



**DMP4051LK3**

**40V P-CHANNEL ENHANCEMENT MODE MOSFET**

**Product Summary**

$V_{(BR)DSS}$	$R_{DS(on)}$	$I_D$ $T_A = 25^\circ C$
-40V	51m $\Omega$ @ $V_{GS} = -10V$	-10.5A
	85m $\Omega$ @ $V_{GS} = -4.5V$	-8.4A

**Description and Applications**

This MOSFET has been designed to minimize the on-state resistance ( $R_{DS(on)}$ ) and yet maintain superior switching performance, making it ideal for high efficiency power management applications.

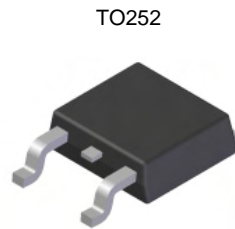
- Backlighting
- DC-DC Converters
- Power management functions

**Features and Benefits**

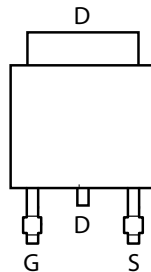
- 100% Unclamped Inductive Switch (UIS) test in production
- Low on-resistance
- Fast switching speed
- **“Green” component and RoHS compliant (Note 1)**
- **Qualified to AEC-Q101 Standards for High Reliability**

**Mechanical Data**

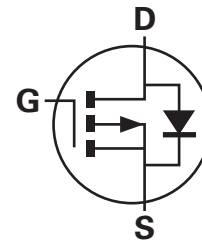
- Case: TO252
- Case Material: Molded Plastic, “Green” Molding Compound. UL Flammability Classification Rating 94V-0 (Note 1)
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminals: Matte Tin Finish annealed over Copper leadframe. Solderable per MIL-STD-202, Method 208
- Weight: 0.33 grams (approximate)



Top View



Top View  
Pin-Out



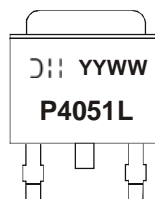
Equivalent Circuit

**Ordering Information** (Notes 1 & 2)

Product	Grade	Marking	Reel size (inches)	Tape width (mm)	Quantity per reel
DMP4051LK3-13	Commercial	P4051L	13	16	2,500
DMP4051LK3Q-13	Automotive	P4051L	13	16	2,500

- Notes:
1. Diodes, Inc. defines “Green” products as those which are RoHS compliant and contain no halogens or antimony compounds; further information about Diodes Inc.’s “Green” Policy can be found on our website. For packaging details, go to our website.
  2. Products with Q-suffix are automotive grade. Automotive products are electrical and thermal the same as the commercial, except where specified.

**Marking Information**



- ⎓ = Manufacturer’s Marking
- P4051L = Product Type Marking Code
- YYWW = Date Code Marking
- YY = Year (ex: 09 = 2009)
- WW = Week (01 - 53)

**Maximum Ratings** @ $T_A = 25^\circ\text{C}$  unless otherwise specified

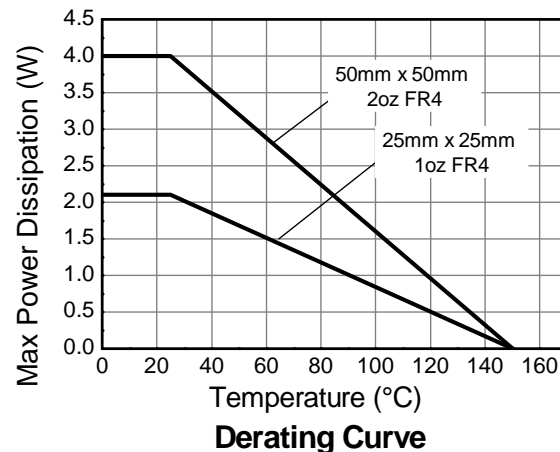
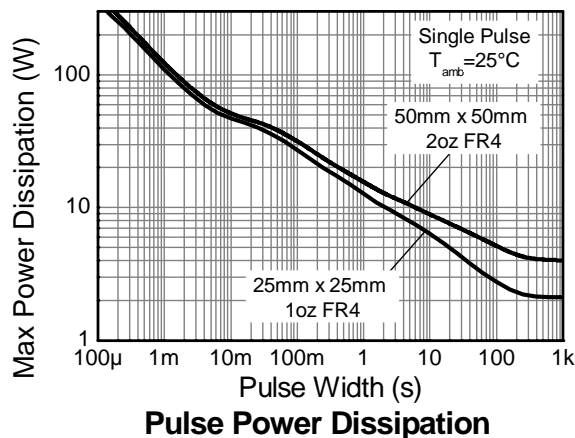
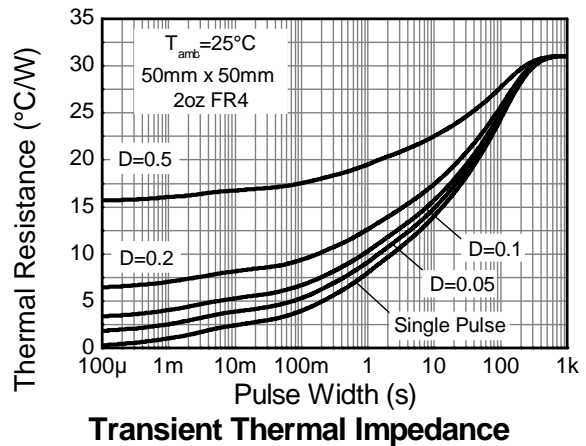
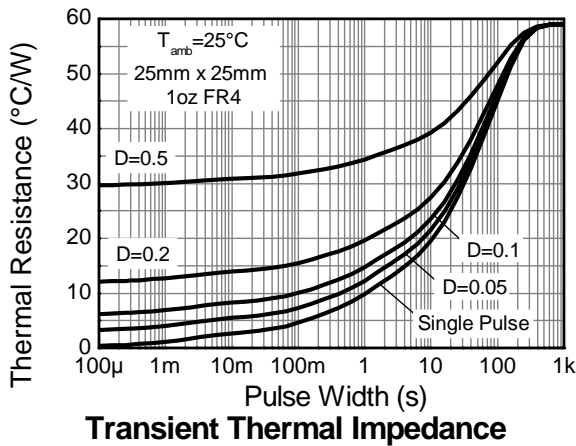
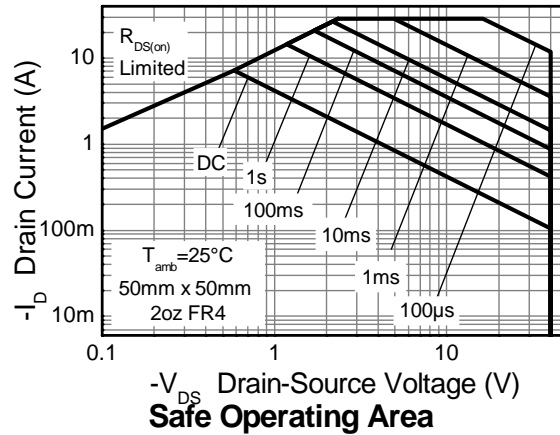
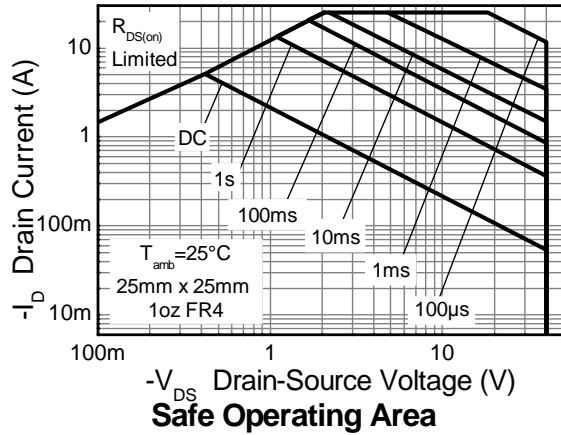
Characteristic			Symbol	Value	Unit
Drain-Source voltage			$V_{DSS}$	-40	V
Gate-Source voltage		(Note 3)	$V_{GS}$	$\pm 20$	V
Single Pulsed Avalanche Energy		(Note 9)	$E_{AS}$	50	mJ
Single Pulsed Avalanche Current		(Note 9)	$I_{AS}$	20.3	A
Continuous Drain current	$V_{GS} = 10\text{V}$	(Note 5)	$I_D$	-10.5	A
		$T_A = 70^\circ\text{C}$ (Note 5)		-8.40	
		(Note 4)		-7.2	
Pulsed Drain current	$V_{GS} = 10\text{V}$	(Note 6)	$I_{DM}$	-28.9	A
Continuous Source current (Body diode)		(Note 5)	$I_S$	-10.1	A
Pulsed Source current (Body diode)		(Note 5)	$I_{SM}$	-28.9	A

**Thermal Characteristics** @ $T_A = 25^\circ\text{C}$  unless otherwise specified

Characteristic		Symbol	Value	Unit
Power dissipation Linear derating factor	(Note 4)	$P_D$	4.18	W mW/ $^\circ\text{C}$
	(Note 5)		33.4	
	(Note 7)		8.9	
	(Note 7)		71.4	
Thermal Resistance, Junction to Ambient	(Note 4)	$R_{\theta JA}$	2.14	$^\circ\text{C/W}$
	(Note 5)		17.1	
	(Note 7)		29.9	
Thermal Resistance, Junction to Lead	(Note 8)	$R_{\theta JL}$	14.0	$^\circ\text{C/W}$
Operating and storage temperature range		$T_J, T_{STG}$	2.46	$^\circ\text{C}$
			-55 to 150	

- Notes:
- AEC-Q101  $V_{GS}$  maximum is  $\pm 16\text{V}$ .
  - For a device surface mounted on 50mm x 50mm x 1.6mm FR4 PCB with high coverage of single sided 2oz copper, in still air conditions; the device is measured when operating in a steady-state condition.
  - Same as note 4, except the device is measured at  $t \leq 10$  sec.
  - Same as note 4, except the device is pulsed with  $D = 0.02$  and pulse width 300 $\mu\text{s}$ . The pulse current is limited by the maximum junction temperature.
  - For a device surface mounted on 25mm x 25mm x 1.6mm FR4 PCB with high coverage of single sided 1oz copper, in still air conditions; the device is measured when operating in a steady-state condition.
  - Thermal resistance from junction to solder-point (at the end of the drain lead).
  - UIS in production with  $L = 100\mu\text{H}$ ,  $V_{DD} = -40\text{V}$ .

**Thermal Characteristics**

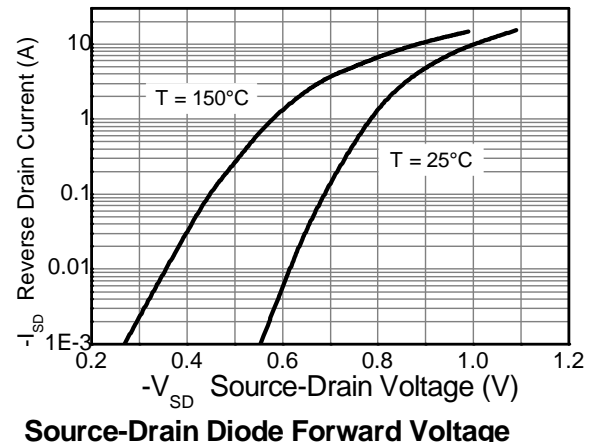
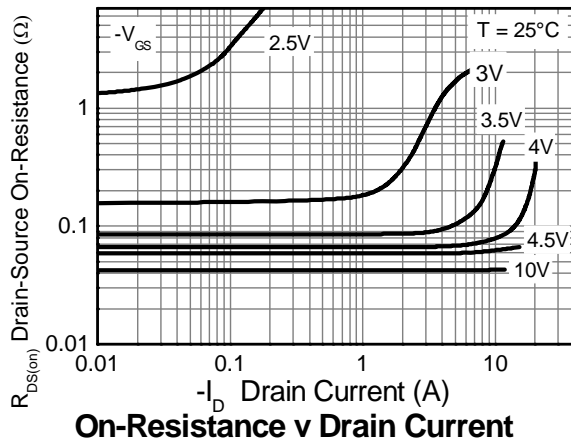
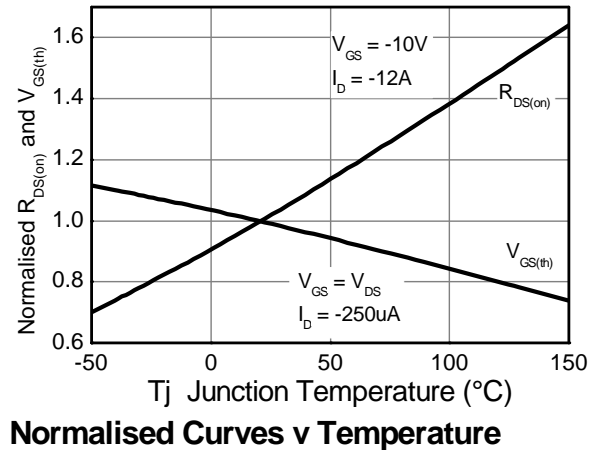
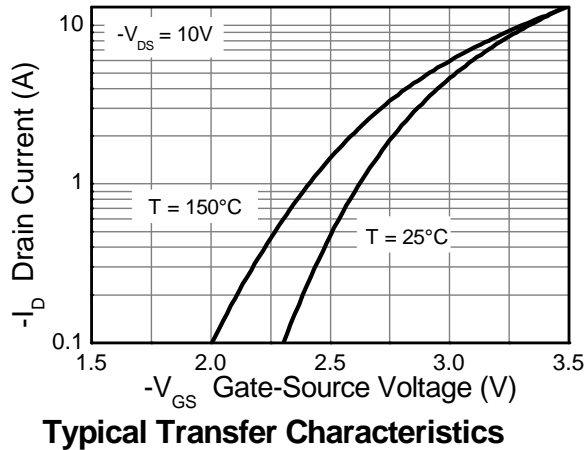
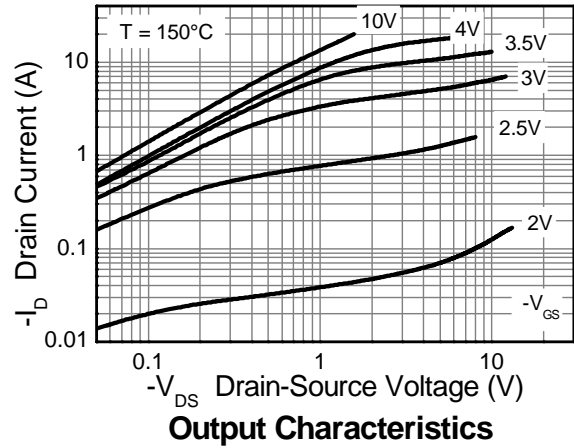
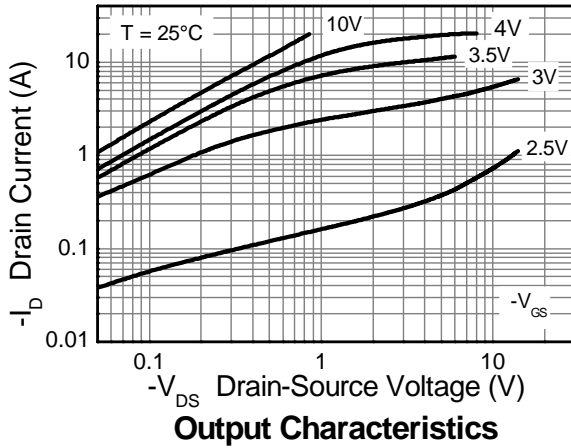


**Electrical Characteristics** @T<sub>A</sub> = 25°C unless otherwise specified

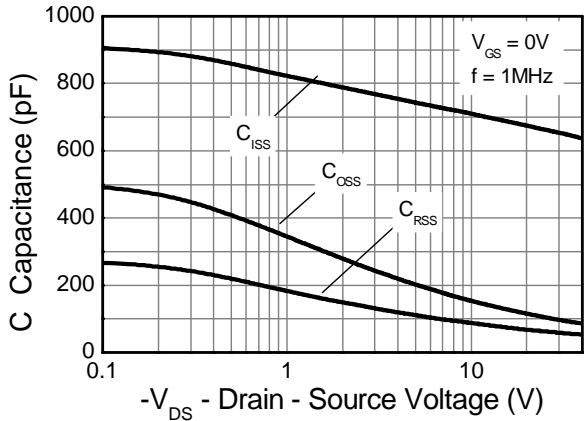
Characteristic	Symbol	Min	Typ	Max	Unit	Test Condition
<b>OFF CHARACTERISTICS</b>						
Drain-Source Breakdown Voltage	BV <sub>DSS</sub>	-40	—	—	V	I <sub>D</sub> = -250μA, V <sub>GS</sub> = 0V
Zero Gate Voltage Drain Current	I <sub>DSS</sub>	—	—	-0.5	μA	V <sub>DS</sub> = -40V, V <sub>GS</sub> = 0V
Gate-Source Leakage	I <sub>GSS</sub>	—	—	±100	nA	V <sub>GS</sub> = ±20V, V <sub>DS</sub> = 0V
<b>ON CHARACTERISTICS</b>						
Gate Threshold Voltage	V <sub>GS(th)</sub>	-1.0	—	-3.0	V	I <sub>D</sub> = -250μA, V <sub>DS</sub> = V <sub>GS</sub>
Static Drain-Source On-Resistance (Note 10)	R <sub>DS(on)</sub>	—	0.041	0.051	Ω	V <sub>GS</sub> = -10V, I <sub>D</sub> = -12A
			0.059	0.085		V <sub>GS</sub> = -4.5V, I <sub>D</sub> = -8A
Forward Transconductance (Notes 10 & 11)	g <sub>fs</sub>	—	16.6	—	S	V <sub>DS</sub> = -15V, I <sub>D</sub> = -12A
Diode Forward Voltage (Note 10)	V <sub>SD</sub>	—	-0.98	-1.2	V	I <sub>S</sub> = -12A, V <sub>GS</sub> = 0V
Reverse recovery time (Note 11)	t <sub>rr</sub>	—	138	—	ns	I <sub>S</sub> = -12A, di/dt = 100A/μs
Reverse recovery charge (Note 11)	Q <sub>rr</sub>	—	841	—	nC	
<b>DYNAMIC CHARACTERISTICS (Note 11)</b>						
Input Capacitance	C <sub>iss</sub>	—	674	—	pF	V <sub>DS</sub> = -20V, V <sub>GS</sub> = 0V f = 1MHz
Output Capacitance	C <sub>oss</sub>	—	115	—	pF	
Reverse Transfer Capacitance	C <sub>rss</sub>	—	67.7	—	pF	V <sub>GS</sub> = -10V I <sub>D</sub> = -12A
Total Gate Charge (Note 12)	Q <sub>g</sub>	—	7.0	—	nC	
Total Gate Charge (Note 12)	Q <sub>g</sub>	—	14	—	nC	V <sub>GS</sub> = -10V I <sub>D</sub> = -12A
Gate-Source Charge (Note 12)	Q <sub>gs</sub>	—	2.2	—	nC	
Gate-Drain Charge (Note 12)	Q <sub>gd</sub>	—	3.7	—	nC	V <sub>DD</sub> = -20V, V <sub>GS</sub> = -10V I <sub>D</sub> = -12A, R <sub>G</sub> ≅ 6.0Ω
Turn-On Delay Time (Note 12)	t <sub>D(on)</sub>	—	2.3	—	ns	
Turn-On Rise Time (Note 12)	t <sub>r</sub>	—	14.1	—	ns	
Turn-Off Delay Time (Note 12)	t <sub>D(off)</sub>	—	25.1	—	ns	
Turn-Off Fall Time (Note 12)	t <sub>f</sub>	—	14.3	—	ns	

Notes: 10. Measured under pulsed conditions. Pulse width ≤ 300μs; duty cycle ≤ 2%  
 11. For design aid only, not subject to production testing.  
 12. Switching characteristics are independent of operating junction temperatures.

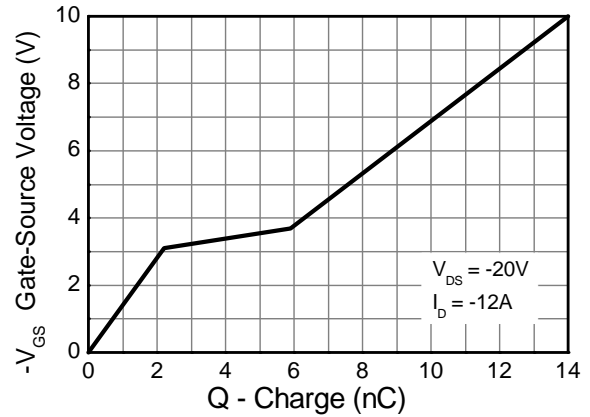
**Typical Characteristics**



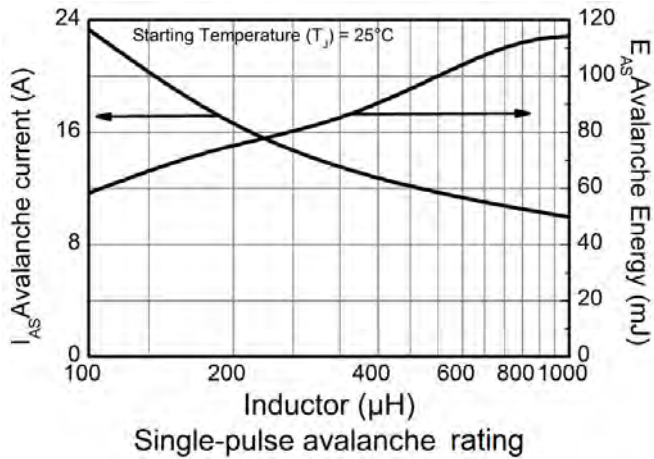
**Typical Characteristics - continued**



**Capacitance v Drain-Source Voltage**

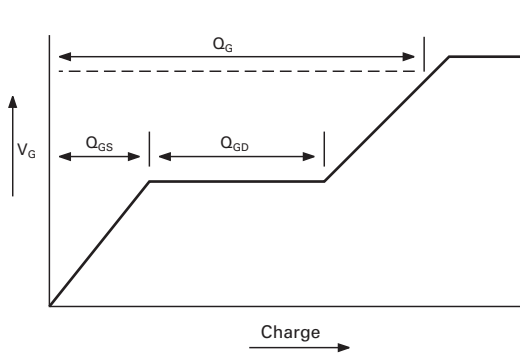


**Gate-Source Voltage v Gate Charge**

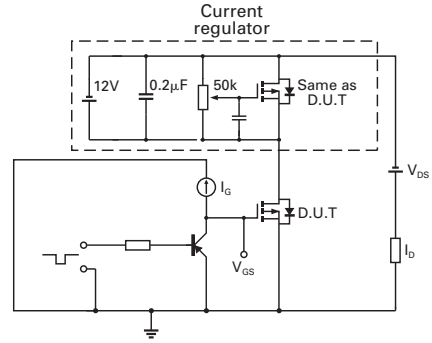


**Single-pulse avalanche rating**

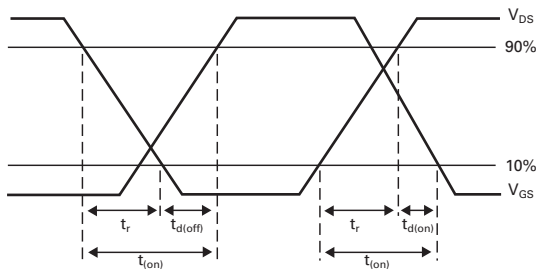
**Test Circuits**



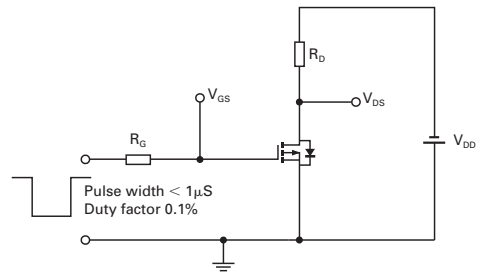
**Basic gate charge waveform**



**Gate charge test circuit**

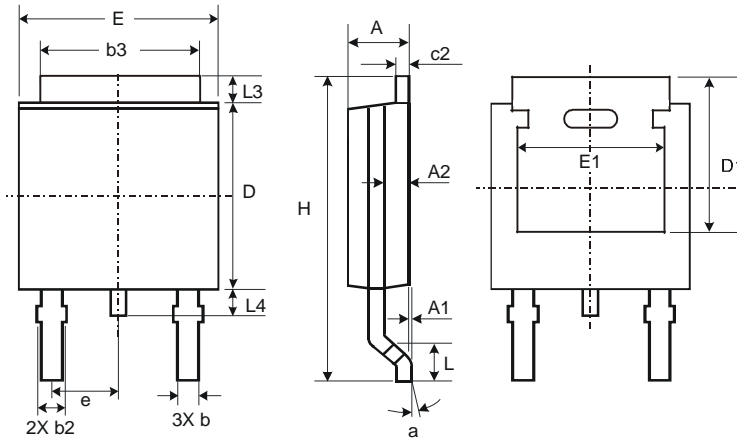


**Switching time waveforms**



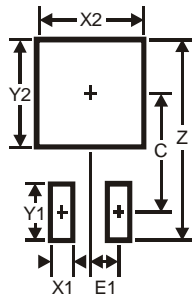
**Switching time test circuit**

**Package Outline Dimensions**



TO252			
Dim	Min	Max	Typ
A	2.19	2.39	2.29
A1	0.00	0.13	0.08
A2	0.97	1.17	1.07
b	0.64	0.88	0.783
b2	0.76	1.14	0.95
b3	5.21	5.46	5.33
c2	0.45	0.58	0.531
D	6.00	6.20	6.10
D1	5.21	-	-
e	-	-	2.286
E	6.45	6.70	6.58
E1	4.32	-	-
H	9.40	10.41	9.91
L	1.40	1.78	1.59
L3	0.88	1.27	1.08
L4	0.64	1.02	0.83
a	0°	10°	-
<b>All Dimensions in mm</b>			

**Suggested Pad Layout**



Dimensions	Value (in mm)
Z	11.6
X1	1.5
X2	7.0
Y1	2.5
Y2	7.0
C	6.9
E1	2.3



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