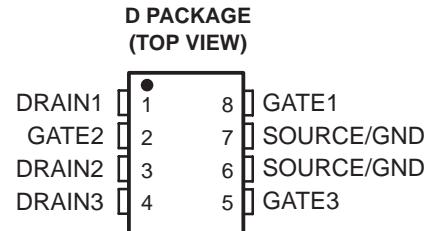


- Low $r_{DS(on)}$ 0.6 Ω Typ
- High-Voltage Outputs 60 V
- Pulsed Current 2.25 A Per Channel
- Fast Commutation Speed
- Direct Logic-Level Interface

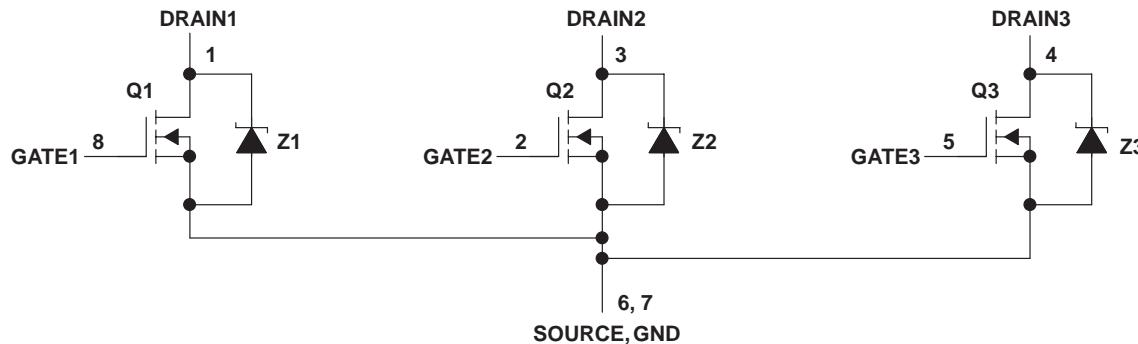


description

The TPIC2322L is a monolithic logic-level power DMOS array that consists of three electrically isolated N-channel enhancement-mode DMOS transistors configured with a common source and open drains.

The TPIC2322L is offered in a standard eight-pin small-outline surface-mount (D) package and is characterized for operation over the case temperature range of -40°C to 125°C .

schematic



absolute maximum ratings over operating case temperature range (unless otherwise noted)[†]

Drain-to-source voltage, V_{DS}	60 V
Gate-to-GND voltage	100 V
Drain-to-GND voltage	100 V
Gate-to-source voltage, V_{GS}	± 20 V
Continuous drain current, each output, all outputs on, $T_C = 25^{\circ}\text{C}$	0.75 A
Continuous source-to-drain diode current, $T_C = 25^{\circ}\text{C}$	0.75 A
Pulsed drain current, each output, I_{max} , $T_C = 25^{\circ}\text{C}$ (see Note 1 and Figure 15)	2.25 A
Single-pulse avalanche energy, E_{AS} , $T_C = 25^{\circ}\text{C}$ (see Figure 4)	30.4 mJ
Continuous total power dissipation at (or below) $T_C = 25^{\circ}\text{C}$ (see Figure 15)	0.95 W
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

[†] 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.

NOTE 1: Pulse duration = 10 ms and duty cycle = 2%.

TPIC2322L

3-CHANNEL COMMON-SOURCE LOGIC-LEVEL POWER DMOS ARRAY

SLIS036A – JUNE 1994 – REVISED OCTOBER 1994

electrical characteristics, $T_C = 25^\circ\text{C}$ (unless otherwise noted)

PARAMETER	TEST CONDITIONS	MIN	TYP	MAX	UNIT
$V_{(\text{BR})\text{DSX}}$ Drain-to-source breakdown voltage	$I_D = 250 \mu\text{A}$, $V_{GS} = 0$	60			V
$V_{GS(\text{th})}$ Gate-to-source threshold voltage	$I_D = 1 \text{ mA}$, $V_{DS} = V_{GS}$, See Figure 5	1.5	1.85	2.2	V
$V_{(\text{BR})}$ Reverse drain to GND breakdown voltage	Drain to GND current = $250 \mu\text{A}$	100			V
$V_{DS(\text{on})}$ Drain-to-source on-state voltage	$I_D = 0.75 \text{ A}$, $V_{GS} = 5 \text{ V}$, See Notes 2 and 3		0.45	0.53	V
$V_{F(\text{SD})}$ Forward on-state voltage, source-to-drain	$I_S = 0.75 \text{ A}$, $V_{GS} = 0$ See Notes 2 and 3 and Figure 12		0.85	1	V
I_{DSS} Zero-gate-voltage drain current	$V_{DS} = 48 \text{ V}$, $V_{GS} = 0$	$T_C = 25^\circ\text{C}$	0.05	1	μA
		$T_C = 125^\circ\text{C}$	0.5	10	
I_{GSSF} Forward gate current, drain short circuited to source	$V_{GS} = 16 \text{ V}$, $V_{DS} = 0$	10	100		nA
I_{GSSR} Reverse gate current, drain short circuited to source	$V_{SG} = 16 \text{ V}$, $V_{DS} = 0$	10	100		nA
I_{lk} Leakage current, drain-to-GND	$V_{DGND} = 48 \text{ V}$	$T_C = 25^\circ\text{C}$	0.05	1	μA
		$T_C = 125^\circ\text{C}$	0.5	10	
$r_{DS(\text{on})}$ Static drain-to-source on-state resistance	$V_{GS} = 5 \text{ V}$, $I_D = 0.75 \text{ A}$, See Notes 2 and 3 and Figures 6 and 7	$T_C = 25^\circ\text{C}$	0.6	0.7	Ω
		$T_C = 125^\circ\text{C}$	0.94	1	
g_{fs} Forward transconductance	$V_{DS} = 15 \text{ V}$, See Notes 2 and 3 and Figure 9	$I_D = 0.5 \text{ A}$,	0.75	0.9	S
C_{iss} Short-circuit input capacitance, common source	$V_{DS} = 25 \text{ V}$, $f = 1 \text{ MHz}$, See Figure 11		115	145	pF
C_{oss} Short-circuit output capacitance, common source			60	75	
C_{rss} Short-circuit reverse transfer capacitance, common source			30	40	

NOTES: 2. Technique should limit $T_J - T_C$ to 10°C maximum.
3. These parameters are measured with voltage-sensing contacts separate from the current-carrying contacts.

source-to-drain diode characteristics, $T_C = 25^\circ\text{C}$ (see schematic diagram)

PARAMETER	TEST CONDITIONS	MIN	TYP	MAX	UNIT
t_{rr} Reverse-recovery time	$I_F = 0.375 \text{ A}$, $V_{DS} = 48 \text{ V}$, $di/dt = 100 \text{ A}/\mu\text{s}$, See Figures 1 and 14	85			ns
Q_{RR} Total diode charge		0.19			μC

resistive-load switching characteristics, $T_C = 25^\circ\text{C}$

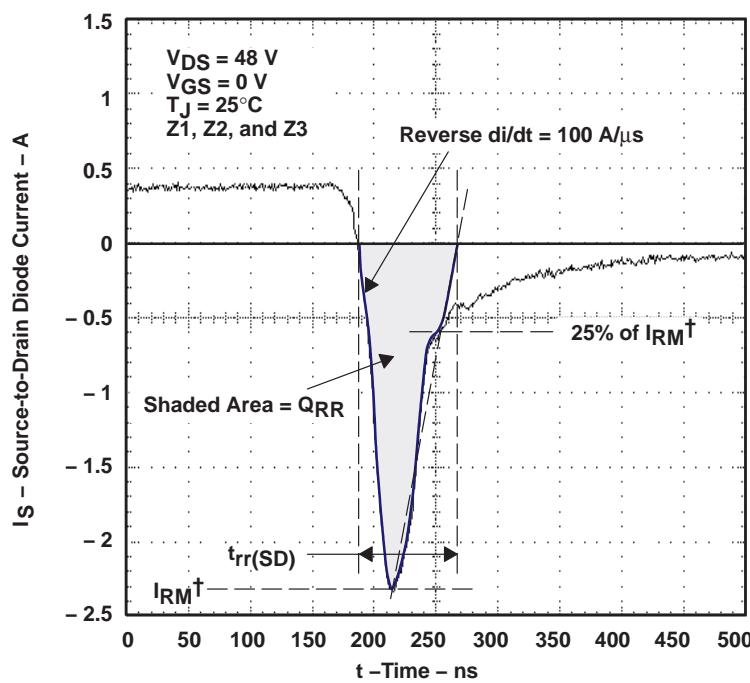
PARAMETER	TEST CONDITIONS	MIN	TYP	MAX	UNIT
$t_{d(on)}$	$V_{DD} = 25 \text{ V}$, $R_L = 67 \Omega$, $t_{en} = 10 \text{ ns}$, $t_{dis} = 10 \text{ ns}$, See Figure 2	21	42		ns
$t_{d(off)}$		26	52		
t_r		14	28		
t_f		13	26		
Q_g	$V_{DS} = 48 \text{ V}$, $I_D = 0.375 \text{ A}$, $V_{GS} = 5 \text{ V}$, See Figure 3	1.8	2.3		nC
$Q_{gs(th)}$		0.4	0.5		
Q_{gd}		1.1	1.4		
L_D		5			nH
L_S		5			
R_g		0.25			Ω

thermal resistance

PARAMETER	TEST CONDITIONS	MIN	TYP	MAX	UNIT
$R_{\theta JA}$	Junction-to-ambient thermal resistance, See Note 4			130	$^\circ\text{C/W}$
$R_{\theta JP}$				44	$^\circ\text{C/W}$

NOTE 4: Package mounted on an FR4 printed-circuit board with no heat sink.

PARAMETER MEASUREMENT INFORMATION



$\dagger I_{RM}^\dagger$ = maximum recovery current

Figure 1. Reverse-Recovery-Current Waveform of Source-to-Drain Diode

TPIC2322L

3-CHANNEL COMMON-SOURCE LOGIC-LEVEL POWER DMOS ARRAY

SLIS036A – JUNE 1994 – REVISED OCTOBER 1994

PARAMETER MEASUREMENT INFORMATION

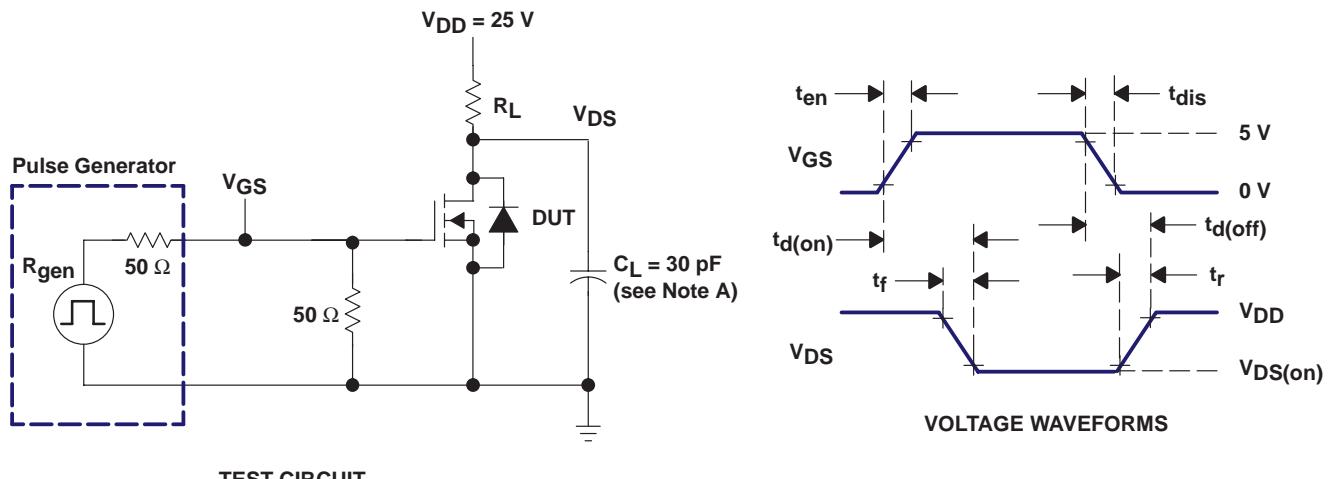


Figure 2. Resistive-Switching Test Circuit and Voltage Waveforms

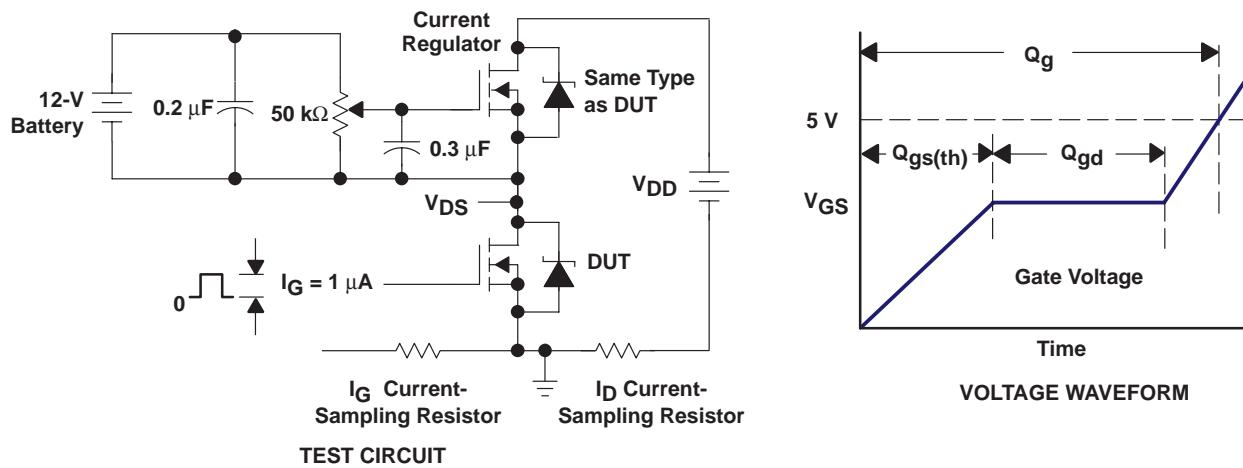
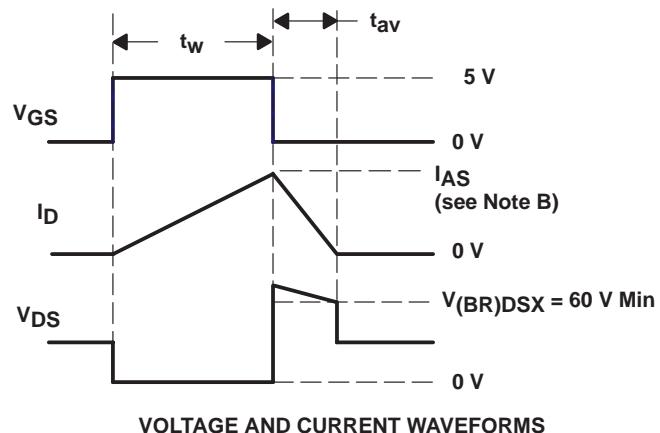
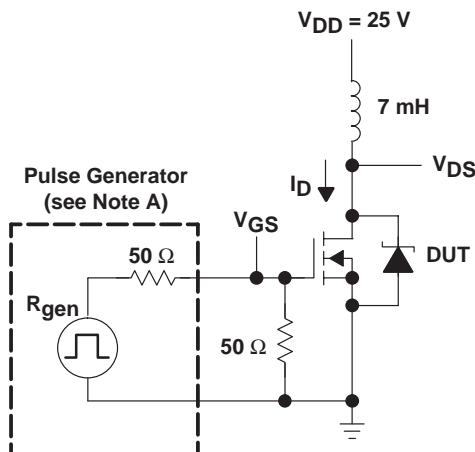


Figure 3. Gate-Charge Test Circuit and Voltage Waveform

PARAMETER MEASUREMENT INFORMATION

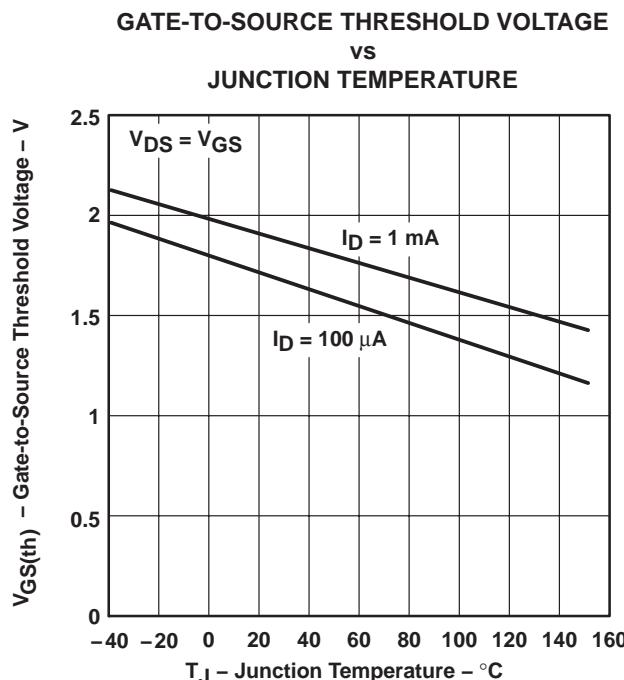


NOTES: A. The pulse generator has the following characteristics: $t_f \leq 10$ ns, $t_r \leq 10$ ns, $Z_O = 50 \Omega$.
 B. Input pulse duration (t_W) is increased until peak current $I_{AS} = 2.25$ A.

$$\text{Energy test level is defined as } E_{AS} = \frac{I_{AS} \times V_{(BR)DSX} \times t_{av}}{2} = 30.4 \text{ mJ.}$$

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

TYPICAL CHARACTERISTICS



**STATIC DRAIN-TO-SOURCE ON-STATE RESISTANCE
VS
JUNCTION TEMPERATURE**

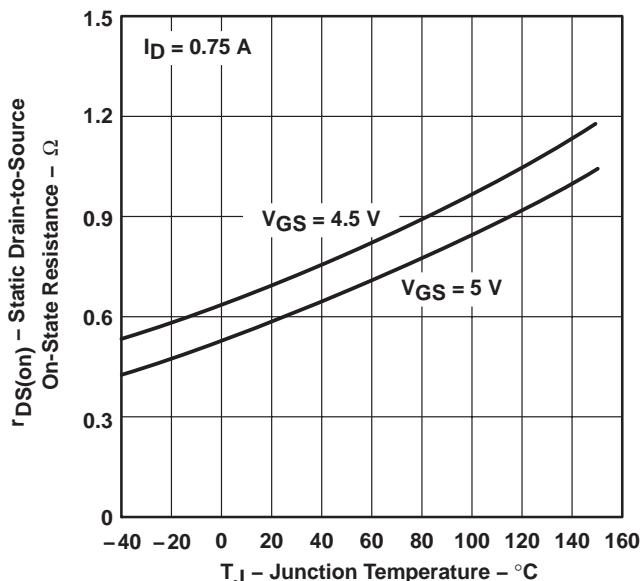


Figure 5

Figure 6

TPIC2322L

3-CHANNEL COMMON-SOURCE LOGIC-LEVEL POWER DMOS ARRAY

SLIS036A – JUNE 1994 – REVISED OCTOBER 1994

TYPICAL CHARACTERISTICS

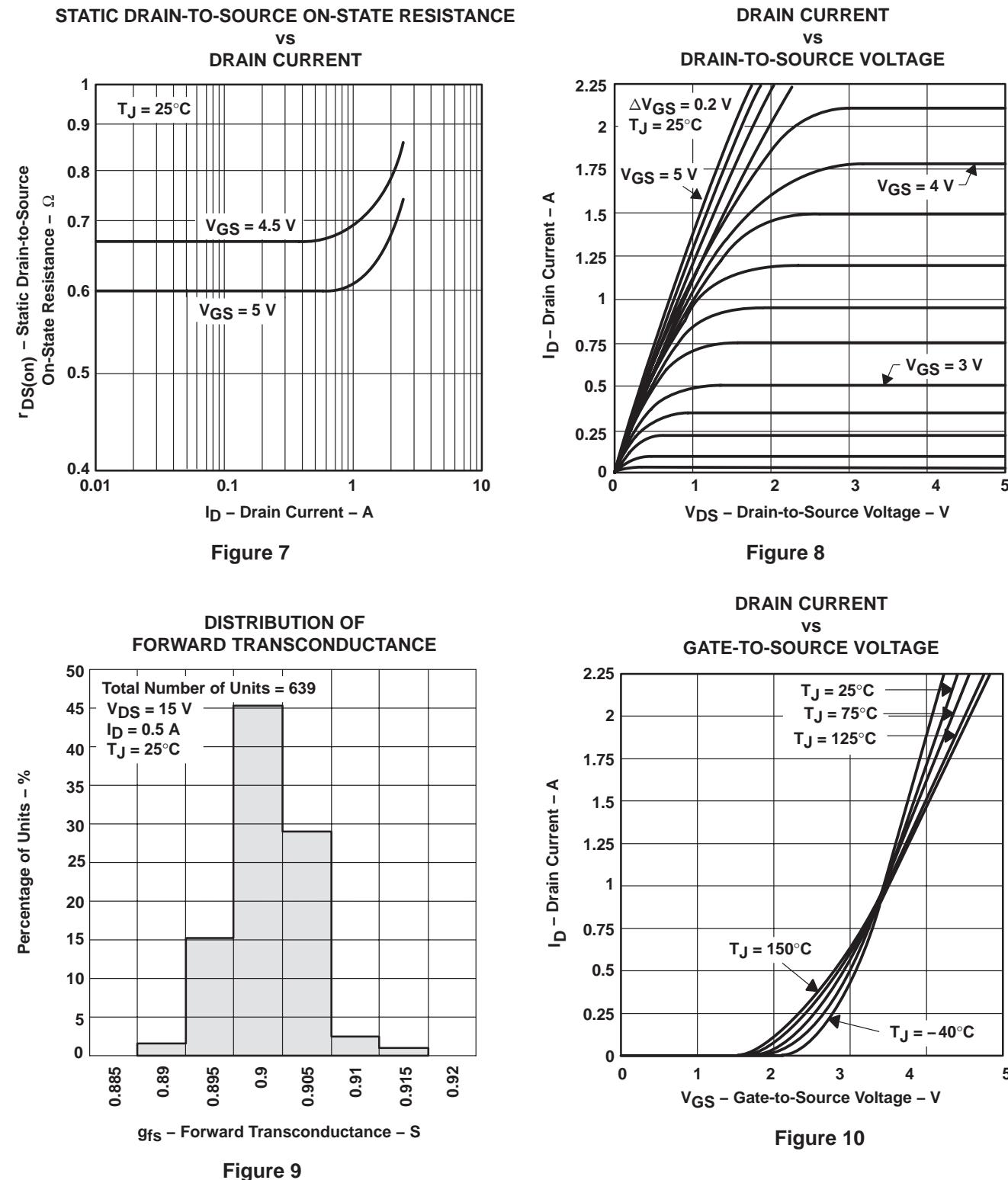


Figure 7

Figure 8

Figure 9

Figure 10

TYPICAL CHARACTERISTICS

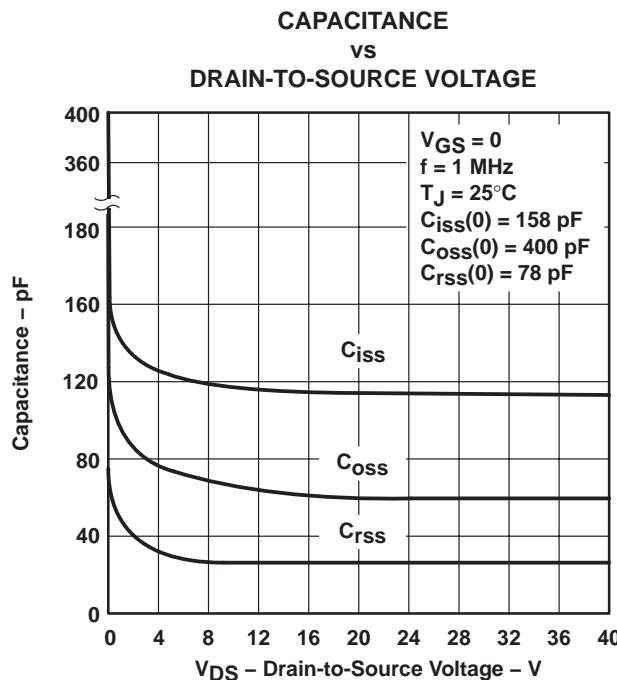


Figure 11

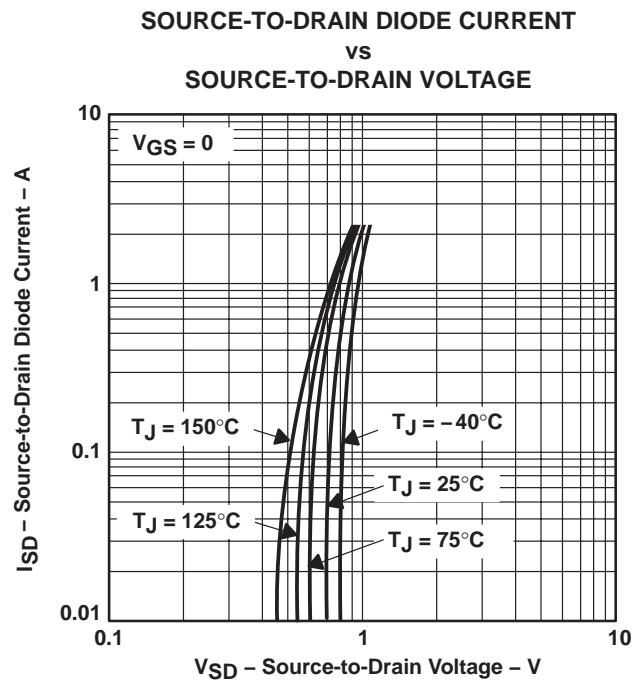


Figure 12

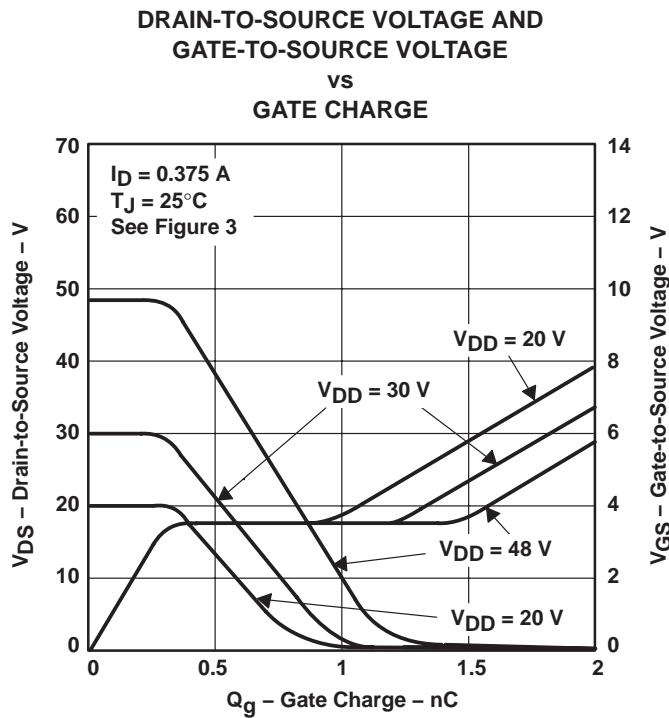


Figure 13

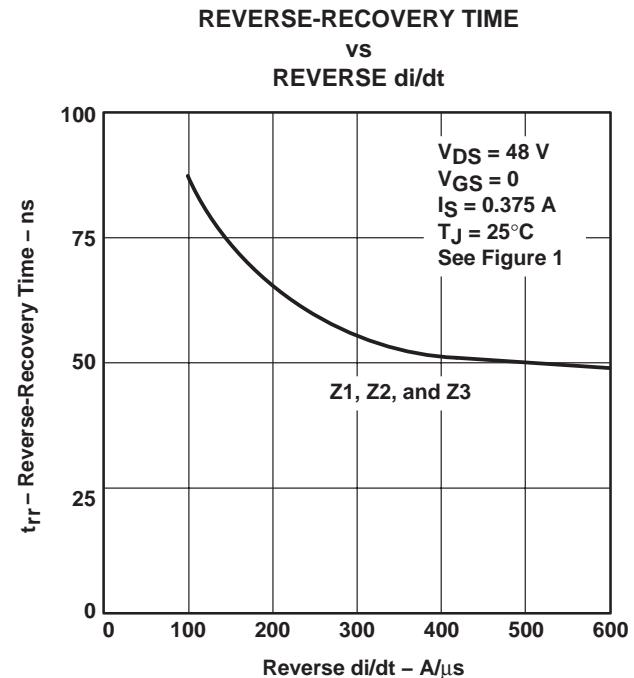


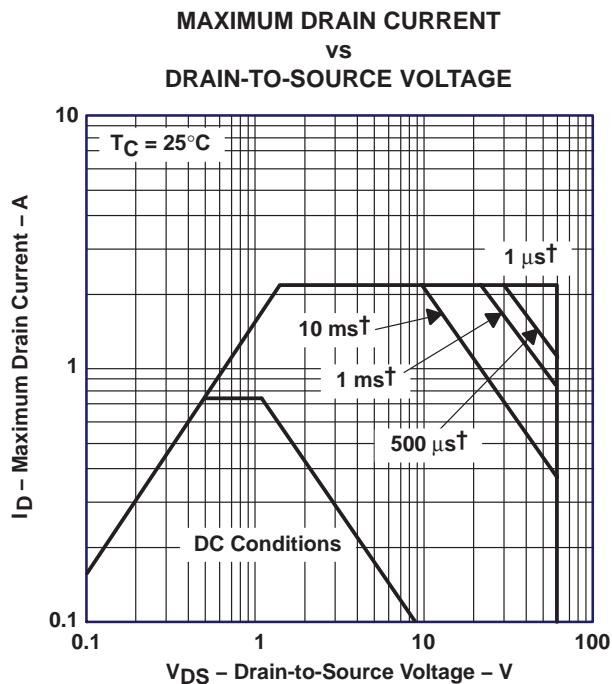
Figure 14

TPIC2322L

3-CHANNEL COMMON-SOURCE LOGIC-LEVEL POWER DMOS ARRAY

SLIS036A – JUNE 1994 – REVISED OCTOBER 1994

THERMAL INFORMATION



† Less than 2% duty cycle

Figure 15

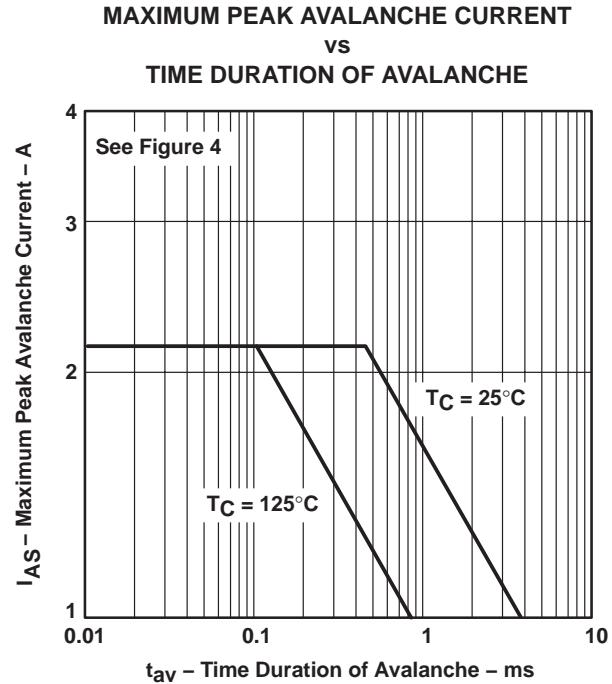
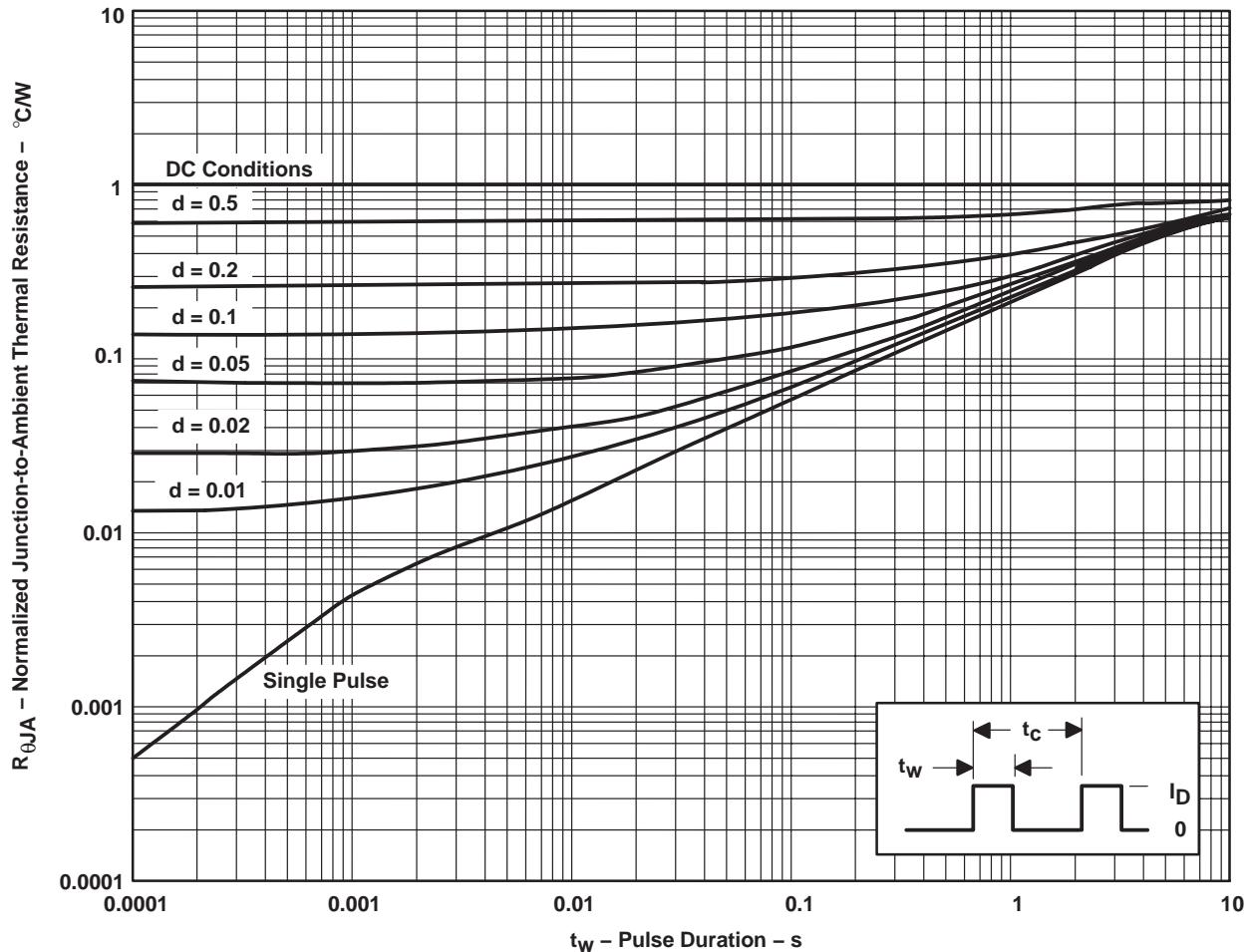


Figure 16

THERMAL INFORMATION

D PACKAGE[†]
NORMALIZED JUNCTION-TO-AMBIENT THERMAL RESISTANCE
VS
PULSE DURATION



[†] Device mounted on FR4 printed-circuit board with no heat sink.

NOTES: $Z_{\theta A}(t) = r(t) R_{\theta JA}$

t_W = pulse duration

t_C = cycle time

d = duty cycle = t_W/t_C

Figure 17

PACKAGING INFORMATION

Orderable Device	Status ⁽¹⁾	Package Type	Package Drawing	Pins	Package Qty	Eco Plan ⁽²⁾	Lead/Ball Finish	MSL Peak Temp ⁽³⁾
TPIC2322LD	OBsolete	SOIC	D	8		TBD	Call TI	Call TI

⁽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⁾ Eco Plan - The planned eco-friendly classification: Pb-Free (RoHS) or Green (RoHS & no Sb/Br) - please check <http://www.ti.com/productcontent> for the latest availability information and additional product content details.

TBD: The Pb-Free/Green conversion plan has not been defined.

Pb-Free (RoHS): TI's terms "Lead-Free" or "Pb-Free" mean semiconductor products that are compatible with the current RoHS requirements for all 6 substances, including the requirement that lead not exceed 0.1% by weight in homogeneous materials. Where designed to be soldered at high temperatures, TI Pb-Free products are suitable for use in specified lead-free processes.

Green (RoHS & no Sb/Br): TI defines "Green" to mean Pb-Free (RoHS compatible), and free of Bromine (Br) and Antimony (Sb) based flame retardants (Br or Sb do not exceed 0.1% by weight in homogeneous material)

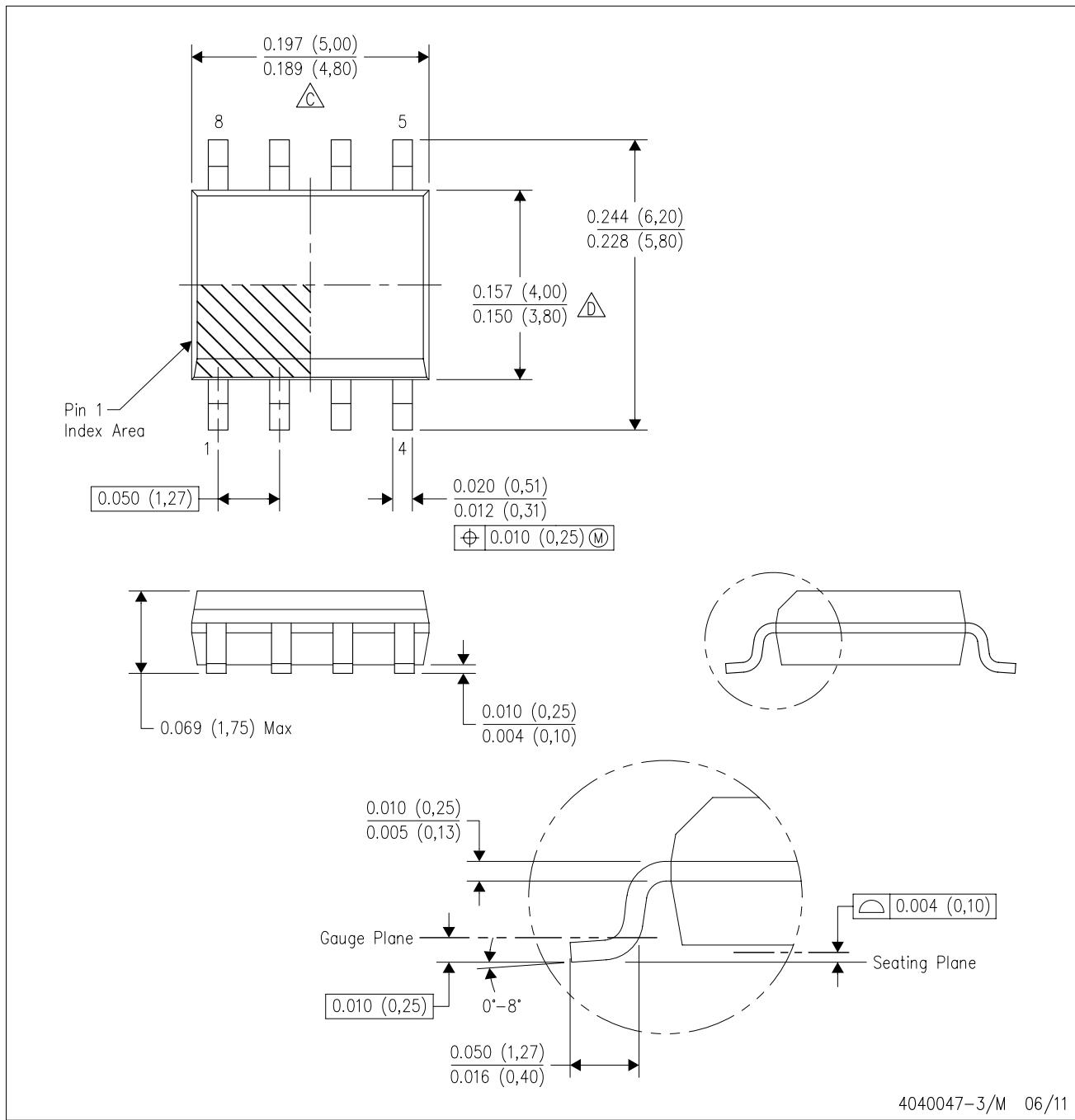
⁽³⁾ MSL, Peak Temp. -- The Moisture Sensitivity Level rating according to the JEDEC industry standard classifications, and peak solder temperature.

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D (R-PDSO-G8)

PLASTIC SMALL OUTLINE



NOTES: A. All linear dimensions are in inches (millimeters).

B. This drawing is subject to change without notice.

△C Body length does not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or gate burrs shall not exceed 0.006 (0.15) each side.

△D Body width does not include interlead flash. Interlead flash shall not exceed 0.017 (0.43) each side.

E. Reference JEDEC MS-012 variation AA.

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