

- Low  $r_{DS(on)}$  . . . 5  $\Omega$  Typical
- Avalanche Energy . . . 30 mJ
- Eight Power DMOS-Transistor Outputs of 150-mA Continuous Current
- 500-mA Typical Current-Limiting Capability
- Output Clamp Voltage . . . 50 V
- Four Distinct Function Modes
- Low Power Consumption

### description

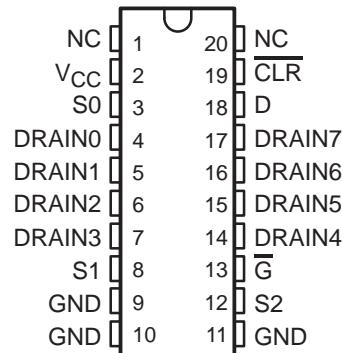
This power logic 8-bit addressable latch controls open-drain DMOS-transistor outputs and is designed for general-purpose storage applications in digital systems. Specific uses include working registers, serial-holding registers, and decoders or demultiplexers. This is a multi-functional device capable of storing single-line data in eight addressable latches and 3-to-8 decoder or demultiplexer with active-low DMOS outputs.

Four distinct modes of operation are selectable by controlling the clear (CLR) and enable ( $\bar{G}$ ) inputs as enumerated in the function table. In the addressable-latch mode, data at the data-in (D) terminal is written into the addressed latch. The addressed DMOS-transistor output inverts the data input with all unaddressed DMOS-transistor outputs remaining in their previous states. In the memory mode, all DMOS-transistor outputs remain in their previous states and are unaffected by the data or address inputs. To eliminate the possibility of entering erroneous data in the latch, enable  $\bar{G}$  should be held high (inactive) while the address lines are changing. In the 3-to-8 decoding or demultiplexing mode, the addressed output is inverted with respect to the D input and all other outputs are off. In the clear mode, all outputs are off and unaffected by the address and data inputs. When data is low for a given output, the DMOS-transistor output is off. When data is high, the DMOS-transistor output has sink-current capability.

Outputs are low-side, open-drain DMOS transistors with output ratings of 50 V and 150-mA continuous sink-current capability. Each output provides a 500-mA typical current limit at  $T_C = 25^\circ\text{C}$ . The current limit decreases as the junction temperature increases for additional device protection.

The TPIC6B259 is characterized for operation over the operating case temperature range of  $-40^\circ\text{C}$  to  $125^\circ\text{C}$ .

DW OR N PACKAGE  
(TOP VIEW)



NC – No internal connection

FUNCTION TABLE

INPUTS	OUTPUT OF ADDRESSED DRAIN	EACH OTHER DRAIN	FUNCTION
CLR	G	D	
H	L	H	L
H	L	L	H
H	H	X	$Q_{io}$
L	L	H	L
L	L	L	H
L	H	X	H

LATCH SELECTION TABLE

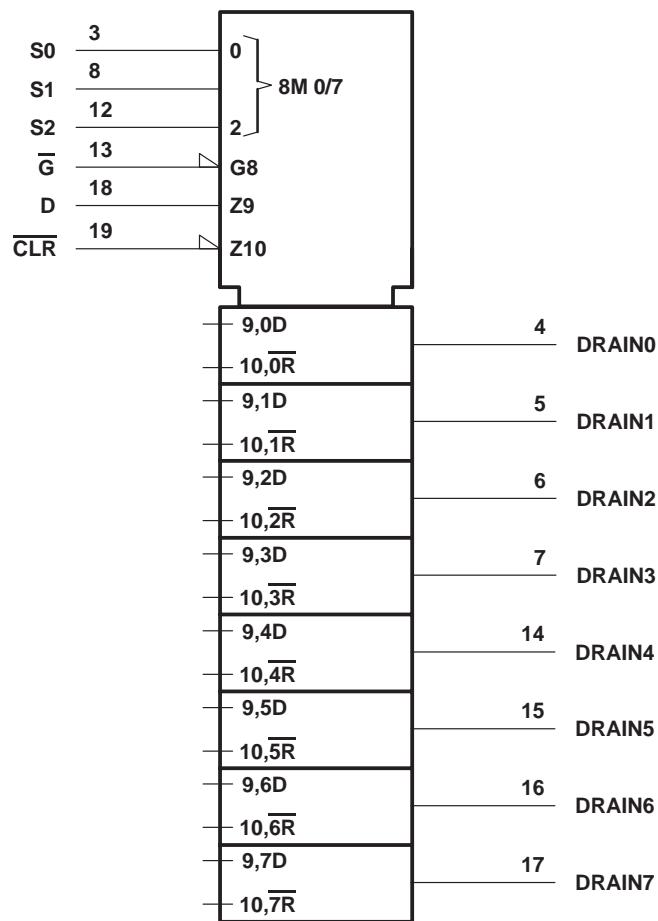
SELECT INPUTS			DRAIN ADDRESSED
S2	S1	S0	
L	L	L	0
L	L	H	1
L	H	L	2
L	H	H	3
H	L	L	4
H	L	H	5
H	H	L	6
H	H	H	7

H = high level, L = low level

# TPIC6B259 POWER LOGIC 8-BIT ADDRESSABLE LATCH

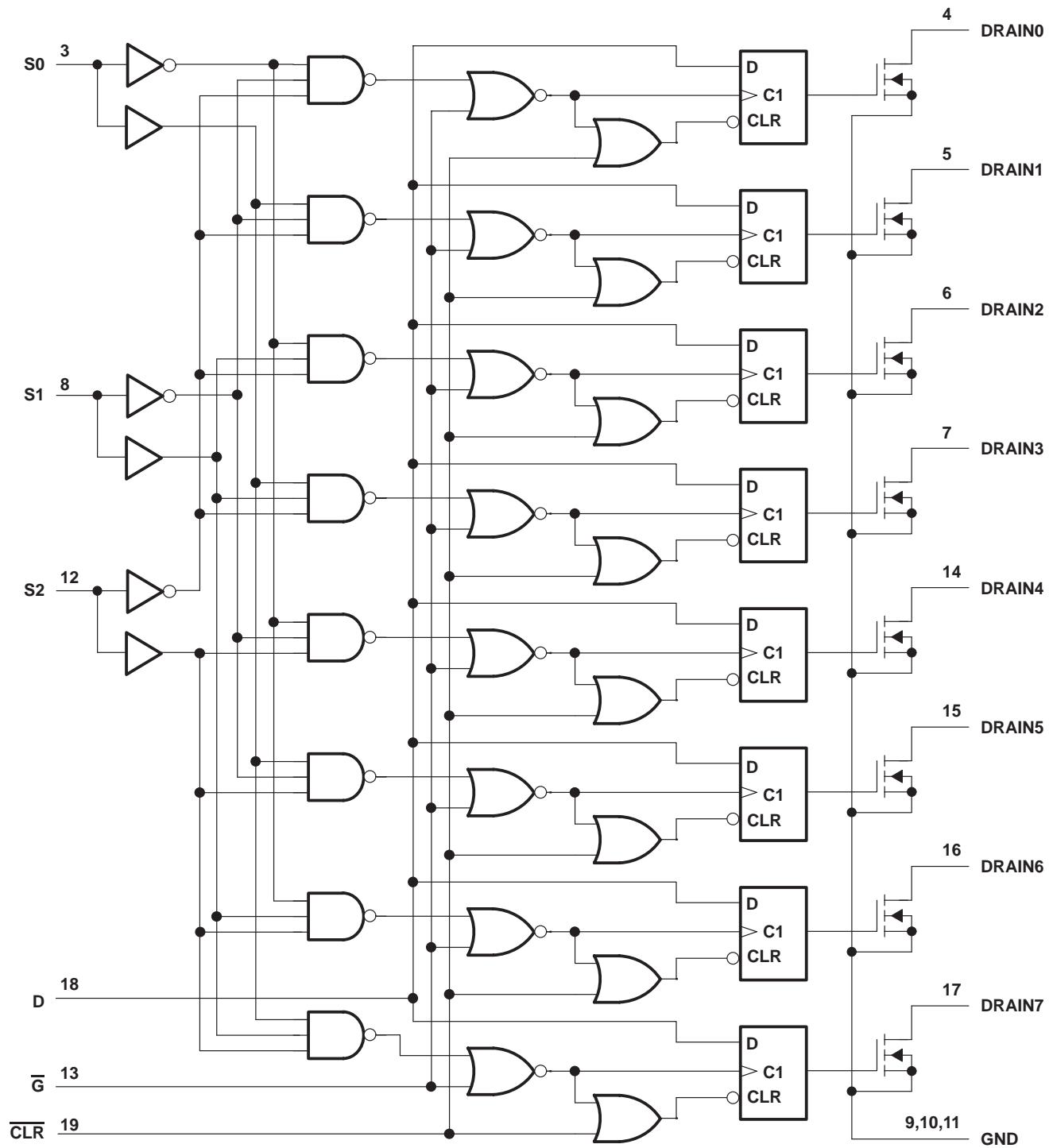
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## logic symbol†



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

logic diagram (positive logic)

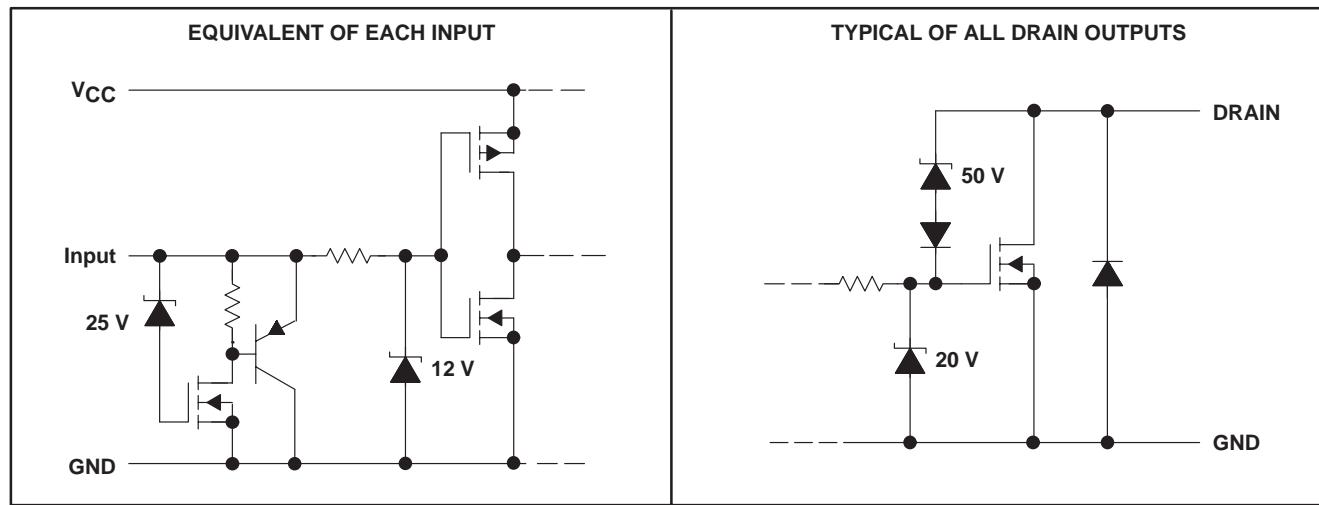


# TPIC6B259

## POWER LOGIC 8-BIT ADDRESSABLE LATCH

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### schematic of inputs and outputs



absolute maximum ratings over the recommended operating case temperature range (unless otherwise noted)<sup>†</sup>

Logic supply voltage, $V_{CC}$ (see Note 1) .....	7 V
Logic input voltage range, $V_I$ .....	-0.3 V to 7 V
Power DMOS drain-to-source voltage, $V_{DS}$ (see Note 2) .....	50 V
Continuous source-to-drain diode anode current .....	500 mA
Pulsed source-to-drain diode anode current (see Note 3) .....	1 A
Pulsed drain current, each output, all outputs on, $I_D$ , $T_C = 25^\circ\text{C}$ (see Note 3) .....	500 mA
Continuous drain current, each output, all outputs on, $I_D$ , $T_C = 25^\circ\text{C}$ .....	150 mA
Peak drain current single output, $I_{DM}$ , $T_C = 25^\circ\text{C}$ (see Note 3) .....	500 mA
Single-pulse avalanche energy, $E_{AS}$ (see Figure 4) .....	30 mJ
Avalanche current, $I_{AS}$ (see Note 4) .....	500 mA
Continuous total dissipation .....	See Dissipating Rating Table
Operating virtual junction temperature range, $T_J$ .....	-40°C to 150°C
Operating case temperature range, $T_C$ .....	-40°C to 125°C
Storage temperature range .....	-65°C to 150°C
Lead temperature 1,6 mm (1/16 inch) from case for 10 seconds .....	260°C

<sup>†</sup> 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.

NOTES: 1. All voltage values are with respect to GND.

2. Each power DMOS source is internally connected to GND.
3. Pulse duration  $\leq 100 \mu\text{s}$  and duty cycle  $\leq 2\%$ .
4. DRAIN supply voltage = 15 V, starting junction temperature ( $T_{JS}$ ) = 25°C,  $L = 200 \text{ mH}$ ,  $I_{AS} = 0.5 \text{ A}$  (see Figure 4).

DISSIPATION RATING TABLE

PACKAGE	$T_C \leq 25^\circ\text{C}$ POWER RATING	DERATING FACTOR ABOVE $T_C = 25^\circ\text{C}$	$T_C = 125^\circ\text{C}$ POWER RATING
DW	1389 mW	11.1 mW/°C	278 mW
N	1050 mW	10.5 mW/°C	263 mW

**recommended operating conditions**

	MIN	MAX	UNIT
Logic supply voltage, $V_{CC}$	4.5	5.5	V
High-level input voltage, $V_{IH}$	0.85 $V_{CC}$		V
Low-level input voltage, $V_{IL}$	0.15 $V_{CC}$		V
Pulsed drain output current, $T_C = 25^\circ C$ , $V_{CC} = 5 V$ (see Notes 3 and 5)	-500	500	mA
Setup time, D high before $\bar{G} \uparrow$ , $t_{SU}$ (see Figure 2)	20		ns
Hold time, D high after $\bar{G} \uparrow$ , $t_h$ (see Figure 2)	20		ns
Pulse duration, $t_w$ (see Figure 2)	40		ns
Operating case temperature, $T_C$	-40	125	°C

**electrical characteristics,  $V_{CC} = 5 V$ ,  $T_C = 25^\circ C$  (unless otherwise noted)**

PARAMETER	TEST CONDITIONS		MIN	TYP	MAX	UNIT
$V_{(BR)DSX}$ Drain-to-source breakdown voltage	$I_D = 1 \text{ mA}$		50			V
$V_{SD}$ Source-to-drain diode forward voltage	$I_F = 100 \text{ mA}$		0.85	1		V
$I_{IH}$ High-level input current	$V_{CC} = 5.5 \text{ V}$ , $V_I = V_{CC}$			1		μA
$I_{IL}$ Low-level input current	$V_{CC} = 5.5 \text{ V}$ , $V_I = 0$			-1		μA
$I_{CC}$ Logic supply current	$V_{CC} = 5.5 \text{ V}$	All outputs off	20	100		μA
		All outputs on	150	300		
$I_N$ Nominal current	$V_{DS(on)} = 0.5 \text{ V}$ , $I_N = I_D$ , $T_C = 85^\circ C$ , See Notes 5, 6, and 7		90			mA
$I_{DSX}$ Off-state drain current	$V_{DS} = 40 \text{ V}$ , $V_{CC} = 5.5 \text{ V}$		0.1	5		μA
	$V_{DS} = 40 \text{ V}$ , $V_{CC} = 5.5 \text{ V}$ , $T_C = 125^\circ C$		0.15	8		
$r_{DS(on)}$ Static drain-to-source on-state resistance	$I_D = 100 \text{ mA}$ , $V_{CC} = 4.5 \text{ V}$		4.2	5.7		Ω
	$I_D = 100 \text{ mA}$ , $V_{CC} = 4.5 \text{ V}$ , $T_C = 125^\circ C$		6.8	9.5		
	$I_D = 350 \text{ mA}$ , $V_{CC} = 4.5 \text{ V}$		5.5	8		

**switching characteristics,  $V_{CC} = 5 \text{ V}$ ,  $T_C = 25^\circ C$**

PARAMETER	TEST CONDITIONS	MIN	TYP	MAX	UNIT
$t_{PLH}$ Propagation delay time, low-to-high-level output from D		150			ns
$t_{PHL}$ Propagation delay time, high-to-low-level output from D		90			ns
$t_r$ Rise time, drain output		200			ns
$t_f$ Fall time, drain output		200			ns
$t_a$ Reverse-recovery-current rise time		100			ns
$t_{rr}$ Reverse-recovery time		300			

NOTES: 3. Pulse duration  $\leq 100 \mu\text{s}$  and duty cycle  $\leq 2\%$ .  
 5. Technique should limit  $T_J - T_C$  to  $10^\circ C$  maximum.  
 6. These parameters are measured with voltage-sensing contacts separate from the current-carrying contacts.  
 7. Nominal current is defined for a consistent comparison between devices from different sources. It is the current that produces a voltage drop of  $0.5 \text{ V}$  at  $T_C = 85^\circ C$ .

# TPIC6B259

## POWER LOGIC 8-BIT ADDRESSABLE LATCH

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### thermal resistance

PARAMETER		TEST CONDITIONS	MIN	MAX	UNIT
R <sub>θJA</sub>	Thermal resistance junction-to-ambient	DW package N package	All 8 outputs with equal power	90	°C/W
				95	

### PARAMETER MEASUREMENT INFORMATION

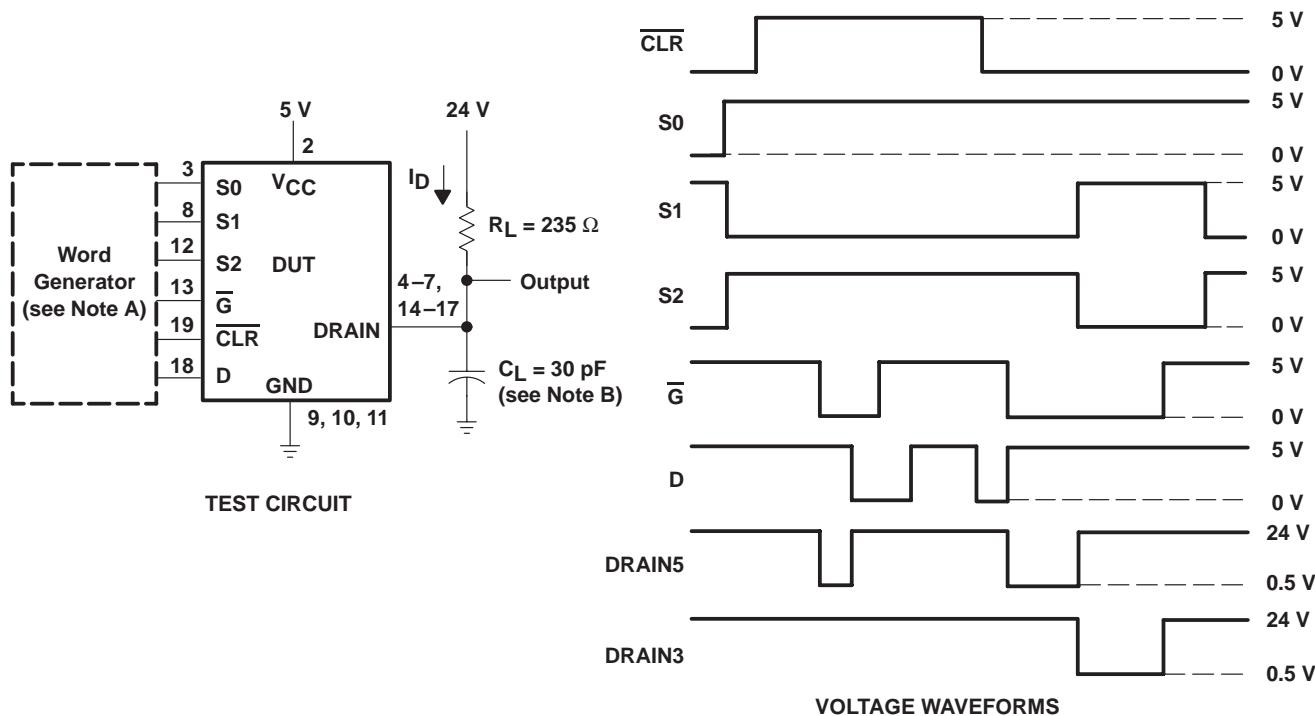
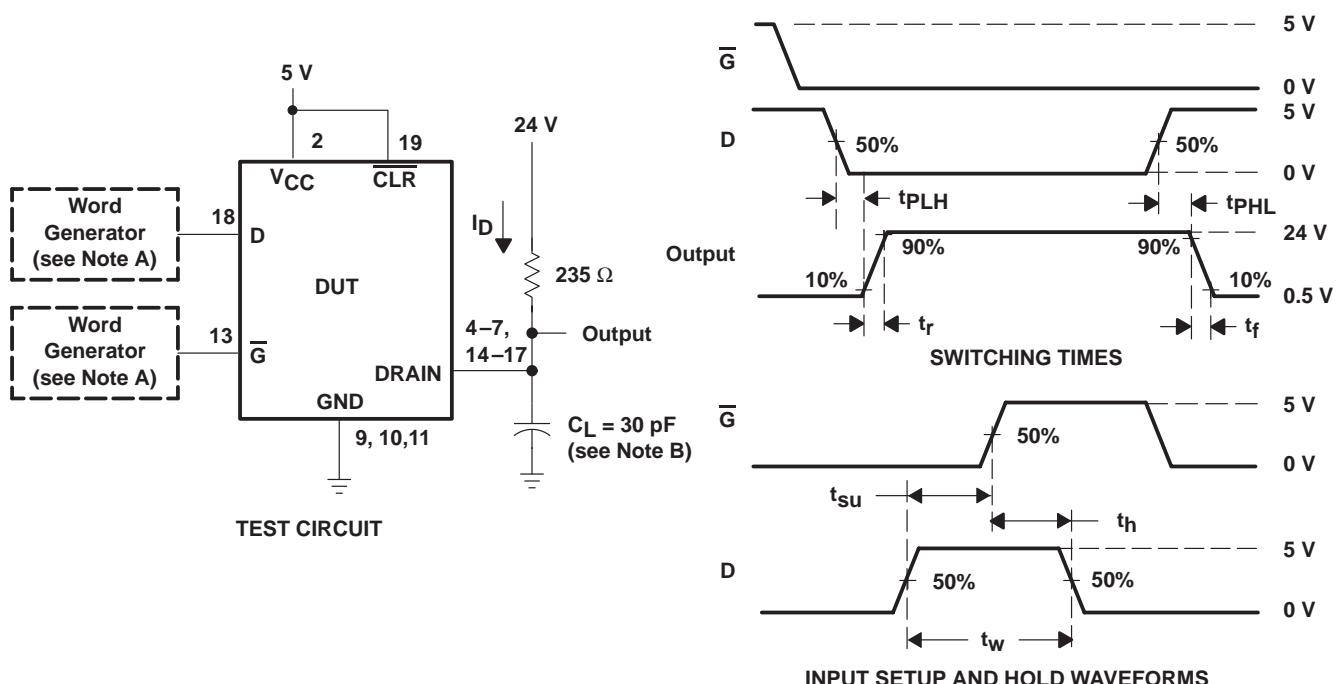


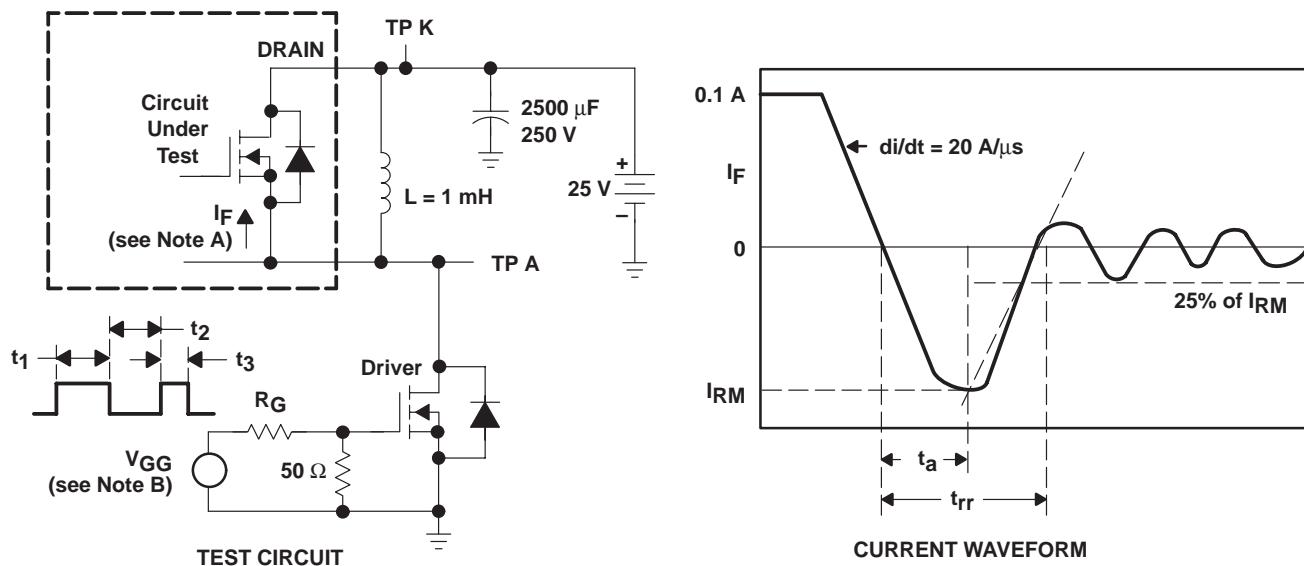
Figure 1. Resistive-Load Test Circuit and Voltage Waveforms

PARAMETER MEASUREMENT INFORMATION



NOTES: A. The word generator has the following characteristics:  $t_r \leq 10$  ns,  $t_f \leq 10$  ns,  $t_w = 300$  ns, pulsed repetition rate (PRR) = 5 kHz,  $Z_0 = 50$  Ω.  
B.  $C_L$  includes probe and jig capacitance.

Figure 2. Test Circuit, Switching Times, and Voltage Waveforms



NOTES: A. The DRAIN terminal under test is connected to the TP K test point. All other terminals are connected together and connected to the TP A test point.  
B. The  $V_{GG}$  amplitude and  $R_G$  are adjusted for  $di/dt = 20$  A/μs. A  $V_{GG}$  double-pulse train is used to set  $I_F = 0.1$  A, where  $t_1 = 10$  μs,  $t_2 = 7$  μs, and  $t_3 = 3$  μs.

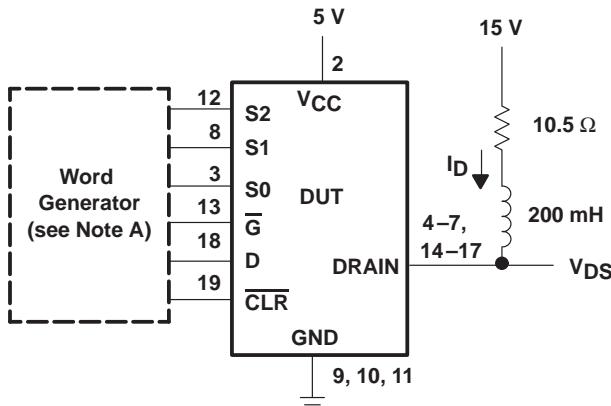
Figure 3. Reverse-Recovery-Current Test Circuit and Waveforms of Source-to-Drain Diode

# TPIC6B259

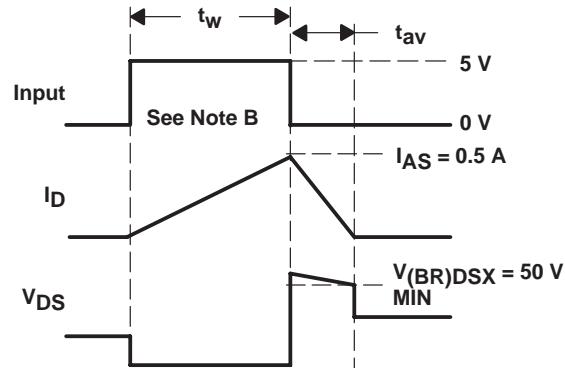
## POWER LOGIC 8-BIT ADDRESSABLE LATCH

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### PARAMETER MEASUREMENT INFORMATION



TEST CIRCUIT



VOLTAGE AND CURRENT WAVEFORMS

NOTES: A. The word generator has the following characteristics:  $t_r \leq 10$  ns,  $t_f \leq 10$  ns,  $Z_O = 50 \Omega$ .  
 B. Input pulse duration,  $t_W$ , is increased until peak current  $I_{AS} = 0.5$  A.  
 Energy test level is defined as  $E_{AS} = I_{AS} \times V_{(BR)DSX} \times t_{av}/2 = 30$  mJ.

Figure 4. Single-Pulse Avalanche Energy Test Circuit and Waveforms

### TYPICAL CHARACTERISTICS

PEAK AVALANCHE CURRENT  
VS  
TIME DURATION OF AVALANCHE

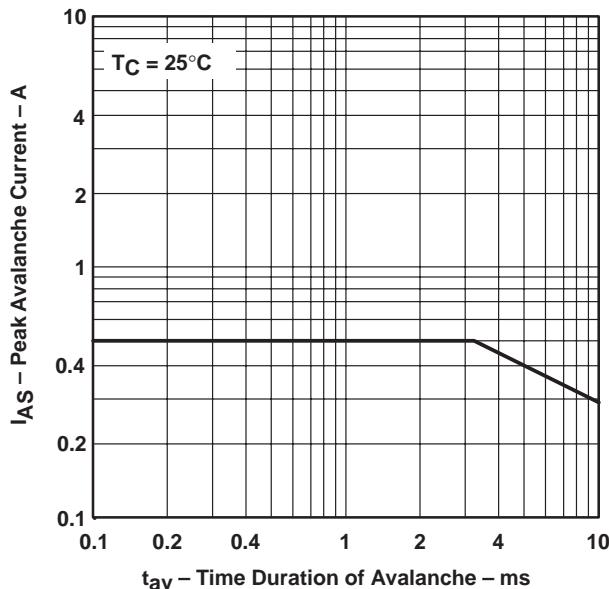
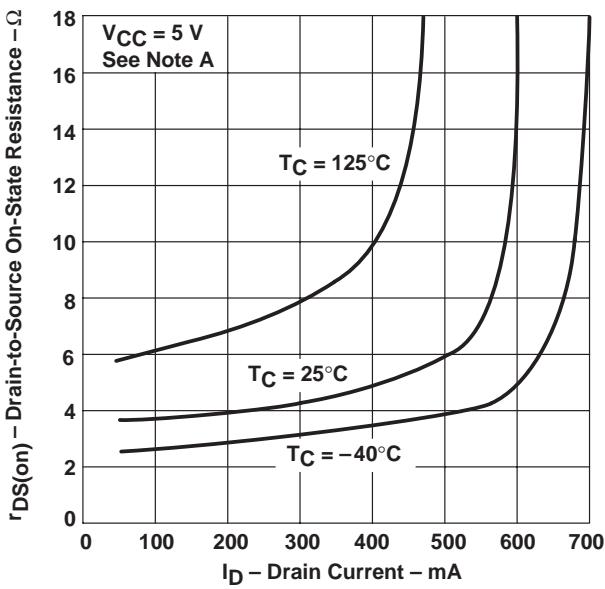


Figure 5

DRAIN-TO-SOURCE ON-STATE RESISTANCE  
VS  
DRAIN CURRENT



NOTE C: Technique should limit  $T_J - T_C$  to 10°C maximum.

Figure 6

TYPICAL CHARACTERISTICS

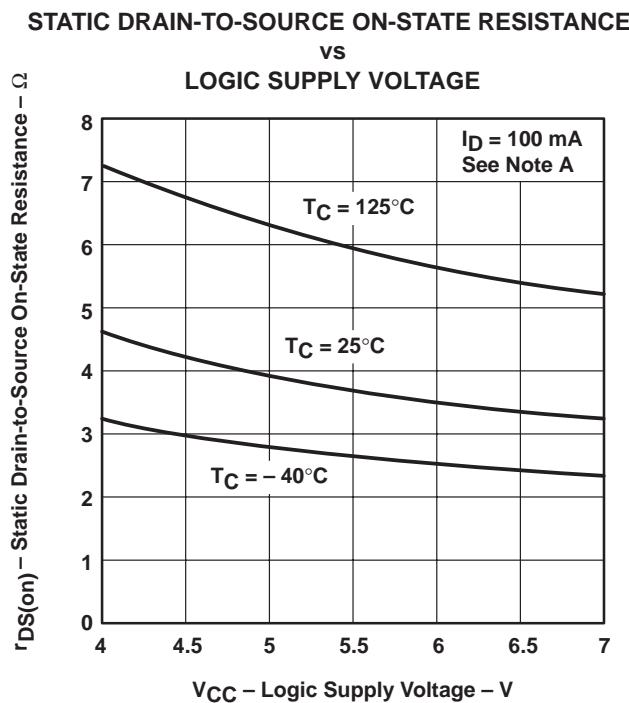


Figure 7

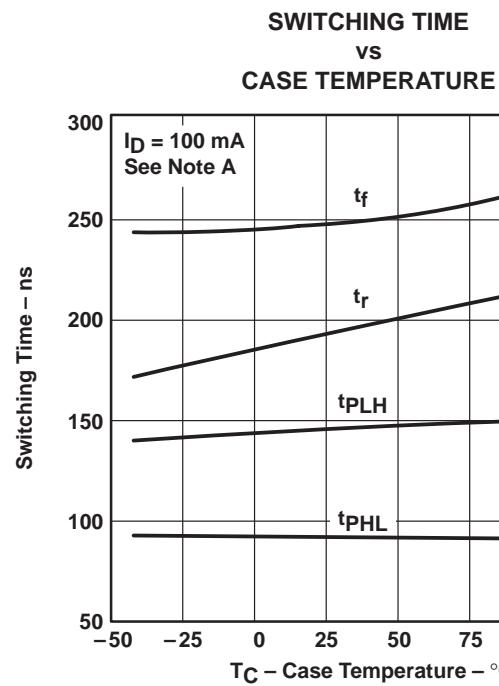


Figure 8

NOTE D: Technique should limit  $T_J - T_C$  to  $10^\circ\text{C}$  maximum.

# TPIC6B259

## POWER LOGIC 8-BIT ADDRESSABLE LATCH

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### THERMAL INFORMATION

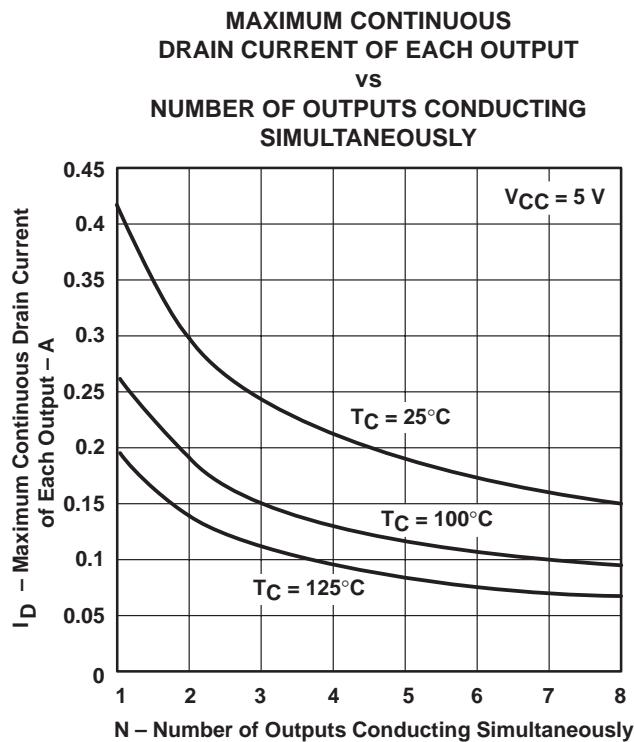


Figure 9

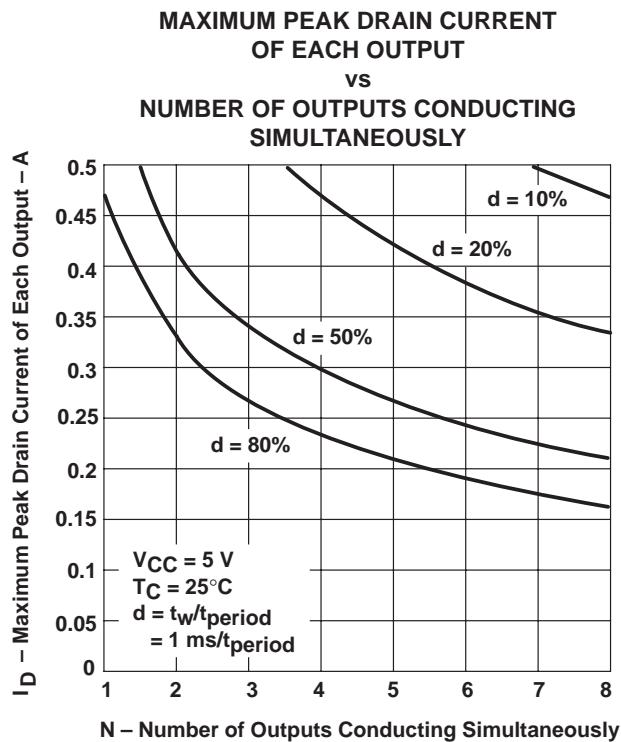


Figure 10

**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)
TPIC6B259DW	Active	Production	SOIC (DW)   20	25   TUBE	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 125	TPIC6B259
TPIC6B259DW.A	Active	Production	SOIC (DW)   20	25   TUBE	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 125	TPIC6B259
TPIC6B259DWG4	Active	Production	SOIC (DW)   20	25   TUBE	Yes	NIPDAU	Level-1-260C-UNLIM	-	TPIC6B259
TPIC6B259DWG4.A	Active	Production	SOIC (DW)   20	25   TUBE	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 125	TPIC6B259
TPIC6B259DWR	Active	Production	SOIC (DW)   20	2000   LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 125	TPIC6B259
TPIC6B259DWR.A	Active	Production	SOIC (DW)   20	2000   LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 125	TPIC6B259
TPIC6B259DWRG4	Active	Production	SOIC (DW)   20	2000   LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-	TPIC6B259
TPIC6B259DWRG4.A	Active	Production	SOIC (DW)   20	2000   LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 125	TPIC6B259
TPIC6B259N	Active	Production	PDIP (N)   20	20   TUBE	Yes	NIPDAU	N/A for Pkg Type	-40 to 125	TPIC6B259N
TPIC6B259N.A	Active	Production	PDIP (N)   20	20   TUBE	Yes	NIPDAU	N/A for Pkg Type	-40 to 125	TPIC6B259N

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

<sup>(2)</sup> **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.

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

<sup>(4)</sup> **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.

<sup>(5)</sup> **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.

<sup>(6)</sup> **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.

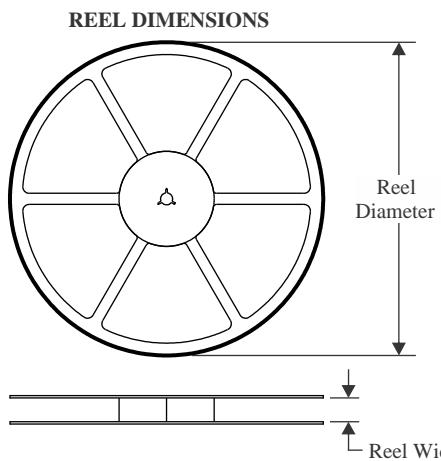
Multiple part markings will be inside parentheses. Only one part marking contained in parentheses and separated by a "-" will appear on a part. If a line is indented then it is a continuation of the previous line and the two combined represent the entire part marking for that device.

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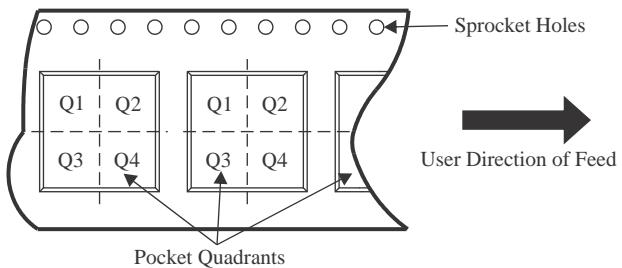
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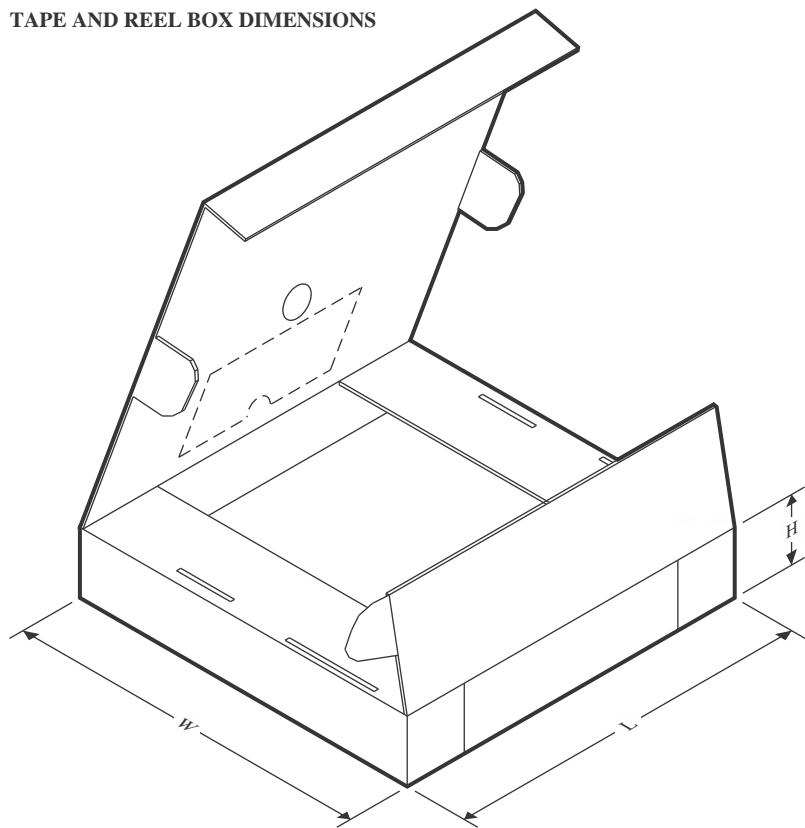
**TAPE AND REEL INFORMATION**


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**


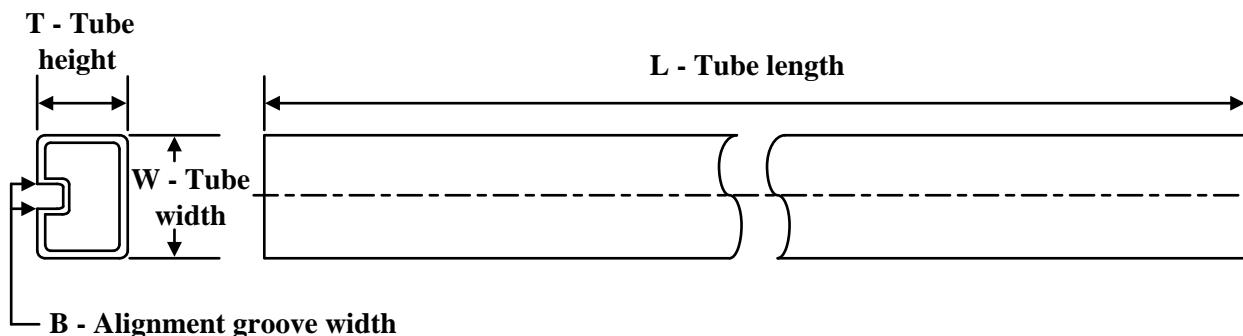
\*All dimensions are nominal

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
TPIC6B259DWR	SOIC	DW	20	2000	330.0	24.4	10.8	13.3	2.7	12.0	24.0	Q1
TPIC6B259DWG4	SOIC	DW	20	2000	330.0	24.4	10.8	13.3	2.7	12.0	24.0	Q1

**TAPE AND REEL BOX DIMENSIONS**


\*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
TPIC6B259DWR	SOIC	DW	20	2000	350.0	350.0	43.0
TPIC6B259DWRG4	SOIC	DW	20	2000	350.0	350.0	43.0

**TUBE**


\*All dimensions are nominal

Device	Package Name	Package Type	Pins	SPQ	L (mm)	W (mm)	T ( $\mu$ m)	B (mm)
TPIC6B259DW	DW	SOIC	20	25	506.98	12.7	4826	6.6
TPIC6B259DW.A	DW	SOIC	20	25	506.98	12.7	4826	6.6
TPIC6B259DWG4	DW	SOIC	20	25	506.98	12.7	4826	6.6
TPIC6B259DWG4.A	DW	SOIC	20	25	506.98	12.7	4826	6.6
TPIC6B259N	N	PDIP	20	20	506	13.97	11230	4.32
TPIC6B259N.A	N	PDIP	20	20	506	13.97	11230	4.32

## N (R-PDIP-T\*\*)

16 PINS SHOWN

## PLASTIC DUAL-IN-LINE PACKAGE



NOTES: A. All linear dimensions are in inches (millimeters).  
 B. This drawing is subject to change without notice.

△ Falls within JEDEC MS-001, except 18 and 20 pin minimum body length (Dim A).

△ The 20 pin end lead shoulder width is a vendor option, either half or full width.

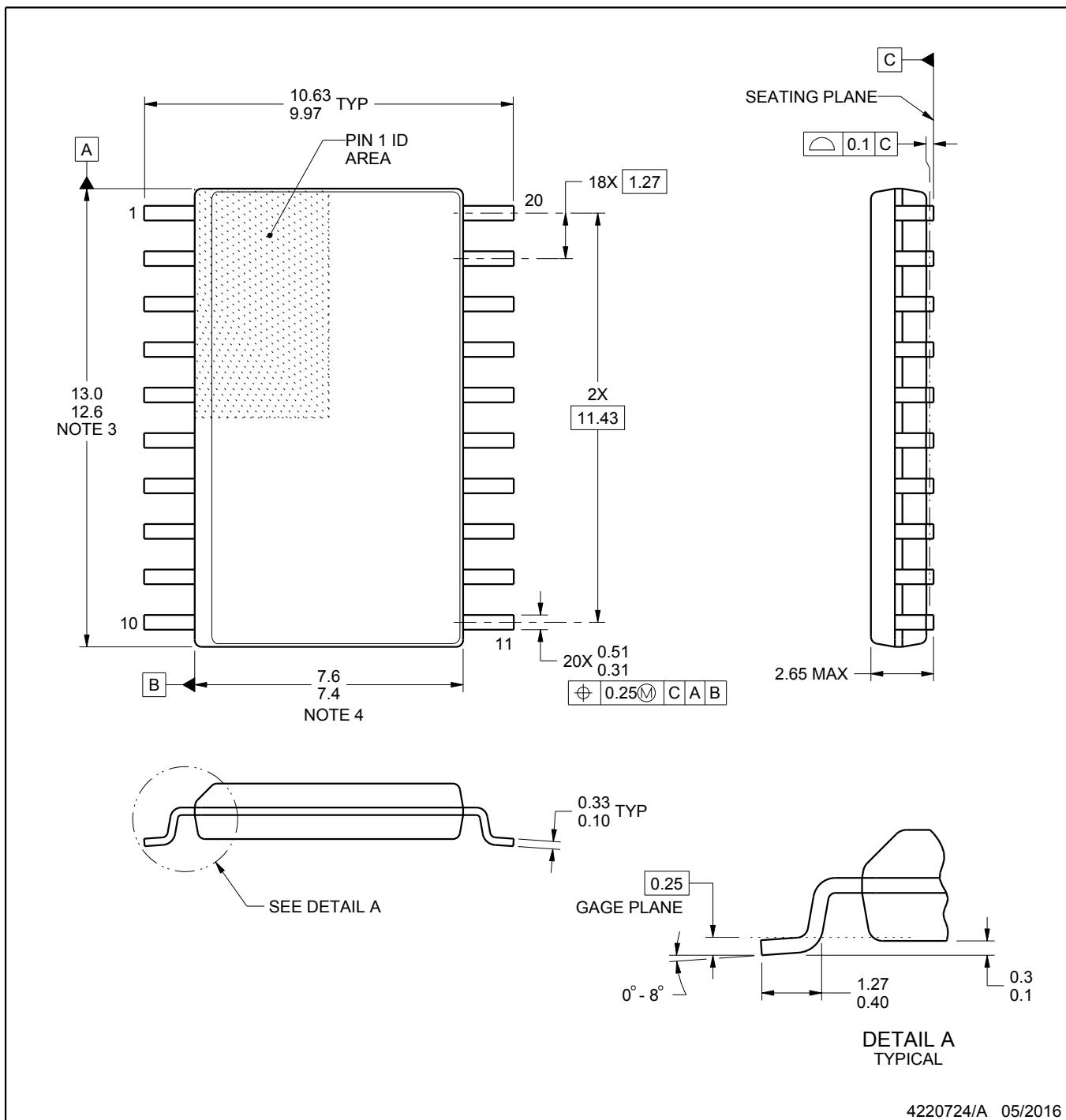
# PACKAGE OUTLINE

DW0020A



SOIC - 2.65 mm max height

SOIC



## NOTES:

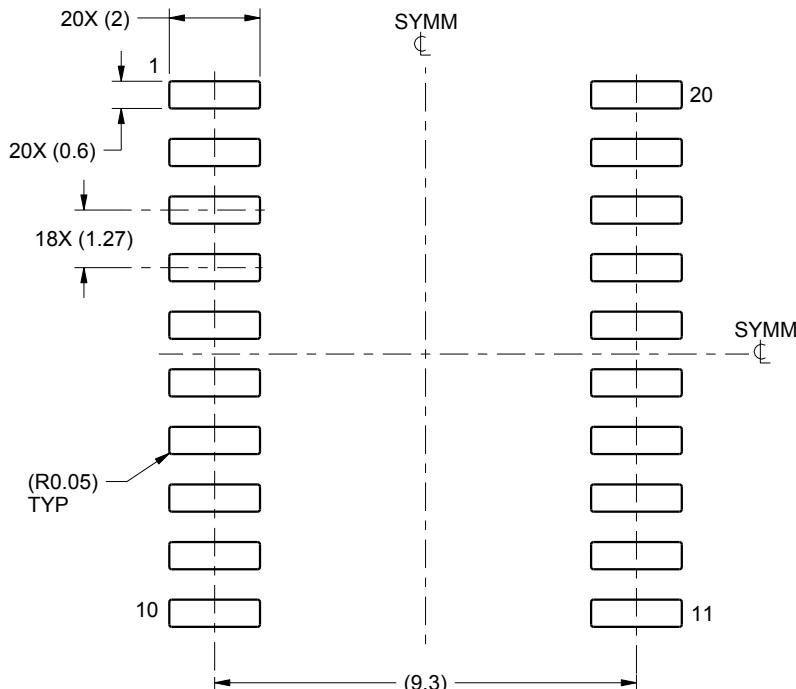
1. All linear dimensions are in millimeters. Dimensions in parenthesis are for reference only. Dimensioning and tolerancing per ASME Y14.5M.
2. This drawing is subject to change without notice.
3. This dimension does not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or gate burrs shall not exceed 0.15 mm per side.
4. This dimension does not include interlead flash. Interlead flash shall not exceed 0.43 mm per side.
5. Reference JEDEC registration MS-013.

# EXAMPLE BOARD LAYOUT

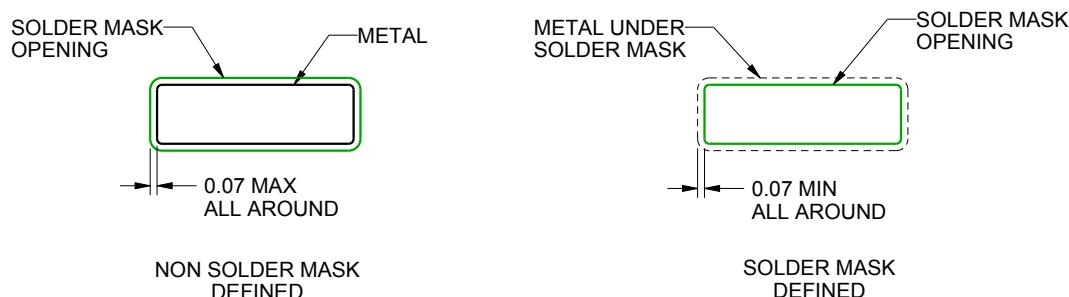
DW0020A

SOIC - 2.65 mm max height

SOIC



LAND PATTERN EXAMPLE  
SCALE:6X



SOLDER MASK DETAILS

4220724/A 05/2016

NOTES: (continued)

6. Publication IPC-7351 may have alternate designs.

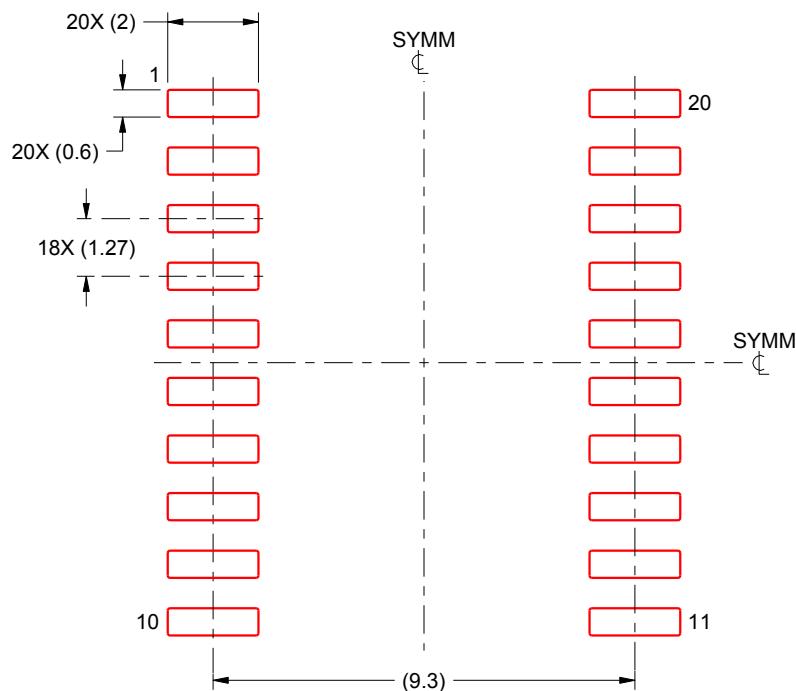
7. Solder mask tolerances between and around signal pads can vary based on board fabrication site.

# EXAMPLE STENCIL DESIGN

DW0020A

SOIC - 2.65 mm max height

SOIC



SOLDER PASTE EXAMPLE  
BASED ON 0.125 mm THICK STENCIL  
SCALE:6X

4220724/A 05/2016

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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