
t_{PLH}	Propagation delay time, low-to-high-level output	CONTROL	RESET	V_{IH} = 2.7 V, V_{IL} = 0.4 V, SENSE = V_{IT+}max + 0.2 V, $\overline{\text{RESIN}}$ = 2.7 V, CT = NC(1)	25°C			38	ns
					Full range			58	
t_{PHL}	Propagation delay time, high-to-low-level output				25°C			38	ns
					Full Range			58	
	Low-level minimum pulse duration	SENSE		$V_{IH} = V_{IT+}$max + 0.2 V, $V_{IL} = V_{IT-min}$ - 0.2 V	Full range	3			µs
		$\overline{\text{RESIN}}$		V_{IL} = 0.4 V, V_{IH} = 2.7 V		1			
t_r	Rise time		RESET and $\overline{\text{RESET}}$	10% to 90%	Full range		8		ns/V
t_f	Fall time			90% to 10%			4		

(1) NC = No capacitor, and includes up to 100-pF probe and jig capacitance.

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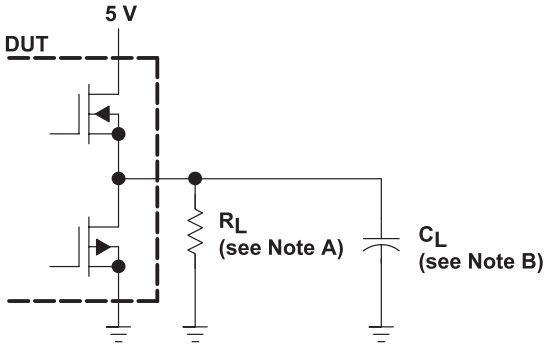
PARAMETER MEASUREMENT INFORMATION



NOTES: A. For switching characteristics, R_L = 2 kΩ.
B. C_L = 50 pF includes jig and probe capacitance.

Figure 1. RESET and $\overline{\text{RESET}}$ Output Configurations

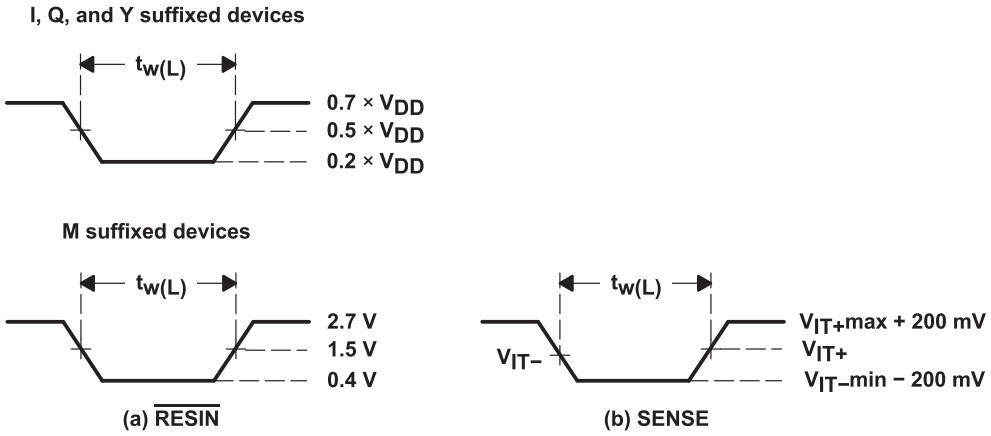


Figure 2. Input Pulse Definition Waveforms

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TYPICAL CHARACTERISTICS

NORMALIZED INPUT THRESHOLD VOLTAGE vs TEMPERATURE

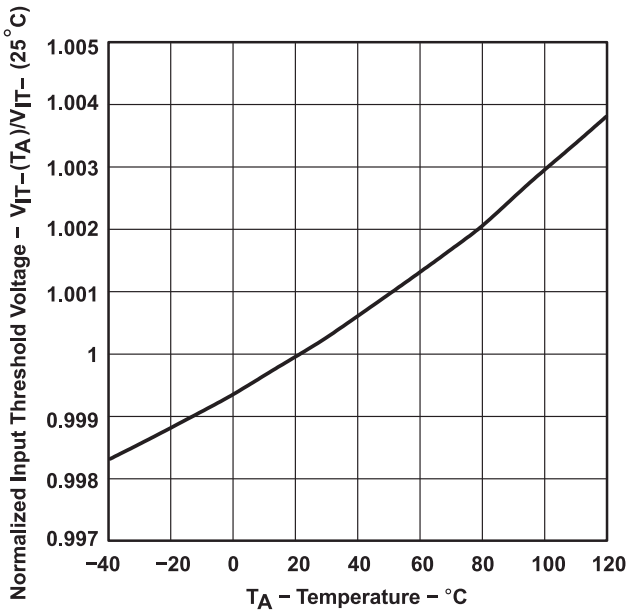

Figure 3.

SUPPLY CURRENT vs SUPPLY VOLTAGE

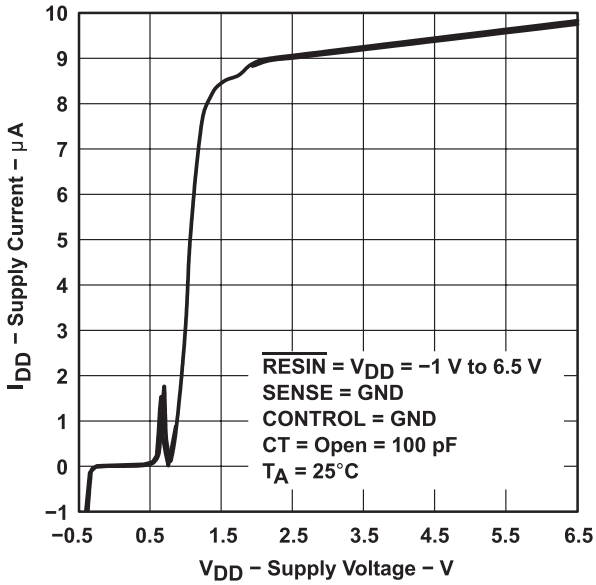

Figure 4.

HIGH-LEVEL OUTPUT VOLTAGE vs HIGH-LEVEL OUTPUT CURRENT

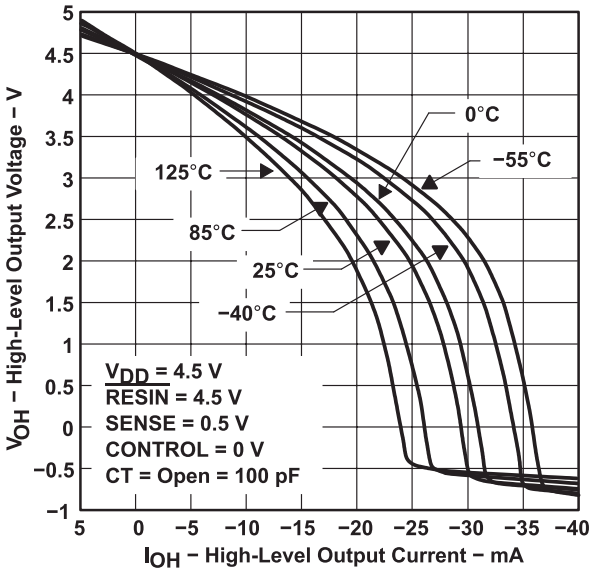

Figure 5.

LOW-LEVEL OUTPUT VOLTAGE vs LOW-LEVEL OUTPUT CURRENT

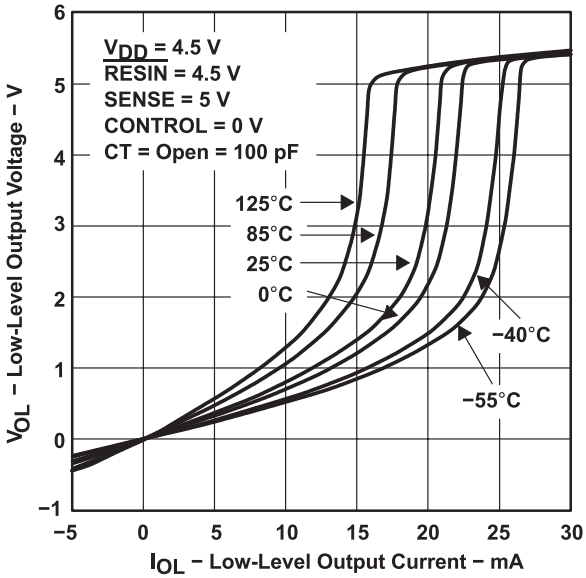

Figure 6.

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TYPICAL CHARACTERISTICS (continued)

INPUT CURRENT vs INPUT VOLTAGE AT SENSE

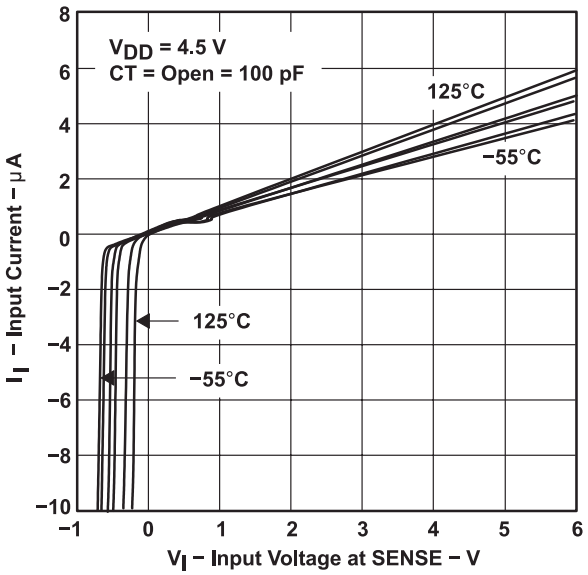

Figure 7.

MINIMUM PULSE DURATION AT SENSE vs SENSE THRESHOLD OVERDRIVE

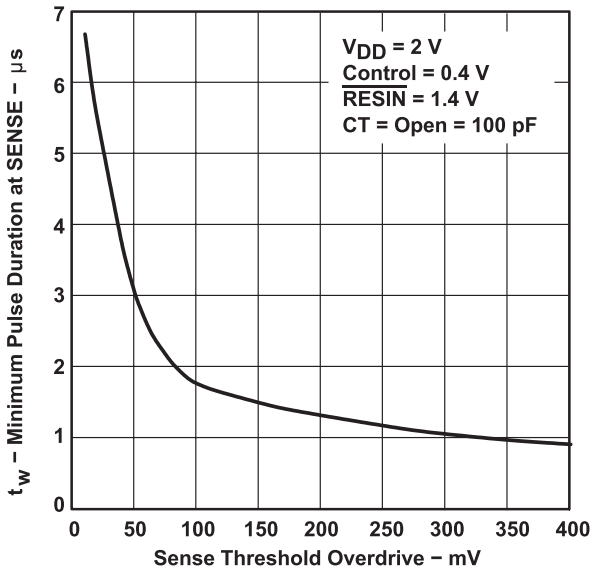

Figure 8.

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APPLICATION INFORMATION

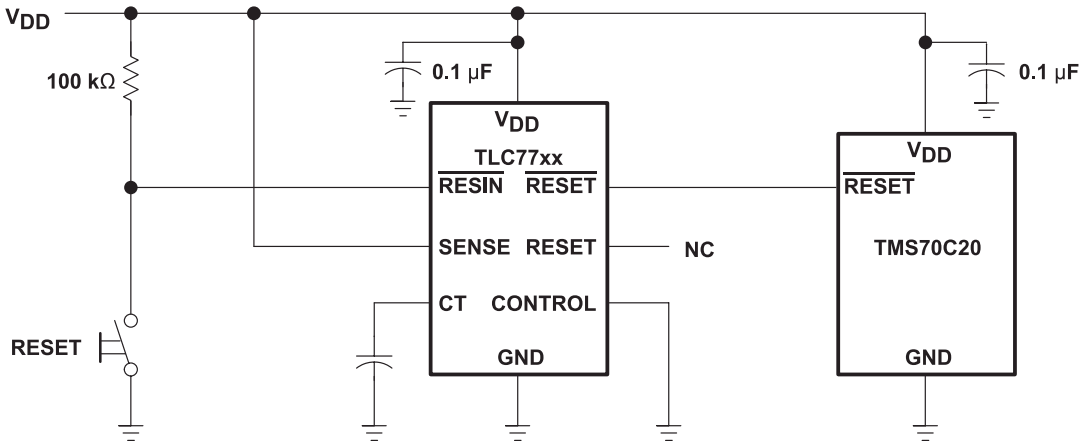

Figure 9. Reset Controller in a Microcomputer System

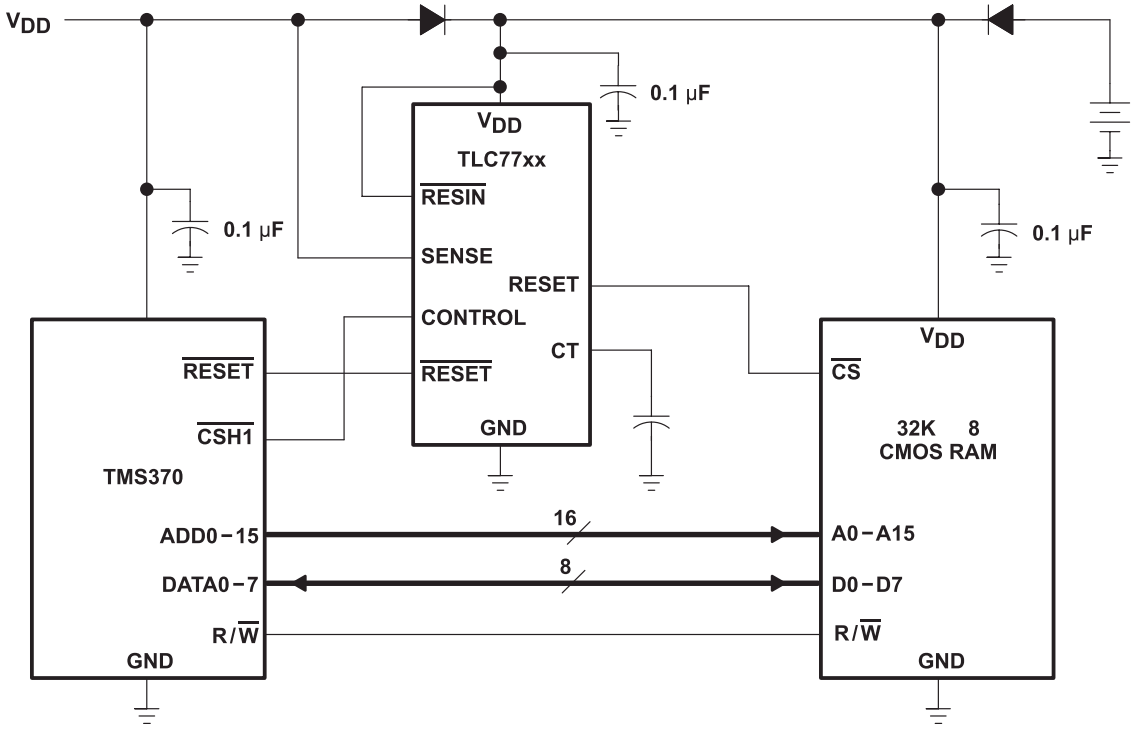

Figure 10. Data Retention During Power Down Using Static CMOS RAMs

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Changes from Revision L (February 2003) to Revision M **Page**

- Updated the DRB package Pin Out dimensions and Ordering Information. 1

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PACKAGING INFORMATION

Orderable Device	Status (1)	Package Type	Package Drawing	Pins	Package Qty	Eco Plan (2)	Lead finish/ Ball material (6)	MSL Peak Temp (3)	Op Temp (°C)	Device Marking (4/5)	Samples
5962-9750901Q2A	ACTIVE	LCCC	FK	20	55	Non-RoHS & Green	SNPB	N / A for Pkg Type	-55 to 125	5962-9750901Q2A TLC7733 MFKB	Samples
5962-9750901QPA	ACTIVE	CDIP	JG	8	50	Non-RoHS & Green	SNPB	N / A for Pkg Type	-55 to 125	9750901QPA TLC7733M	Samples
5962-9751301Q2A	ACTIVE	LCCC	FK	20	55	Non-RoHS & Green	SNPB	N / A for Pkg Type	-55 to 125	5962-9751301Q2A TLC7705 MFKB	Samples
5962-9751301QHA	ACTIVE	CFP	U	10	25	Non-RoHS & Green	SNPB	N / A for Pkg Type	-55 to 125	9751301QHA TLC7705M	Samples
5962-9751301QPA	ACTIVE	CDIP	JG	8	50	Non-RoHS & Green	SNPB	N / A for Pkg Type	-55 to 125	9751301QPA TLC7705M	Samples
TLC7701ID	ACTIVE	SOIC	D	8	75	RoHS & Green	NIPDAU	Level-1-260C-UNLIM	-40 to 85	C7701I	Samples
TLC7701IDR	ACTIVE	SOIC	D	8	2500	RoHS & Green	NIPDAU	Level-1-260C-UNLIM	-40 to 85	C7701I	Samples
TLC7701IP	ACTIVE	PDIP	P	8	50	RoHS & Green	NIPDAU	N / A for Pkg Type	-40 to 85	TLC7701IP	Samples
TLC7701IPW	ACTIVE	TSSOP	PW	8	150	RoHS & Green	NIPDAU	Level-1-260C-UNLIM	-40 to 85	Y7701	Samples
TLC7701IPWR	ACTIVE	TSSOP	PW	8	2000	RoHS & Green	NIPDAU	Level-1-260C-UNLIM	-40 to 85	Y7701	Samples
TLC7701QD	ACTIVE	SOIC	D	8	75	RoHS & Green	NIPDAU	Level-1-260C-UNLIM	-40 to 125	C7701Q	Samples
TLC7701QDR	ACTIVE	SOIC	D	8	2500	RoHS & Green	NIPDAU	Level-1-260C-UNLIM	-40 to 125	C7701Q	Samples
TLC7701QP	ACTIVE	PDIP	P	8	50	RoHS & Green	NIPDAU	N / A for Pkg Type	-40 to 125	TLC7701QP	Samples
TLC7701QPW	ACTIVE	TSSOP	PW	8	150	RoHS & Green	NIPDAU	Level-1-260C-UNLIM	-40 to 125	TD701	Samples
TLC7701QPWR	ACTIVE	TSSOP	PW	8	2000	RoHS & Green	NIPDAU	Level-1-260C-UNLIM	-40 to 125	TD701	Samples
TLC7703ID	ACTIVE	SOIC	D	8	75	RoHS & Green	NIPDAU	Level-1-260C-UNLIM	-40 to 85	C7703I	Samples
TLC7703IDR	ACTIVE	SOIC	D	8	2500	RoHS & Green	NIPDAU	Level-1-260C-UNLIM	-40 to 85	C7703I	Samples

Orderable Device	Status (1)	Package Type	Package Drawing	Pins	Package Qty	Eco Plan (2)	Lead finish/ Ball material (6)	MSL Peak Temp (3)	Op Temp (°C)	Device Marking (4/5)	Samples
TLC7703IP	ACTIVE	PDIP	P	8	50	RoHS & Green	NIPDAU	N / A for Pkg Type	-40 to 85	TLC7703IP	Samples
TLC7703IPWR	ACTIVE	TSSOP	PW	8	2000	RoHS & Green	NIPDAU	Level-1-260C-UNLIM	-40 to 85	Y7703	Samples
TLC7703QD	ACTIVE	SOIC	D	8	75	RoHS & Green	NIPDAU	Level-1-260C-UNLIM	-40 to 125	C7703Q	Samples
TLC7703QPW	ACTIVE	TSSOP	PW	8	150	RoHS & Green	NIPDAU	Level-1-260C-UNLIM	-40 to 125	TD703	Samples
TLC7705ID	ACTIVE	SOIC	D	8	75	RoHS & Green	NIPDAU	Level-1-260C-UNLIM	-40 to 85	C7705I	Samples
TLC7705IDR	ACTIVE	SOIC	D	8	2500	RoHS & Green	NIPDAU	Level-1-260C-UNLIM	-40 to 85	C7705I	Samples
TLC7705IP	ACTIVE	PDIP	P	8	50	RoHS & Green	NIPDAU	N / A for Pkg Type	-40 to 85	TLC7705IP	Samples
TLC7705IPE4	NRND	PDIP	P	8	50	TBD	Call TI	Call TI	-40 to 85		
TLC7705IPW	ACTIVE	TSSOP	PW	8	150	RoHS & Green	NIPDAU	Level-1-260C-UNLIM		Y7705	Samples
TLC7705IPWR	ACTIVE	TSSOP	PW	8	2000	RoHS & Green	NIPDAU	Level-1-260C-UNLIM	-40 to 85	Y7705	Samples
TLC7705MFKB	ACTIVE	LCCC	FK	20	55	Non-RoHS & Green	SNPB	N / A for Pkg Type	-55 to 125	5962-9751301Q2A TLC7705 MFKB	Samples
TLC7705MJG	ACTIVE	CDIP	JG	8	50	Non-RoHS & Green	SNPB	N / A for Pkg Type	-55 to 125	TLC7705 MJG	Samples
TLC7705MJGB	ACTIVE	CDIP	JG	8	50	Non-RoHS & Green	SNPB	N / A for Pkg Type	-55 to 125	9751301QPA TLC7705M	Samples
TLC7705MUB	ACTIVE	CFP	U	10	25	Non-RoHS & Green	SNPB	N / A for Pkg Type	-55 to 125	9751301QHA TLC7705M	Samples
TLC7705QD	ACTIVE	SOIC	D	8	75	RoHS & Green	NIPDAU	Level-1-260C-UNLIM	-40 to 125	C7705Q	Samples
TLC7705QDR	ACTIVE	SOIC	D	8	2500	RoHS & Green	NIPDAU	Level-1-260C-UNLIM	-40 to 125	C7705Q	Samples
TLC7705QPW	ACTIVE	TSSOP	PW	8	150	RoHS & Green	NIPDAU	Level-1-260C-UNLIM	-40 to 125	TD705	Samples
TLC7705QPWR	ACTIVE	TSSOP	PW	8	2000	RoHS & Green	NIPDAU	Level-1-260C-UNLIM	-40 to 125	TD705	Samples
TLC7725ID	ACTIVE	SOIC	D	8	75	RoHS & Green	NIPDAU	Level-1-260C-UNLIM	-40 to 85	C7725I	Samples

Orderable Device	Status (1)	Package Type	Package Drawing	Pins	Package Qty	Eco Plan (2)	Lead finish/ Ball material (6)	MSL Peak Temp (3)	Op Temp (°C)	Device Marking (4/5)	Samples
TLC7725IDR	ACTIVE	SOIC	D	8	2500	RoHS & Green	NIPDAU	Level-1-260C-UNLIM	-40 to 85	C7725I	Samples
TLC7725IPW	ACTIVE	TSSOP	PW	8	150	RoHS & Green	NIPDAU	Level-1-260C-UNLIM		Y7725	Samples
TLC7725IPWR	ACTIVE	TSSOP	PW	8	2000	RoHS & Green	NIPDAU	Level-1-260C-UNLIM	-40 to 85	Y7725	Samples
TLC7725QD	ACTIVE	SOIC	D	8	75	RoHS & Green	NIPDAU	Level-1-260C-UNLIM	-40 to 125	C7725Q	Samples
TLC7725QDR	ACTIVE	SOIC	D	8	2500	RoHS & Green	NIPDAU	Level-1-260C-UNLIM	-40 to 125	C7725Q	Samples
TLC7725QPWR	ACTIVE	TSSOP	PW	8	2000	RoHS & Green	NIPDAU	Level-1-260C-UNLIM	-40 to 125	TD725	Samples
TLC7733ID	ACTIVE	SOIC	D	8	75	RoHS & Green	NIPDAU	Level-1-260C-UNLIM	-40 to 85	C7733I	Samples
TLC7733IDR	ACTIVE	SOIC	D	8	2500	RoHS & Green	NIPDAU	Level-1-260C-UNLIM	-40 to 85	C7733I	Samples
TLC7733IP	ACTIVE	PDIP	P	8	50	RoHS & Green	NIPDAU	N / A for Pkg Type	-40 to 85	TLC7733IP	Samples
TLC7733IPE4	NRND	PDIP	P	8	50	TBD	Call TI	Call TI	-40 to 85		
TLC7733IPW	ACTIVE	TSSOP	PW	8	150	RoHS & Green	NIPDAU	Level-1-260C-UNLIM		Y7733	Samples
TLC7733IPWR	ACTIVE	TSSOP	PW	8	2000	RoHS & Green	NIPDAU	Level-1-260C-UNLIM	-40 to 85	Y7733	Samples
TLC7733MFKB	ACTIVE	LCCC	FK	20	55	Non-RoHS & Green	SNPB	N / A for Pkg Type	-55 to 125	5962-9750901Q2A TLC7733 MFKB	Samples
TLC7733MJG	ACTIVE	CDIP	JG	8	50	Non-RoHS & Green	SNPB	N / A for Pkg Type	-55 to 125	TLC7733 MJG	Samples
TLC7733MJGB	ACTIVE	CDIP	JG	8	50	Non-RoHS & Green	SNPB	N / A for Pkg Type	-55 to 125	9750901QPA TLC7733M	Samples
TLC7733QD	ACTIVE	SOIC	D	8	75	RoHS & Green	NIPDAU	Level-1-260C-UNLIM	-40 to 125	C7733Q	Samples
TLC7733QDR	ACTIVE	SOIC	D	8	2500	RoHS & Green	NIPDAU	Level-1-260C-UNLIM	-40 to 125	C7733Q	Samples
TLC7733QP	ACTIVE	PDIP	P	8	50	RoHS & Green	NIPDAU	N / A for Pkg Type	-40 to 125	TLC7733QP	Samples
TLC7733QPW	ACTIVE	TSSOP	PW	8	150	RoHS & Green	NIPDAU	Level-1-260C-UNLIM	-40 to 125	TD733	Samples
TLC7733QPWR	ACTIVE	TSSOP	PW	8	2000	RoHS & Green	NIPDAU	Level-1-260C-UNLIM	-40 to 125	TD733	Samples

(1) The marketing status values are defined as follows:
ACTIVE: Product device recommended for new designs.
LIFEBUY: TI has announced that the device will be discontinued, and a lifetime-buy period is in effect.
NRND: Not recommended for new designs. Device is in production to support existing customers, but TI does not recommend using this part in a new design.
PREVIEW: Device has been announced but is not in production. Samples may or may not be available.
OBSOLETE: TI has discontinued the production of the device.

(2) **RoHS:** TI defines "RoHS" to mean semiconductor products that are compliant with the current EU RoHS requirements for all 10 RoHS substances, including the requirement that RoHS substance do not exceed 0.1% by weight in homogeneous materials. Where designed to be soldered at high temperatures, "RoHS" products are suitable for use in specified lead-free processes. TI may reference these types of products as "Pb-Free".
RoHS Exempt: TI defines "RoHS Exempt" to mean products that contain lead but are compliant with EU RoHS pursuant to a specific EU RoHS exemption.
Green: TI defines "Green" to mean the content of Chlorine (Cl) and Bromine (Br) based flame retardants meet JS709B low halogen requirements of <=1000ppm threshold. Antimony trioxide based flame retardants must also meet the <=1000ppm threshold requirement.

(3) MSL, Peak Temp. - The Moisture Sensitivity Level rating according to the JEDEC industry standard classifications, and peak solder temperature.

(4) There may be additional marking, which relates to the logo, the lot trace code information, or the environmental category on the device.

(5) Multiple Device Markings will be inside parentheses. Only one Device Marking contained in parentheses and separated by a "~" will appear on a device. If a line is indented then it is a continuation of the previous line and the two combined represent the entire Device Marking for that device.

(6) Lead finish/Ball material - Orderable Devices may have multiple material finish options. Finish options are separated by a vertical ruled line. Lead finish/Ball material values may wrap to two lines if the finish value exceeds the maximum column width.

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OTHER QUALIFIED VERSIONS OF TLC77 :

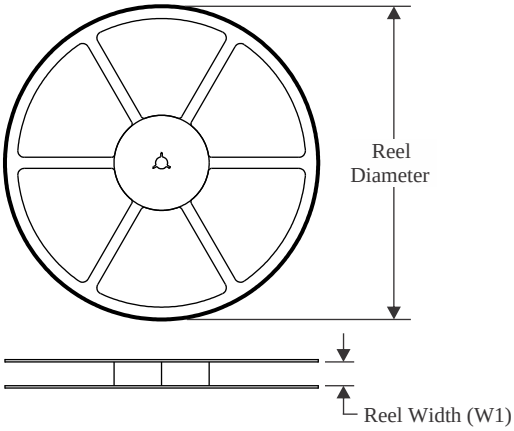
- Automotive : TLC77-Q1
- Enhanced Product : TLC77-EP

NOTE: Qualified Version Definitions:

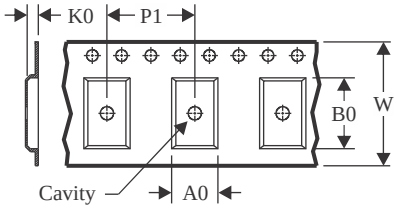
- Automotive - Q100 devices qualified for high-reliability automotive applications targeting zero defects
- Enhanced Product - Supports Defense, Aerospace and Medical Applications

TAPE AND REEL INFORMATION

REEL DIMENSIONS

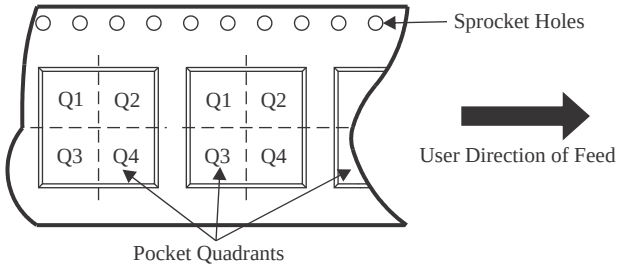


TAPE DIMENSIONS



A0	Dimension designed to accommodate the component width
B0	Dimension designed to accommodate the component length
K0	Dimension designed to accommodate the component thickness
W	Overall width of the carrier tape
P1	Pitch between successive cavity centers

QUADRANT ASSIGNMENTS FOR PIN 1 ORIENTATION IN TAPE

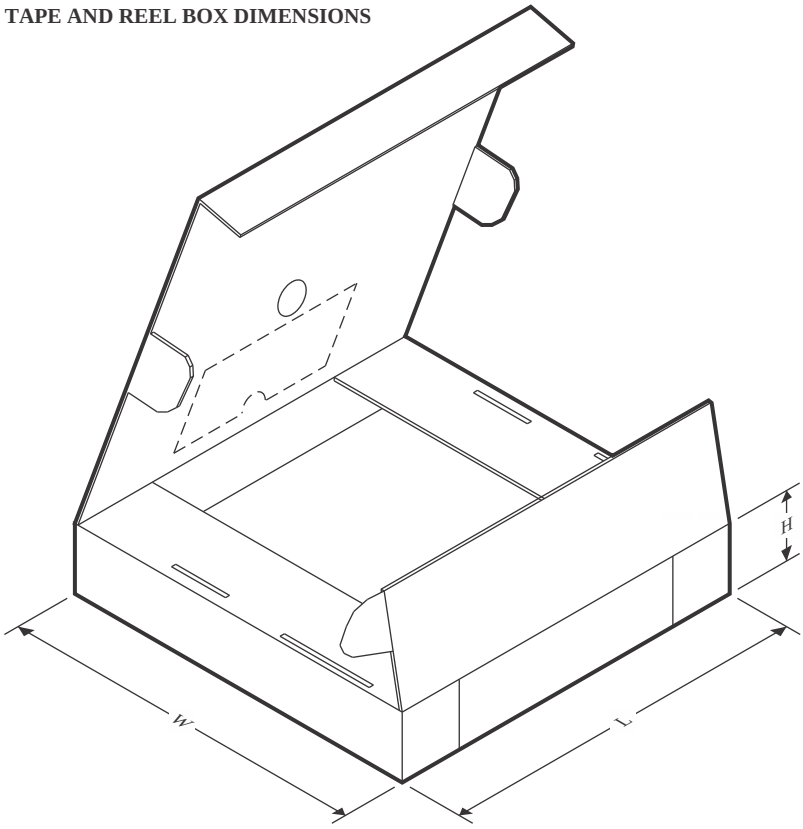


*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Reel Diameter (mm)	Reel Width W1 (mm)	A0 (mm)	B0 (mm)	K0 (mm)	P1 (mm)	W (mm)	Pin1 Quadrant
TLC7701IDR	SOIC	D	8	2500	330.0	12.4	6.4	5.2	2.1	8.0	12.0	Q1
TLC7701IPWR	TSSOP	PW	8	2000	330.0	12.4	7.0	3.6	1.6	8.0	12.0	Q1
TLC7701QDR	SOIC	D	8	2500	330.0	12.4	6.4	5.2	2.1	8.0	12.0	Q1
TLC7701QPWR	TSSOP	PW	8	2000	330.0	12.4	7.0	3.6	1.6	8.0	12.0	Q1
TLC7703IDR	SOIC	D	8	2500	330.0	12.4	6.4	5.2	2.1	8.0	12.0	Q1
TLC7703IPWR	TSSOP	PW	8	2000	330.0	12.4	7.0	3.6	1.6	8.0	12.0	Q1
TLC7705IDR	SOIC	D	8	2500	330.0	12.4	6.4	5.2	2.1	8.0	12.0	Q1
TLC7705IPWR	TSSOP	PW	8	2000	330.0	12.4	7.0	3.6	1.6	8.0	12.0	Q1
TLC7705QDR	SOIC	D	8	2500	330.0	12.4	6.4	5.2	2.1	8.0	12.0	Q1
TLC7705QPWR	TSSOP	PW	8	2000	330.0	12.4	7.0	3.6	1.6	8.0	12.0	Q1
TLC7725IDR	SOIC	D	8	2500	330.0	12.4	6.4	5.2	2.1	8.0	12.0	Q1
TLC7725IPWR	TSSOP	PW	8	2000	330.0	12.4	7.0	3.6	1.6	8.0	12.0	Q1
TLC7725QDR	SOIC	D	8	2500	330.0	12.4	6.4	5.2	2.1	8.0	12.0	Q1
TLC7725QPWR	TSSOP	PW	8	2000	330.0	12.4	7.0	3.6	1.6	8.0	12.0	Q1
TLC7733IDR	SOIC	D	8	2500	330.0	12.4	6.4	5.2	2.1	8.0	12.0	Q1
TLC7733IPWR	TSSOP	PW	8	2000	330.0	12.4	7.0	3.6	1.6	8.0	12.0	Q1

Device	Package Type	Package Drawing	Pins	SPQ	Reel Diameter (mm)	Reel Width W1 (mm)	A0 (mm)	B0 (mm)	K0 (mm)	P1 (mm)	W (mm)	Pin1 Quadrant
TLC7733QDR	SOIC	D	8	2500	330.0	12.4	6.4	5.2	2.1	8.0	12.0	Q1
TLC7733QPWR	TSSOP	PW	8	2000	330.0	12.4	7.0	3.6	1.6	8.0	12.0	Q1

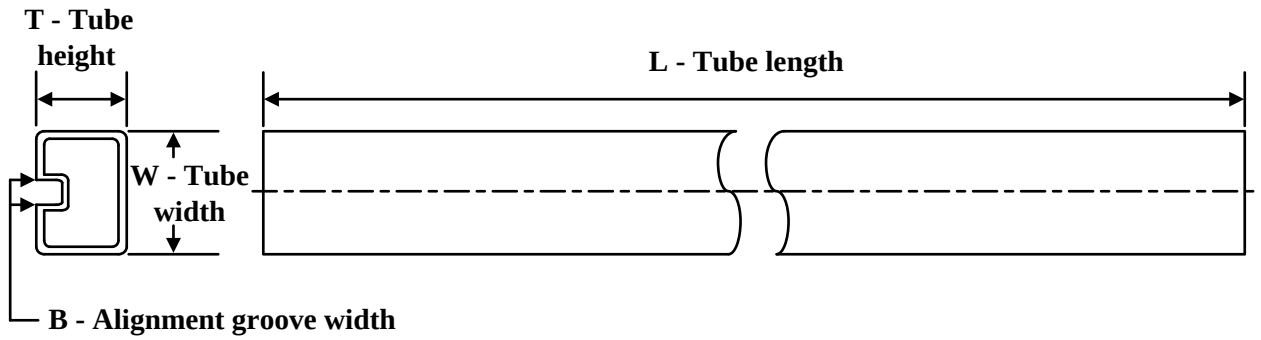
TAPE AND REEL BOX DIMENSIONS



*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
TLC7701IDR	SOIC	D	8	2500	350.0	350.0	43.0
TLC7701IPWR	TSSOP	PW	8	2000	356.0	356.0	35.0
TLC7701QDR	SOIC	D	8	2500	350.0	350.0	43.0
TLC7701QPWR	TSSOP	PW	8	2000	356.0	356.0	35.0
TLC7703IDR	SOIC	D	8	2500	350.0	350.0	43.0
TLC7703IPWR	TSSOP	PW	8	2000	356.0	356.0	35.0
TLC7705IDR	SOIC	D	8	2500	350.0	350.0	43.0
TLC7705IPWR	TSSOP	PW	8	2000	356.0	356.0	35.0
TLC7705QDR	SOIC	D	8	2500	350.0	350.0	43.0
TLC7705QPWR	TSSOP	PW	8	2000	356.0	356.0	35.0
TLC7725IDR	SOIC	D	8	2500	350.0	350.0	43.0
TLC7725IPWR	TSSOP	PW	8	2000	356.0	356.0	35.0
TLC7725QDR	SOIC	D	8	2500	350.0	350.0	43.0
TLC7725QPWR	TSSOP	PW	8	2000	356.0	356.0	35.0
TLC7733IDR	SOIC	D	8	2500	356.0	356.0	35.0
TLC7733IPWR	TSSOP	PW	8	2000	356.0	356.0	35.0
TLC7733QDR	SOIC	D	8	2500	356.0	356.0	35.0
TLC7733QPWR	TSSOP	PW	8	2000	356.0	356.0	35.0

TUBE



*All dimensions are nominal

Device	Package Name	Package Type	Pins	SPQ	L (mm)	W (mm)	T (µm)	B (mm)
5962-9750901Q2A	FK	LCCC	20	55	506.98	12.06	2030	NA
5962-9751301Q2A	FK	LCCC	20	55	506.98	12.06	2030	NA
5962-9751301QHA	U	CFP	10	25	506.98	26.16	6220	NA
TLC7701ID	D	SOIC	8	75	505.46	6.76	3810	4
TLC7701IP	P	PDIP	8	50	506	13.97	11230	4.32
TLC7701IPW	PW	TSSOP	8	150	530	10.2	3600	3.5
TLC7701QD	D	SOIC	8	75	505.46	6.76	3810	4
TLC7701QP	P	PDIP	8	50	506	13.97	11230	4.32
TLC7701QPW	PW	TSSOP	8	150	530	10.2	3600	3.5
TLC7703ID	D	SOIC	8	75	505.46	6.76	3810	4
TLC7703IP	P	PDIP	8	50	506	13.97	11230	4.32
TLC7703QD	D	SOIC	8	75	505.46	6.76	3810	4
TLC7703QPW	PW	TSSOP	8	150	530	10.2	3600	3.5
TLC7705ID	D	SOIC	8	75	505.46	6.76	3810	4
TLC7705IP	P	PDIP	8	50	506	13.97	11230	4.32
TLC7705IPW	PW	TSSOP	8	150	530	10.2	3600	3.5
TLC7705MFKB	FK	LCCC	20	55	506.98	12.06	2030	NA
TLC7705MUB	U	CFP	10	25	506.98	26.16	6220	NA
TLC7705QD	D	SOIC	8	75	505.46	6.76	3810	4
TLC7705QPW	PW	TSSOP	8	150	530	10.2	3600	3.5
TLC7725ID	D	SOIC	8	75	505.46	6.76	3810	4
TLC7725IPW	PW	TSSOP	8	150	530	10.2	3600	3.5
TLC7725QD	D	SOIC	8	75	505.46	6.76	3810	4
TLC7733ID	D	SOIC	8	75	506.6	8	3940	4.32
TLC7733ID	D	SOIC	8	75	505.46	6.76	3810	4
TLC7733IP	P	PDIP	8	50	506	13.97	11230	4.32
TLC7733IPW	PW	TSSOP	8	150	530	10.2	3600	3.5
TLC7733MFKB	FK	LCCC	20	55	506.98	12.06	2030	NA
TLC7733QD	D	SOIC	8	75	506.6	8	3940	4.32

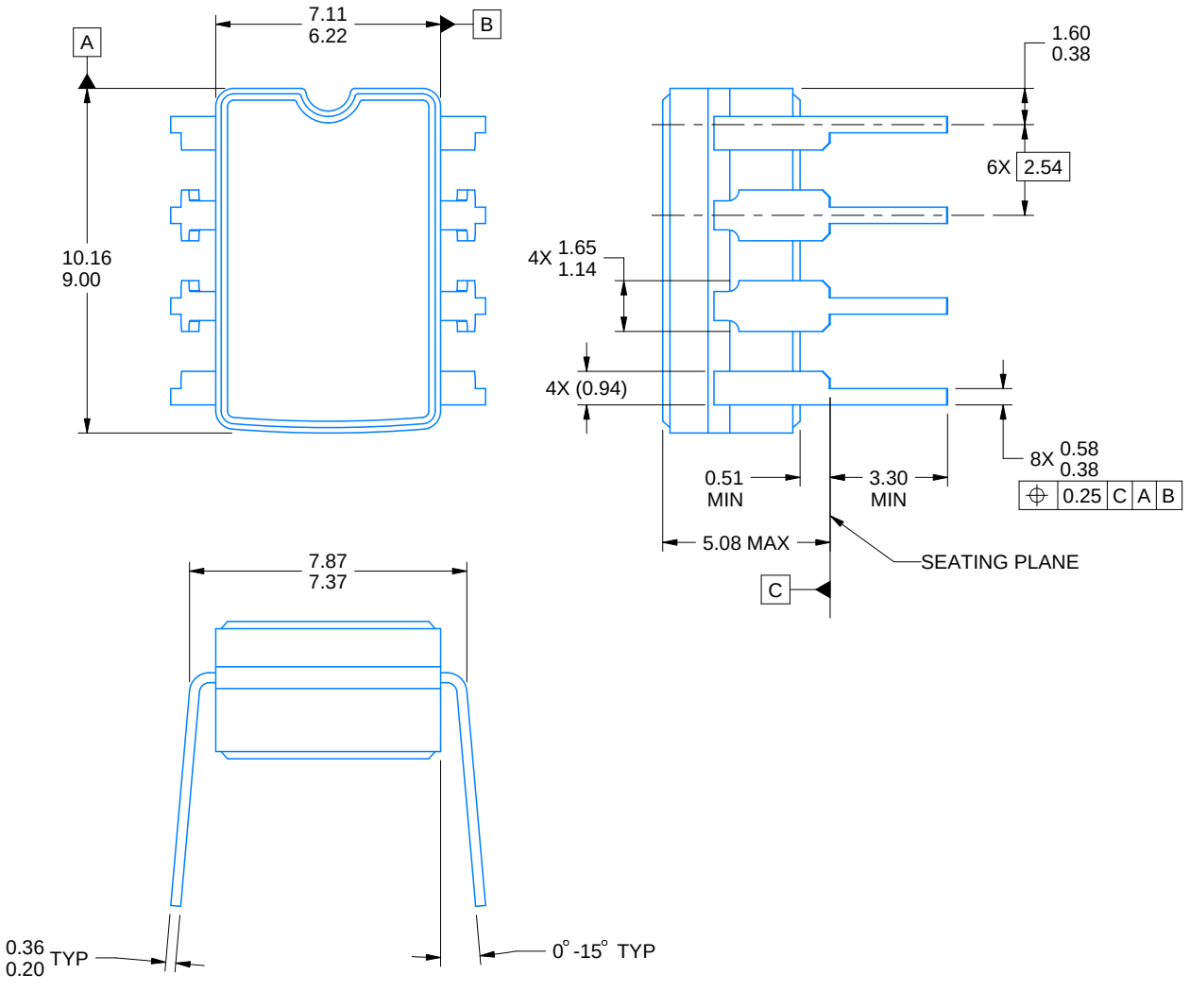
Device	Package Name	Package Type	Pins	SPQ	L (mm)	W (mm)	T (µm)	B (mm)
TLC7733QD	D	SOIC	8	75	505.46	6.76	3810	4
TLC7733QP	P	PDIP	8	50	506	13.97	11230	4.32
TLC7733QPW	PW	TSSOP	8	150	530	10.2	3600	3.5

PACKAGE OUTLINE

JG0008A

CDIP - 5.08 mm max height

CERAMIC DUAL IN-LINE PACKAGE



4230036/A 09/2023

NOTES:

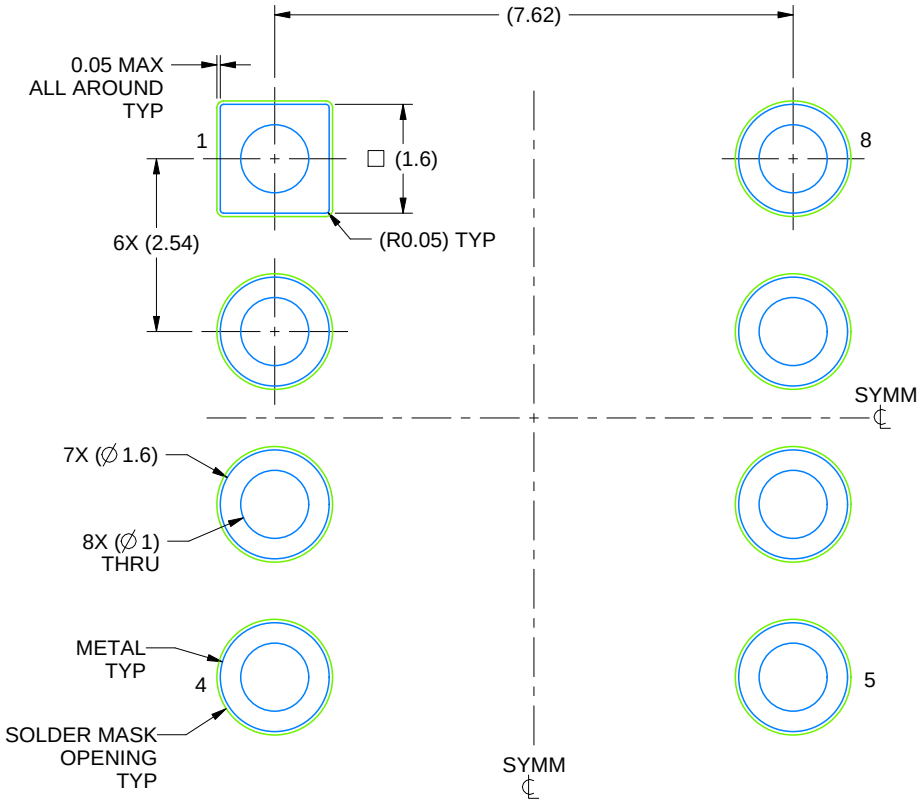
1. All linear dimensions are in millimeters. Any dimensions in parenthesis are for reference only. Dimensioning and tolerancing per ASME Y14.5M.
2. This drawing is subject to change without notice.
3. This package can be hermetically sealed with a ceramic lid using glass frit.
4. Index point is provided on cap for terminal identification.
5. Falls within MIL STD 1835 GDIP1-T8

EXAMPLE BOARD LAYOUT

JG0008A

CDIP - 5.08 mm max height

CERAMIC DUAL IN-LINE PACKAGE



LAND PATTERN EXAMPLE
NON SOLDER MASK DEFINED
SCALE: 9X

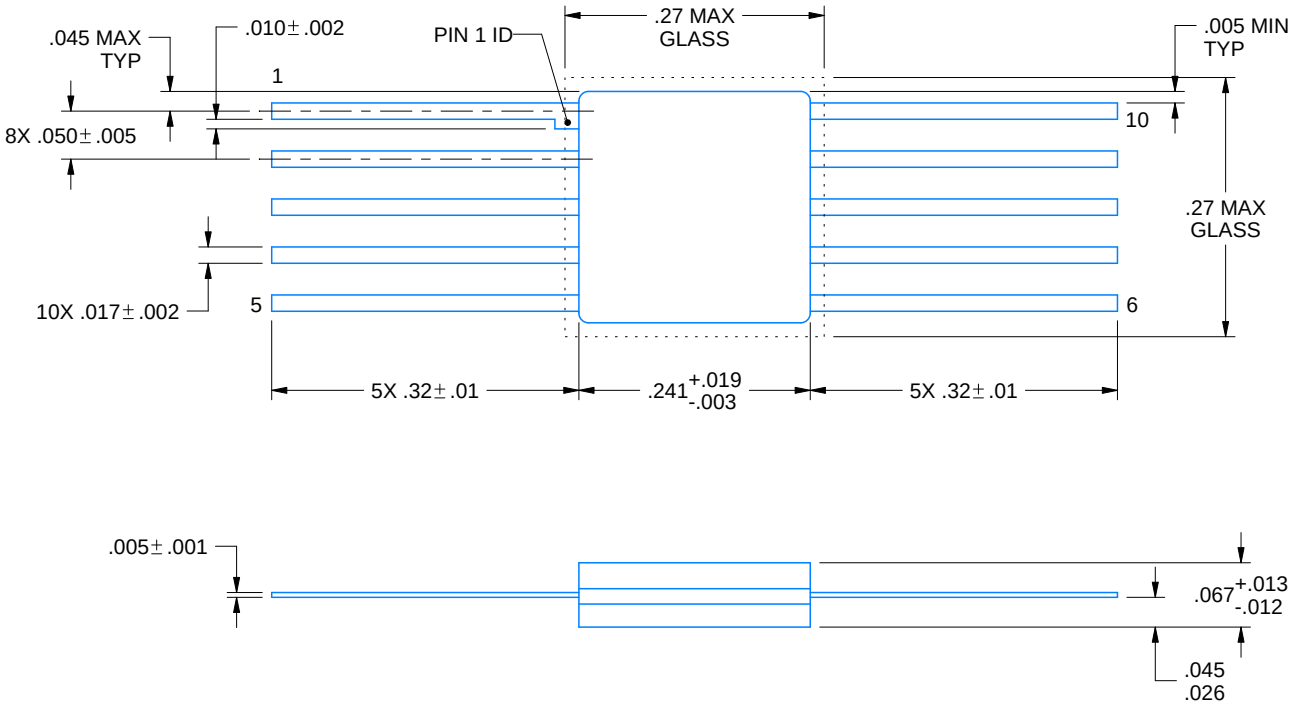
4230036/A 09/2023

U0010A

PACKAGE OUTLINE

CFP - 2.03 mm max height

CERAMIC FLATPACK



4225582/A 01/2020

NOTES:

1. All linear dimensions are in inches. Any dimensions in parenthesis are for reference only. Dimensioning and tolerancing per ASME Y14.5M.
2. This drawing is subject to change without notice.

GENERIC PACKAGE VIEW

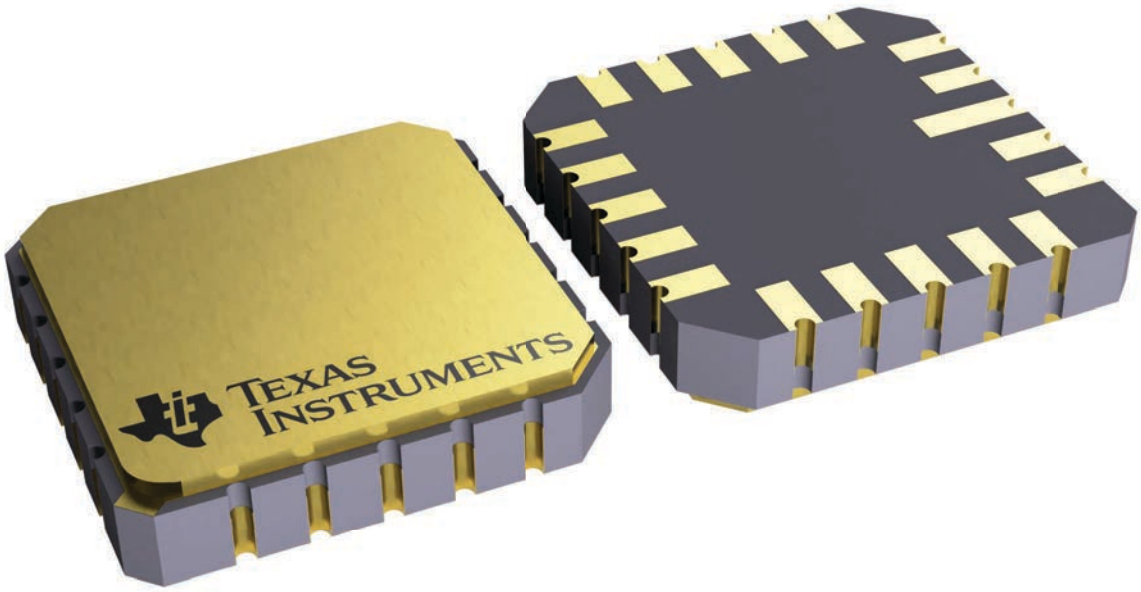
FK 20

LCCC - 2.03 mm max height

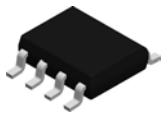
8.89 x 8.89, 1.27 mm pitch

LEADLESS CERAMIC CHIP CARRIER

This image is a representation of the package family, actual package may vary.
Refer to the product data sheet for package details.



4229370VA\

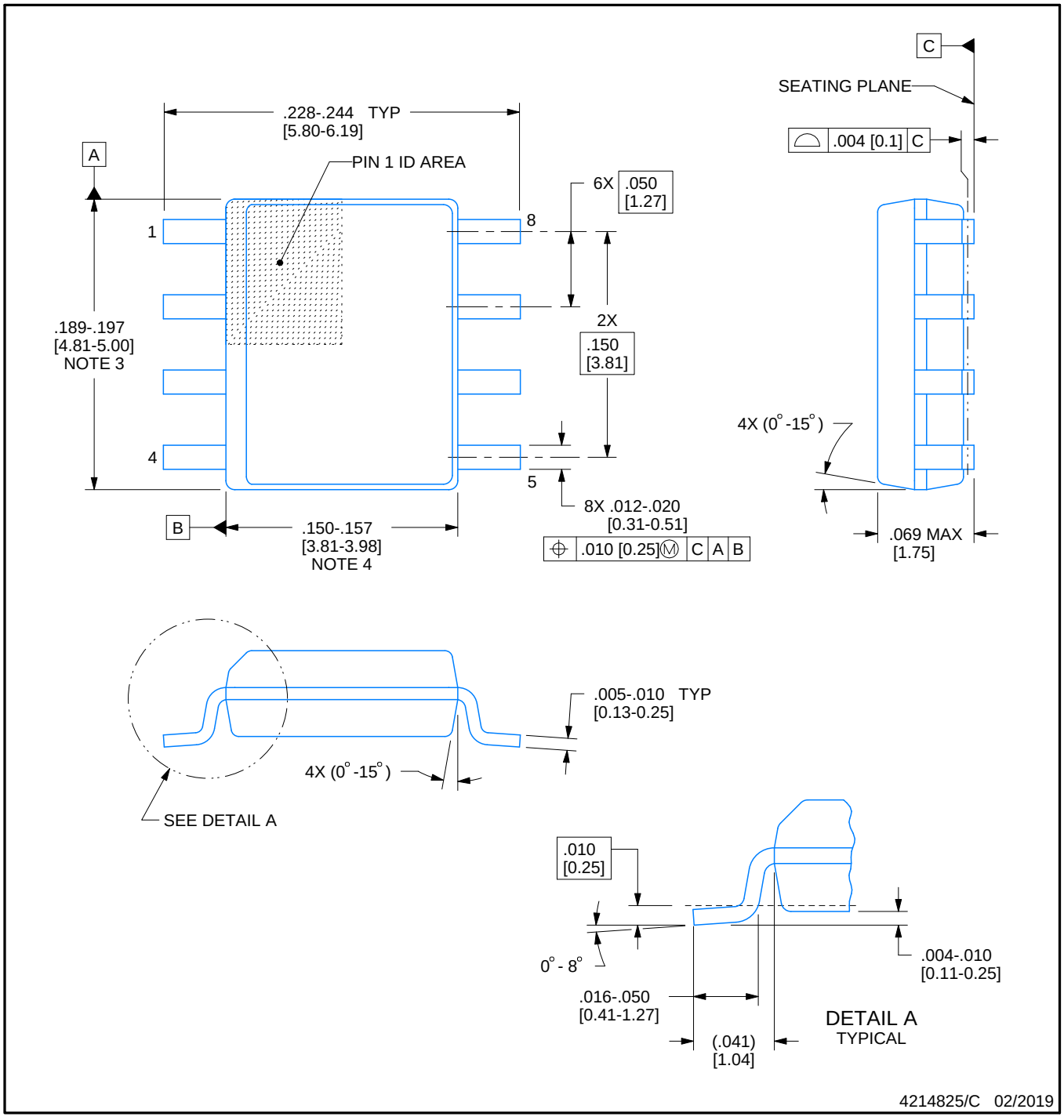


PACKAGE OUTLINE

D0008A

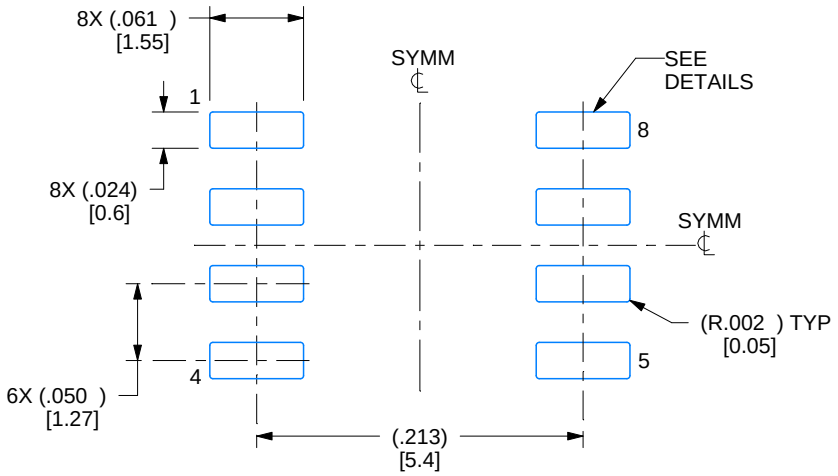
SOIC - 1.75 mm max height

SMALL OUTLINE INTEGRATED CIRCUIT

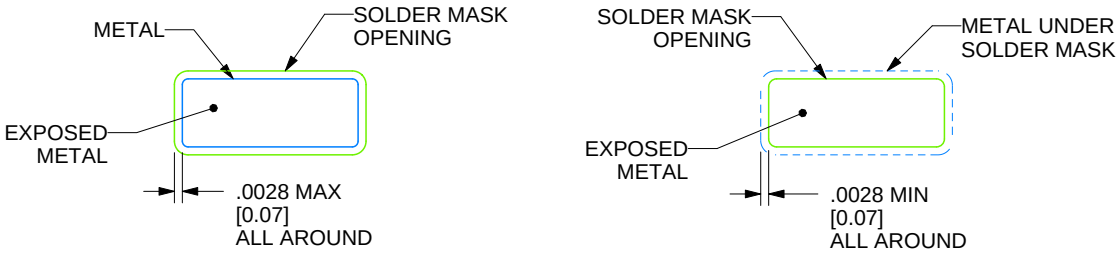


NOTES:

1. Linear dimensions are in inches [millimeters]. Dimensions in parenthesis are for reference only. Controlling dimensions are in inches. Dimensioning and tolerancing per ASME Y14.5M.
2. This drawing is subject to change without notice.
3. This dimension does not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or gate burrs shall not exceed .006 [0.15] per side.
4. This dimension does not include interlead flash.
5. Reference JEDEC registration MS-012, variation AA.



LAND PATTERN EXAMPLE
EXPOSED METAL SHOWN
SCALE:8X



SOLDER MASK DETAILS

4214825/C 02/2019

NOTES: (continued)

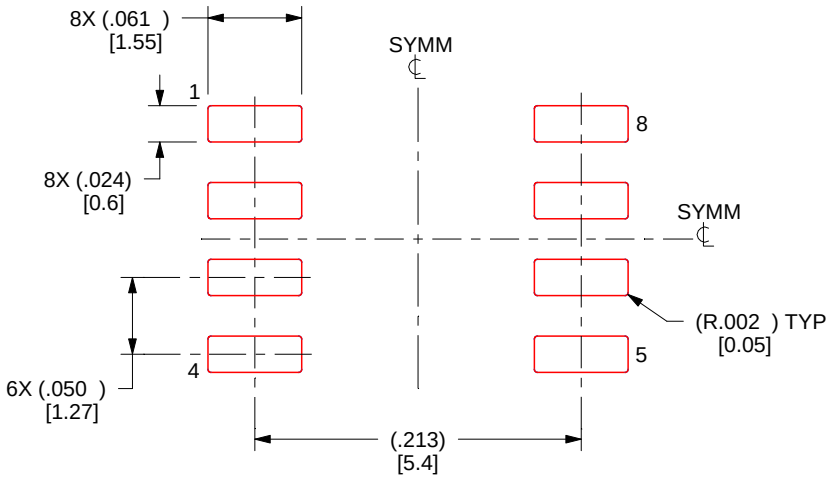
6. Publication IPC-7351 may have alternate designs.
7. Solder mask tolerances between and around signal pads can vary based on board fabrication site.

EXAMPLE STENCIL DESIGN

D0008A

SOIC - 1.75 mm max height

SMALL OUTLINE INTEGRATED CIRCUIT



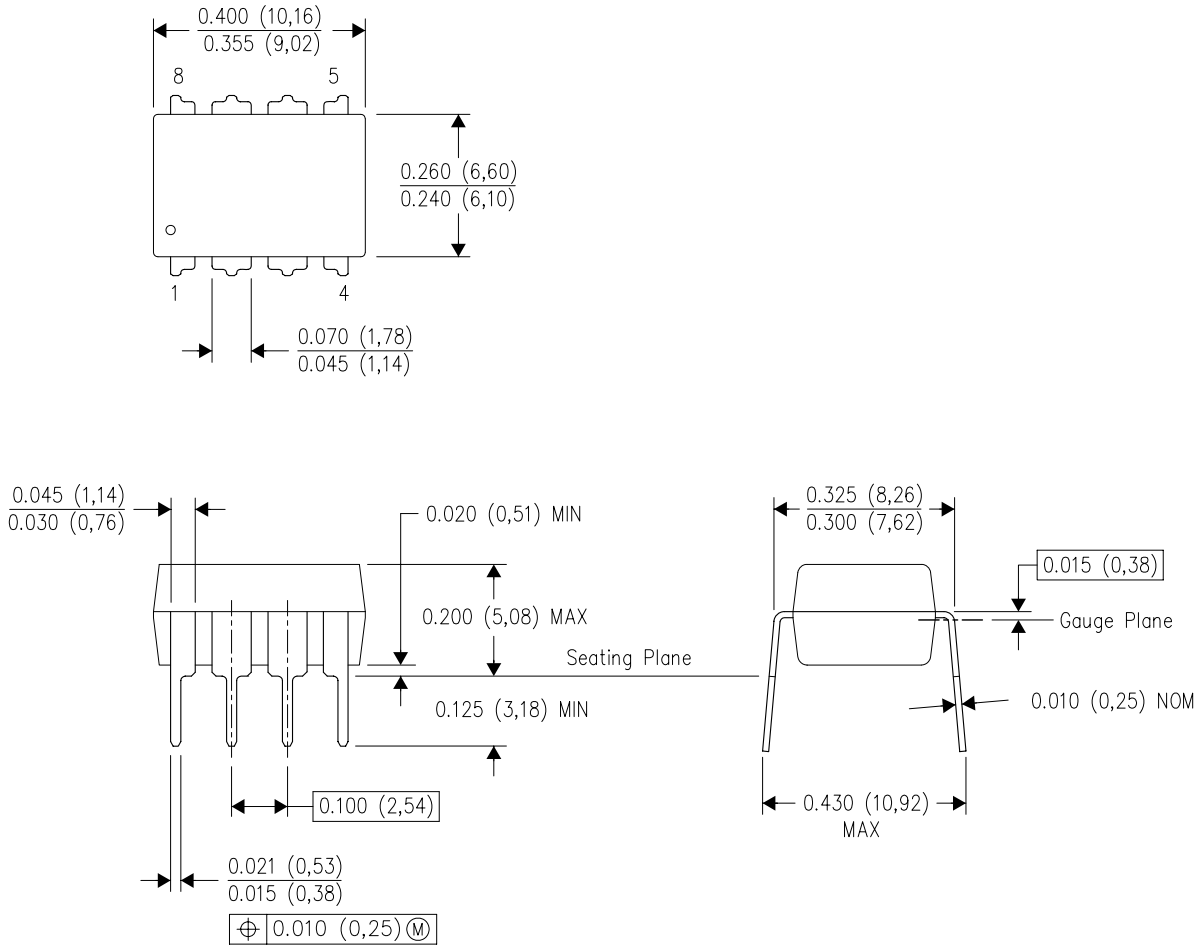
SOLDER PASTE EXAMPLE
BASED ON .005 INCH [0.125 MM] THICK STENCIL
SCALE:8X

4214825/C 02/2019

NOTES: (continued)

8. Laser cutting apertures with trapezoidal walls and rounded corners may offer better paste release. IPC-7525 may have alternate design recommendations.
9. Board assembly site may have different recommendations for stencil design.

P (R–PDIP–T8) PLASTIC DUAL–IN–LINE PACKAGE



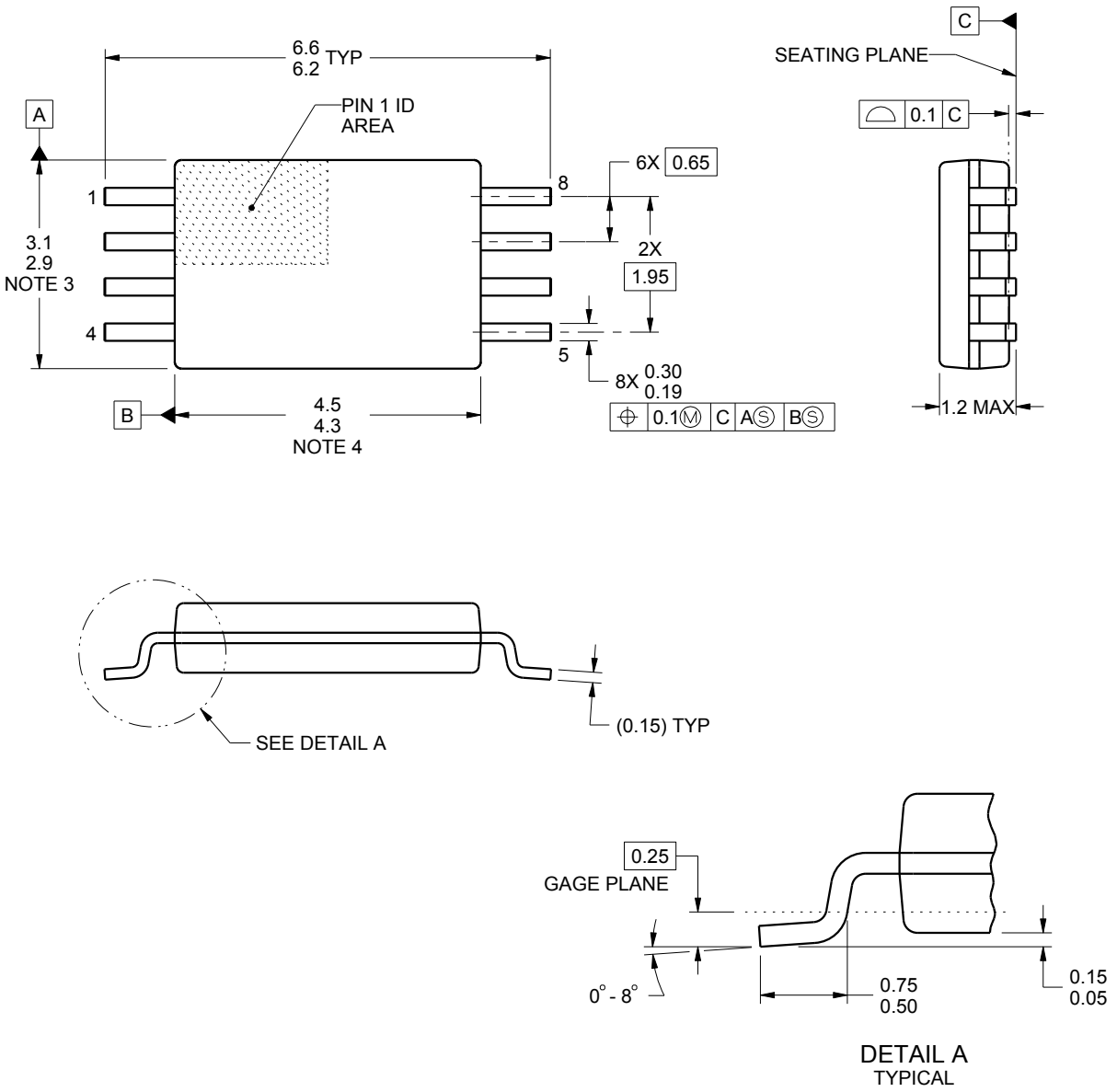
NOTES:
A. All linear dimensions are in inches (millimeters).
B. This drawing is subject to change without notice.
C. Falls within JEDEC MS–001 variation BA.

PACKAGE OUTLINE

PW0008A

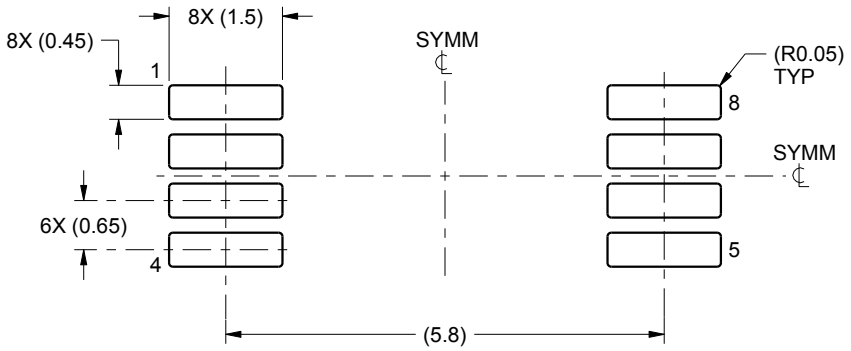
TSSOP - 1.2 mm max height

SMALL OUTLINE PACKAGE

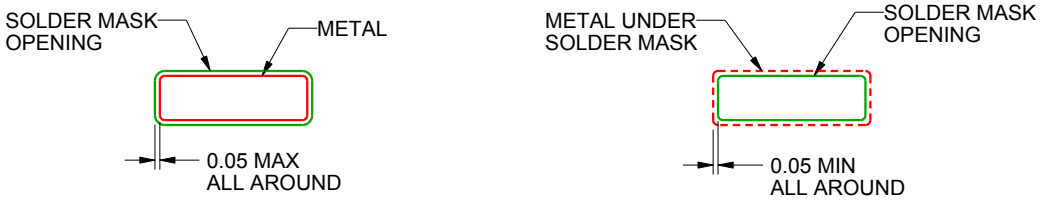


NOTES:

1. All linear dimensions are in millimeters. Any dimensions in parenthesis are for reference only. Dimensioning and tolerancing per ASME Y14.5M.
2. This drawing is subject to change without notice.
3. This dimension does not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or gate burrs shall not exceed 0.15 mm per side.
4. This dimension does not include interlead flash. Interlead flash shall not exceed 0.25 mm per side.
5. Reference JEDEC registration MO-153, variation AA.



LAND PATTERN EXAMPLE
SCALE:10X

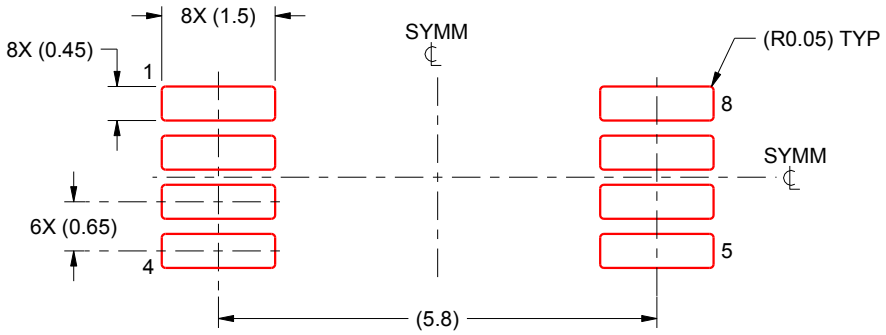


SOLDER MASK DETAILS
NOT TO SCALE

4221848/A 02/2015

NOTES: (continued)

6. Publication IPC-7351 may have alternate designs.
7. Solder mask tolerances between and around signal pads can vary based on board fabrication site.



SOLDER PASTE EXAMPLE
BASED ON 0.125 mm THICK STENCIL
SCALE:10X

4221848/A 02/2015

NOTES: (continued)

8. Laser cutting apertures with trapezoidal walls and rounded corners may offer better paste release. IPC-7525 may have alternate design recommendations.
9. Board assembly site may have different recommendations for stencil design.

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