

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 $V_{DD} \geq 1$ V
- Power-Down Control Support for Static RAM With Battery Backup
- Maximum Supply Current of 16 μ A
- 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 ($V_{I(\text{SENSE})}$) 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:

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

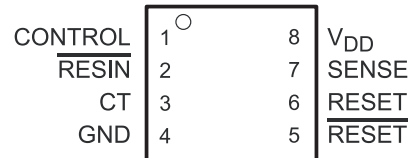
Where

C_T is in farads

t_d is in seconds

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.

DRB PACKAGE
(TOP VIEW)



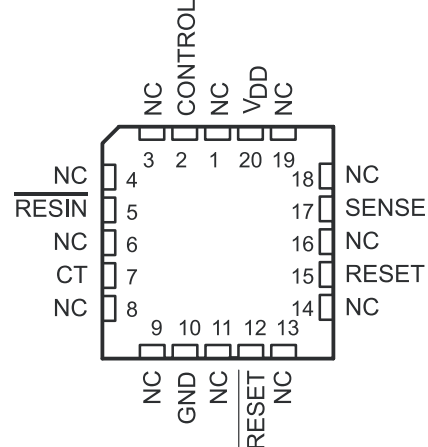
D, JG, P OR PW PACKAGE
(TOP VIEW)



U PACKAGE
(TOP VIEW)



FK PACKAGE
(TOP VIEW)



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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 TLC77xxL 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).

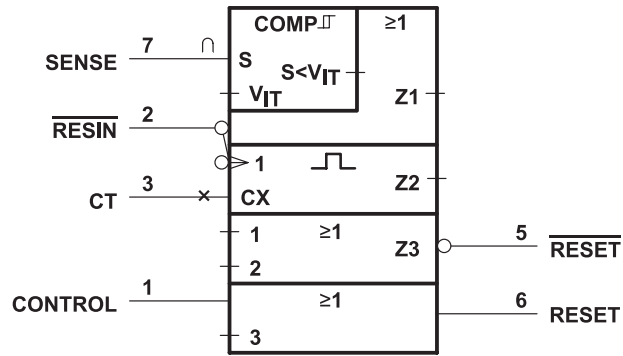
(2) The PW package is only available left-end taped and reeled (indicated by the R suffix on the device type; e.g., TLC7705QPWR).

Table 1. FUNCTION TABLE

CONTROL	\overline{RESIN}	$V_{I(SENSE)} > V_{IT+}$	\overline{RESET}	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 $t > t_d$.

LOGIC SYMBOL



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

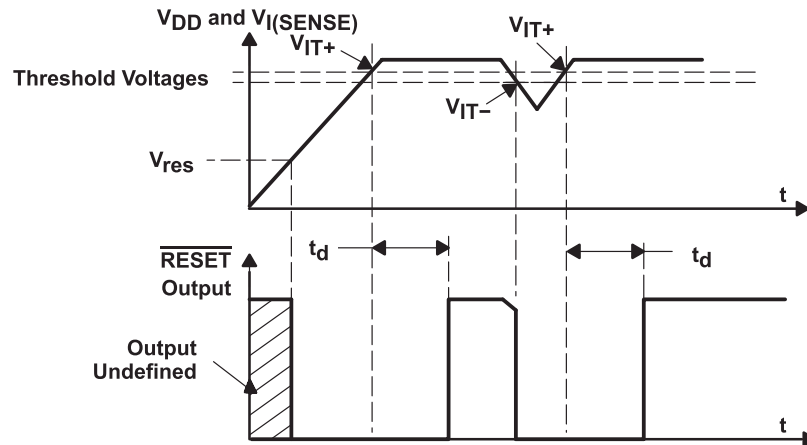
FUNCTIONAL BLOCK DIAGRAM



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

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

TIMING DIAGRAM



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 ≤ 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×V _{DD}		V
V _{IL}	Low-level input voltage at $\overline{\text{RESIN}}$ and CONTROL ⁽¹⁾		0.2×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	TL77xxI	–40	85
		TL77xxQ	–40	125
		TL77xxM	–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.

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			
		I _{OH} = 2 -mA	V _{DD} = 4.5 V	4.3			
			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		
		I _{OL} = 2 mA	V _{DD} = 4.5 V		0.2		
			V _{DD} = 4.5 V		0.5		
V _{IT-}	Negative-going input threshold voltage, SENSE ⁽²⁾	V _{DD} = 2 V to 6 V	TCLC7701	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	V _{DD} = 2 V to 6 V	TCLC7701	30		mV	
			TLC7725				
			TLC7703	70			
			TLC7733				
			TLC7705				
V _{res}	Power-up reset voltage ⁽³⁾	I _{OL} = 20 μA			1	V	
I _i	Input current	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	RESIN = V _{DD} , SENSE = V _{DD} ≥ V _{ITmax} + 0.2 V, CONTROL = 0 V, Outputs open		9	16	μA	
I _{DD(d)}	Supply current during t _d	V _{DD} = 5 V, V _{CT} = 0, 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 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.

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	$I_{OH} = -20 \mu A$	$V_{DD} = 2 V$	$T_A = 25^\circ C$	1.8		V	
				$T_A = -55^\circ C \text{ to } 125^\circ C$	1.7			
			$V_{DD} = 2.7 V$	$T_A = 25^\circ C$	2.5		V	
				$T_A = -55^\circ C \text{ to } 125^\circ C$	2.3			
			$V_{DD} = 4.5 V$	$T_A = 25^\circ C$	4.3		V	
				$T_A = -55^\circ C \text{ to } 125^\circ C$	4.2			
$I_{OH} = -2 \mu A$	$V_{DD} = 4.5 V$	$T_A = 25^\circ C$	3.7		V			
		$T_A = -55^\circ C \text{ to } 125^\circ C$	3.6					
V_{OL}	Low-level output voltage	$I_{OL} = -20 \mu A$	$V_{DD} = 2 V$	$T_A = 25^\circ C$		0.2	V	
				$T_A = -55^\circ C \text{ to } 125^\circ C$		0.2		
			$V_{DD} = 2.7 V$	$T_A = 25^\circ C$		0.2	V	
				$T_A = -55^\circ C \text{ to } 125^\circ C$		0.2		
			$V_{DD} = 4.5 V$	$T_A = 25^\circ C$		0.2	V	
				$T_A = -55^\circ C \text{ to } 125^\circ C$		0.2		
			$I_{OL} = 2 \text{ mA}$	$V_{DD} = 4.5 V$	$T_A = 25^\circ C$		0.5	V
					$T_A = -55^\circ C \text{ to } 125^\circ C$		0.5	
V_{IT-}	Negative-going input threshold voltage, SENSE ⁽³⁾	TLC7733	$V_{DD} = 2 V \text{ to } 6 V$	2.86	2.93	3.1	V	
		TLC7705		4.3	4.5	4.8		
V_{hys}	Hysteresis voltage, SENSE		$V_{DD} = 2 V \text{ to } 6 V$		70		mV	
V_{res}	Power-up reset voltage ⁽²⁾		$I_{OL} = 20 \mu A$			1	V	
I_i	Input current	RESIN	$V_i = 0 V \text{ to } V_{DD}$			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		RESIN = VDD, SENSE = $V_{DD} \geq V_{ITmax} + 0.2 V$ CONTROL = 0 V, Outputs open		9	16	μA	
$I_{DD(d)}$	Supply current during t_d	TLC7733	$V_{CT} = 0$, 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		$V_i = 0 V \text{ to } V_{DD}$			50	pF	

 (1) All characteristics are measured with $C_T = 0.1 \mu F$.

 (2) Typical values apply at $T_A = 25^\circ C$.

(3) To ensure best stability of the threshold voltage, a bypass capacitor (ceramic, 0.1 mF) should be connected near the supply terminals.

SWITCHING CHARACTERISTICS

at $V_{DD} = 5\text{ V}$, $R_L = 2\text{ k}\Omega$, $C_L = 50\text{ pF}$, $T_A = 25^\circ\text{C}$ (unless otherwise noted)

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

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

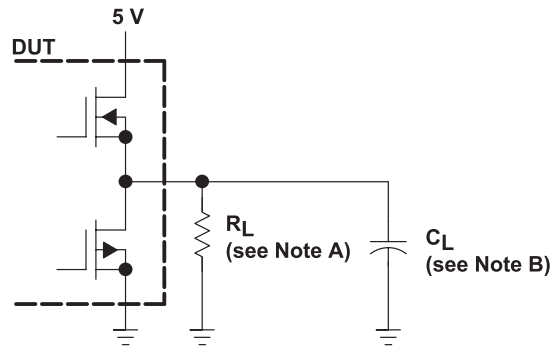
SWITCHING CHARACTERISTICS

 at $V_{DD} = 5\text{ V}$, $R_L = 2\text{ k}\Omega$, $C_L = 50\text{ pF}$, $T_A = 25^\circ\text{C}$ (unless otherwise noted)

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

PARAMETER MEASUREMENT INFORMATION



- NOTES: A. For switching characteristics, $R_L = 2\text{ k}\Omega$.
B. $C_L = 50\text{ pF}$ includes jig and probe capacitance.

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

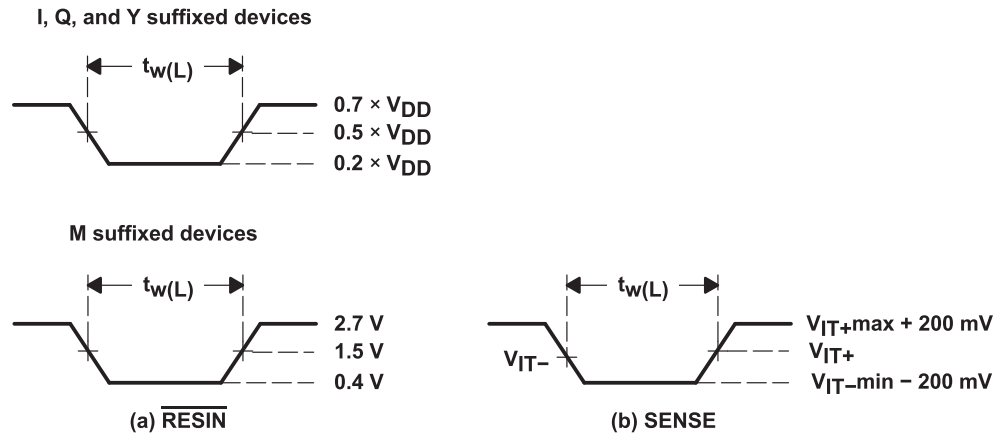


Figure 2. Input Pulse Definition Waveforms

TYPICAL CHARACTERISTICS

NORMALIZED INPUT THRESHOLD VOLTAGE
vs
TEMPERATURE

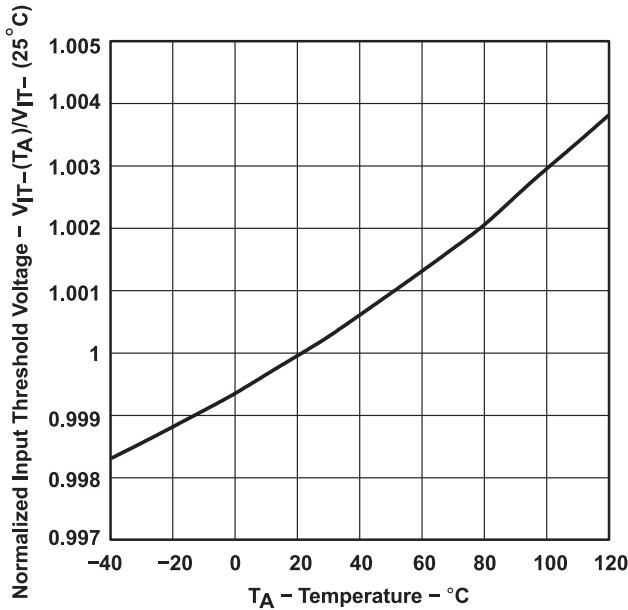


Figure 3.

SUPPLY CURRENT
vs
SUPPLY VOLTAGE

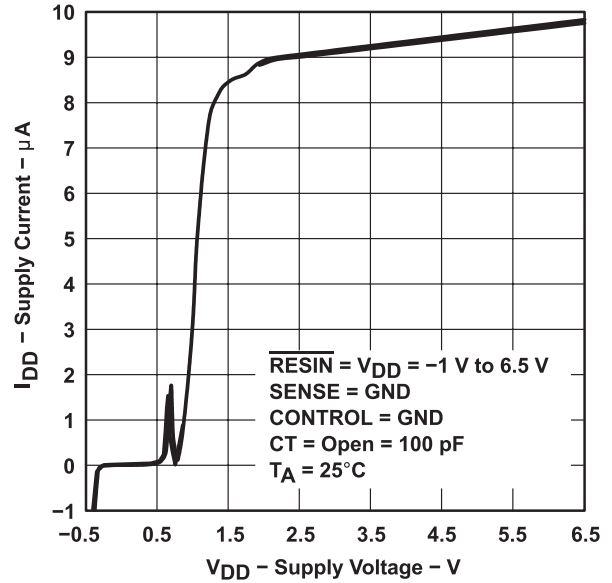


Figure 4.

HIGH-LEVEL OUTPUT VOLTAGE
vs
HIGH-LEVEL OUTPUT CURRENT

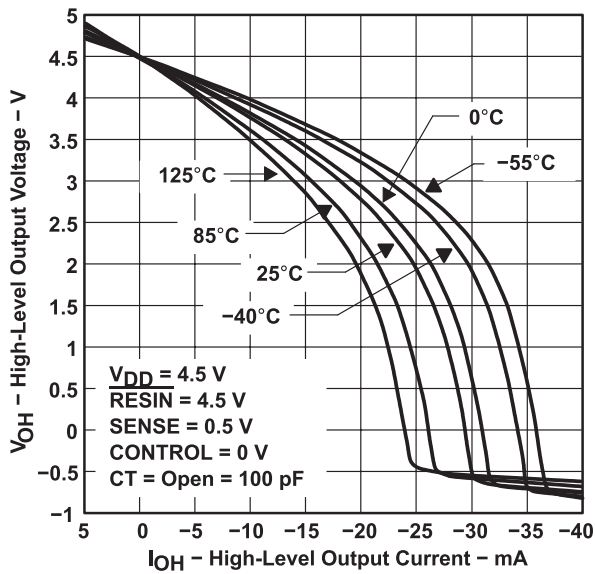


Figure 5.

LOW-LEVEL OUTPUT VOLTAGE
vs
LOW-LEVEL OUTPUT CURRENT

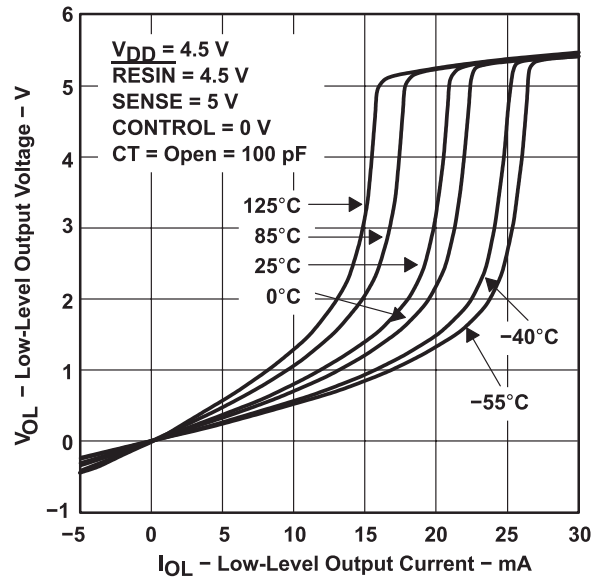
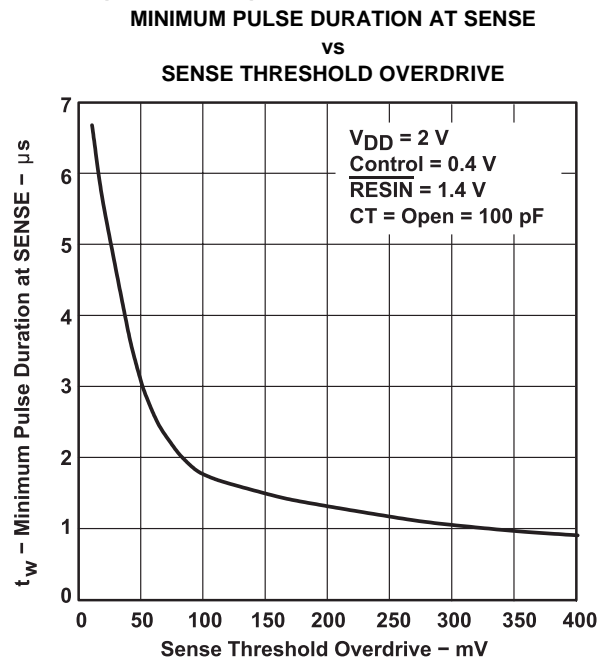
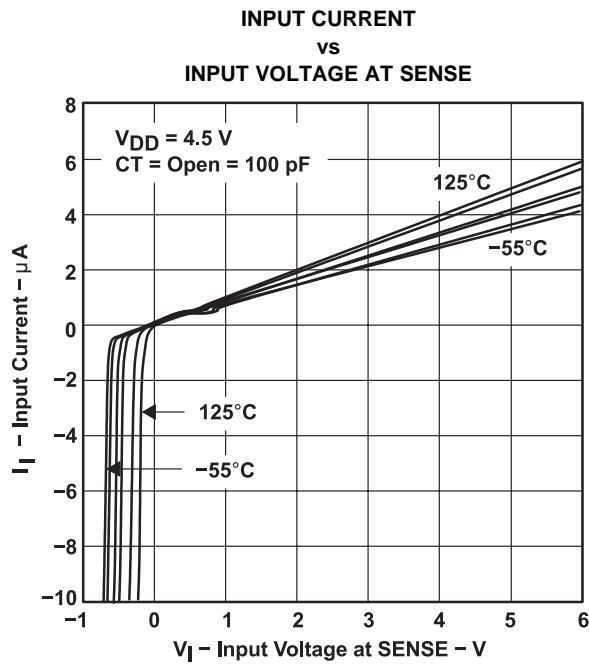


Figure 6.

TYPICAL CHARACTERISTICS (continued)



APPLICATION INFORMATION

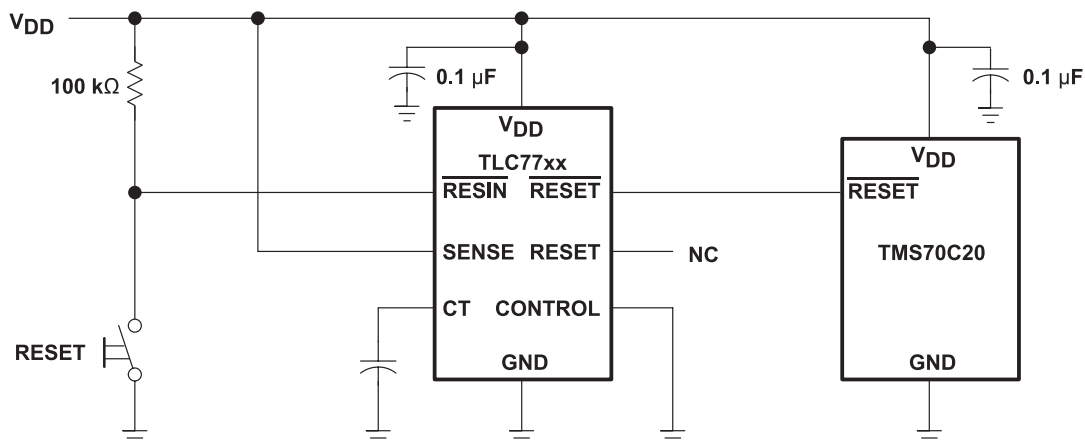


Figure 9. Reset Controller in a Microcomputer System

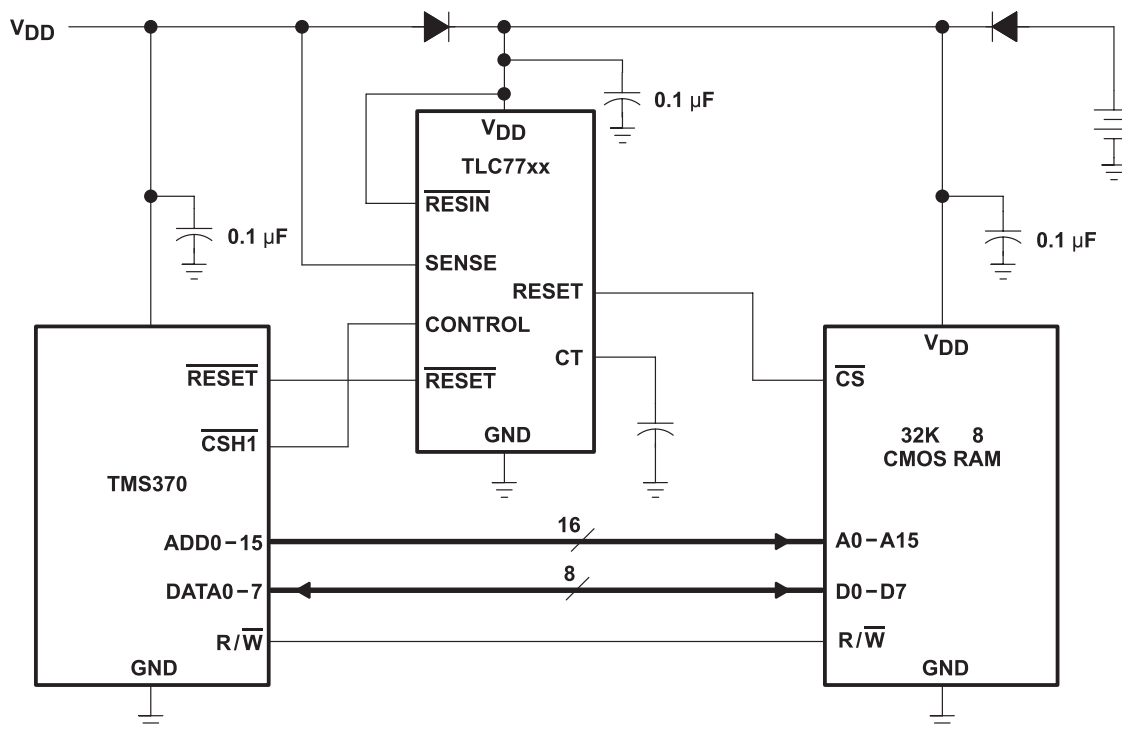


Figure 10. Data Retention During Power Down Using Static CMOS RAMs

Changes from Revision L (February 2003) to Revision M

Page

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

PACKAGING INFORMATION

Orderable part number	Status (1)	Material type (2)	Package Pins	Package qty Carrier	RoHS (3)	Lead finish/ Ball material (4)	MSL rating/ Peak reflow (5)	Op temp (°C)	Part marking (6)
5962-9750901Q2A	Active	Production	LCCC (FK) 20	55 TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	5962- 9750901Q2A TLC7733 MFKB
5962-9750901QPA	Active	Production	CDIP (JG) 8	50 TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	9750901QPA TLC7733M
5962-9751301Q2A	Active	Production	LCCC (FK) 20	55 TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	5962- 9751301Q2A TLC7705 MFKB
5962-9751301QHA	Active	Production	CFP (U) 10	25 TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	9751301QHA TLC7705M
5962-9751301QPA	Active	Production	CDIP (JG) 8	50 TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	9751301QPA TLC7705M
TLC7701ID	Active	Production	SOIC (D) 8	75 TUBE	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 85	C7701I
TLC7701IDR	Active	Production	SOIC (D) 8	2500 LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 85	C7701I
TLC7701IDRBT-NM	Obsolete	Production	SON (DRB) 8	-	-	Call TI	Call TI	-40 to 125	7701N
TLC7701IP	Active	Production	PDIP (P) 8	50 TUBE	Yes	NIPDAU	N/A for Pkg Type	-40 to 85	TLC7701IP
TLC7701IPW	Active	Production	TSSOP (PW) 8	150 TUBE	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 85	Y7701
TLC7701IPWR	Active	Production	TSSOP (PW) 8	2000 LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 85	Y7701
TLC7701QD	Active	Production	SOIC (D) 8	75 TUBE	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 125	C7701Q
TLC7701QDR	Active	Production	SOIC (D) 8	2500 LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 125	C7701Q
TLC7701QP	Active	Production	PDIP (P) 8	50 TUBE	Yes	NIPDAU	N/A for Pkg Type	-40 to 125	TLC7701QP
TLC7701QPW	Active	Production	TSSOP (PW) 8	150 TUBE	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 125	TD701
TLC7701QPWR	Active	Production	TSSOP (PW) 8	2000 LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 125	TD701
TLC7703ID	Active	Production	SOIC (D) 8	75 TUBE	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 85	C7703I
TLC7703IDR	Active	Production	SOIC (D) 8	2500 LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 85	C7703I
TLC7703IP	Active	Production	PDIP (P) 8	50 TUBE	Yes	NIPDAU	N/A for Pkg Type	-40 to 85	TLC7703IP
TLC7703IPW	Obsolete	Production	TSSOP (PW) 8	-	-	Call TI	Call TI	-	Y7703
TLC7703IPWR	Active	Production	TSSOP (PW) 8	2000 LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 85	Y7703
TLC7703QD	Active	Production	SOIC (D) 8	75 TUBE	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 125	C7703Q

Orderable part number	Status (1)	Material type (2)	Package Pins	Package qty Carrier	RoHS (3)	Lead finish/ Ball material (4)	MSL rating/ Peak reflow (5)	Op temp (°C)	Part marking (6)
TLC7703QPW	Active	Production	TSSOP (PW) 8	150 TUBE	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 125	TD703
TLC7705ID	Active	Production	SOIC (D) 8	75 TUBE	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 85	C7705I
TLC7705IDR	Active	Production	SOIC (D) 8	2500 LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 85	C7705I
TLC7705IP	Active	Production	PDIP (P) 8	50 TUBE	Yes	NIPDAU	N/A for Pkg Type	-40 to 85	TLC7705IP
TLC7705IPW	Active	Production	TSSOP (PW) 8	150 TUBE	Yes	NIPDAU	Level-1-260C-UNLIM	-	Y7705
TLC7705IPWR	Active	Production	TSSOP (PW) 8	2000 LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 85	Y7705
TLC7705MFKB	Active	Production	LCCC (FK) 20	55 TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	5962- 9751301Q2A TLC7705 MFKB
TLC7705MJG	Active	Production	CDIP (JG) 8	50 TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	TLC7705 MJG
TLC7705MJGB	Active	Production	CDIP (JG) 8	50 TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	9751301QPA TLC7705M
TLC7705MUB	Active	Production	CFP (U) 10	25 TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	9751301QHA TLC7705M
TLC7705QD	Active	Production	SOIC (D) 8	75 TUBE	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 125	C7705Q
TLC7705QDR	Active	Production	SOIC (D) 8	2500 LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 125	C7705Q
TLC7705QPW	Active	Production	TSSOP (PW) 8	150 TUBE	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 125	TD705
TLC7705QPWR	Active	Production	TSSOP (PW) 8	2000 LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 125	TD705
TLC7725ID	Active	Production	SOIC (D) 8	75 TUBE	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 85	C7725I
TLC7725IDR	Active	Production	SOIC (D) 8	2500 LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 85	C7725I
TLC7725IPW	Active	Production	TSSOP (PW) 8	150 TUBE	Yes	NIPDAU	Level-1-260C-UNLIM	-	Y7725
TLC7725IPWR	Active	Production	TSSOP (PW) 8	2000 LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 85	Y7725
TLC7725QD	Active	Production	SOIC (D) 8	75 TUBE	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 125	C7725Q
TLC7725QDR	Active	Production	SOIC (D) 8	2500 LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 125	C7725Q
TLC7725QPWR	Active	Production	TSSOP (PW) 8	2000 LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 125	TD725
TLC7733ID	Active	Production	SOIC (D) 8	75 TUBE	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 85	C7733I
TLC7733IDR	Active	Production	SOIC (D) 8	2500 LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 85	C7733I
TLC7733IP	Active	Production	PDIP (P) 8	50 TUBE	Yes	NIPDAU	N/A for Pkg Type	-40 to 85	TLC7733IP
TLC7733IPW	Active	Production	TSSOP (PW) 8	150 TUBE	Yes	NIPDAU	Level-1-260C-UNLIM	-	Y7733
TLC7733IPWR	Active	Production	TSSOP (PW) 8	2000 LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 85	Y7733

Orderable part number	Status (1)	Material type (2)	Package Pins	Package qty Carrier	RoHS (3)	Lead finish/ Ball material (4)	MSL rating/ Peak reflow (5)	Op temp (°C)	Part marking (6)
TLC7733MFKB	Active	Production	LCCC (FK) 20	55 TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	5962-9750901Q2A TLC7733 MFKB
TLC7733MJG	Active	Production	CDIP (JG) 8	50 TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	TLC7733 MJG
TLC7733MJGB	Active	Production	CDIP (JG) 8	50 TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	9750901QPA TLC7733M
TLC7733QD	Active	Production	SOIC (D) 8	75 TUBE	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 125	C7733Q
TLC7733QDR	Active	Production	SOIC (D) 8	2500 LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 125	C7733Q
TLC7733QP	Active	Production	PDIP (P) 8	50 TUBE	Yes	NIPDAU	N/A for Pkg Type	-40 to 125	TLC7733QP
TLC7733QPW	Active	Production	TSSOP (PW) 8	150 TUBE	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 125	TD733
TLC7733QPWR	Active	Production	TSSOP (PW) 8	2000 LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 125	TD733

(1) **Status:** For more details on status, see our [product life cycle](#).

(2) **Material type:** When designated, preproduction parts are prototypes/experimental devices, and are not yet approved or released for full production. Testing and final process, including without limitation quality assurance, reliability performance testing, and/or process qualification, may not yet be complete, and this item is subject to further changes or possible discontinuation. If available for ordering, purchases will be subject to an additional waiver at checkout, and are intended for early internal evaluation purposes only. These items are sold without warranties of any kind.

(3) **RoHS values:** Yes, No, RoHS Exempt. See the [TI RoHS Statement](#) for additional information and value definition.

(4) **Lead finish/Ball material:** Parts 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.

(5) **MSL rating/Peak reflow:** The moisture sensitivity level ratings and peak solder (reflow) temperatures. In the event that a part has multiple moisture sensitivity ratings, only the lowest level per JEDEC standards is shown. Refer to the shipping label for the actual reflow temperature that will be used to mount the part to the printed circuit board.

(6) **Part marking:** There may be an additional marking, which relates to the logo, the lot trace code information, or the environmental category of the part.

Multiple part markings will be inside parentheses. Only one part marking contained in parentheses and separated by a "~" will appear on a part. If a line is indented then it is a continuation of the previous line and the two combined represent the entire part marking for that device.

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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

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	505.46	6.76	3810	4
TLC7733ID	D	SOIC	8	75	506.6	8	3940	4.32
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	505.46	6.76	3810	4

Device	Package Name	Package Type	Pins	SPQ	L (mm)	W (mm)	T (μm)	B (mm)
TLC7733QD	D	SOIC	8	75	506.6	8	3940	4.32
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

DRB 8

GENERIC PACKAGE VIEW

VSON - 1 mm max height

PLASTIC SMALL OUTLINE - NO LEAD



Images above are just a representation of the package family, actual package may vary.
Refer to the product data sheet for package details.

4203482/L

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\



D0008A

PACKAGE OUTLINE

SOIC - 1.75 mm max height

SMALL OUTLINE INTEGRATED CIRCUIT



4214825/C 02/2019

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.

EXAMPLE BOARD LAYOUT

D0008A

SOIC - 1.75 mm max height

SMALL OUTLINE INTEGRATED CIRCUIT



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.

PW0008A



PACKAGE OUTLINE
TSSOP - 1.2 mm max height

SMALL OUTLINE PACKAGE



4221848/A 02/2015

NOTES:

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

EXAMPLE BOARD LAYOUT

PW0008A

TSSOP - 1.2 mm max height

SMALL OUTLINE PACKAGE



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.

EXAMPLE STENCIL DESIGN

PW0008A

TSSOP - 1.2 mm max height

SMALL OUTLINE PACKAGE



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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