

Product Summary

BV _{DSS}	R _{DS(ON)} MAX	I _D MAX T _A = +25°C
-40V	51mΩ @ V _{GS} = -10V	-10.5A
	85mΩ @ V _{GS} = -4.5V	-8.4A

Description and Applications

This MOSFET is 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.

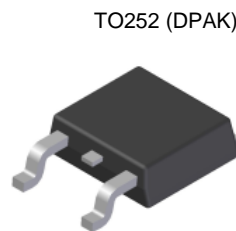
- Backlighting
- DC-DC Converters
- Power Management Functions

Features and Benefits

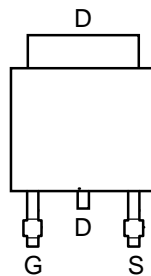
- 100% Unclamped Inductive Switch (UIS) Test in Production
- Low On-Resistance
- Fast Switching Speed
- **Lead-Free Finish; RoHS Compliant (Notes 1 & 2)**
- **Halogen and Antimony Free. "Green" Device (Note 3)**
- **Qualified to AEC-Q101 Standards for High Reliability**

Mechanical Data

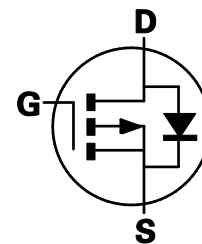
- Case: TO252 (DPAK)
- Case Material: Molded Plastic, "Green" Molding Compound. UL Flammability Classification Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminals: Matte Tin Finish Annealed over Copper Leadframe. Solderable per MIL-STD-202, Method 208 Ⓔ3
- Weight: 0.33 grams (Approximate)



Top View



Top View
Pin-Out



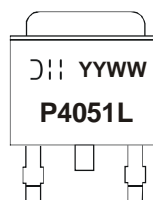
Equivalent Circuit

Ordering Information (Notes 4 and 5)

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. EU Directive 2002/95/EC (RoHS), 2011/65/EU (RoHS 2) & 2015/863/EU (RoHS 3) compliant. All applicable RoHS exemptions applied.
 2. See http://www.diodes.com/quality/lead_free/ for more information about Diodes Incorporated's definitions of Halogen- and Antimony-free, "Green" and Lead-free..
 3. Halogen- and Antimony-free "Green" products are defined as those which contain <900ppm bromine, <900ppm chlorine (<1500ppm total Br + Cl) and <1000ppm antimony compounds.
 4. Automotive products are AEC-Q101 qualified and are PPAP capable. Automotive, AEC-Q101 and standard products are electrically and thermally the same, except where specified. For more information, please refer to <https://www.diodes.com/quality/>.
 5. For packaging details, go to our website at <https://www.diodes.com/design/support/packaging/diodes-packaging/>.

Marking Information



DII = Manufacturer's Marking
 P4051L = Product Type Marking Code
 YYWW = Date Code Marking
 YY = Year (ex: 18 = 2018)
 WW = Week (01 to 53)

Maximum Ratings (@ $T_A = +25^\circ\text{C}$, unless otherwise specified.)

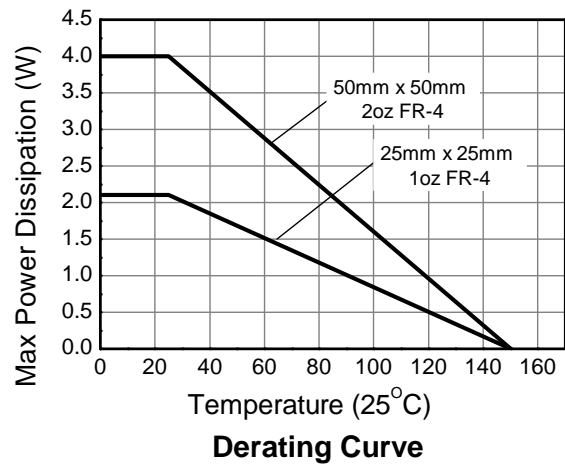
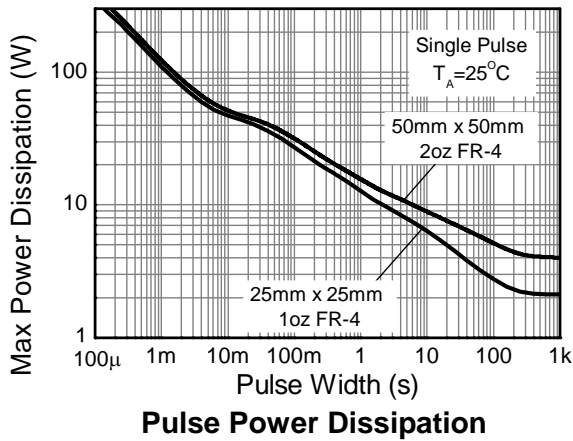
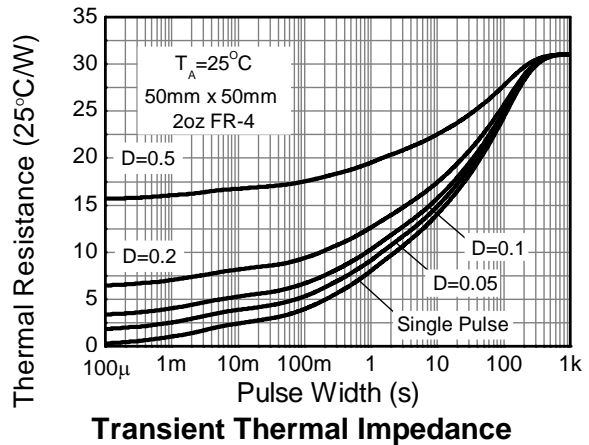
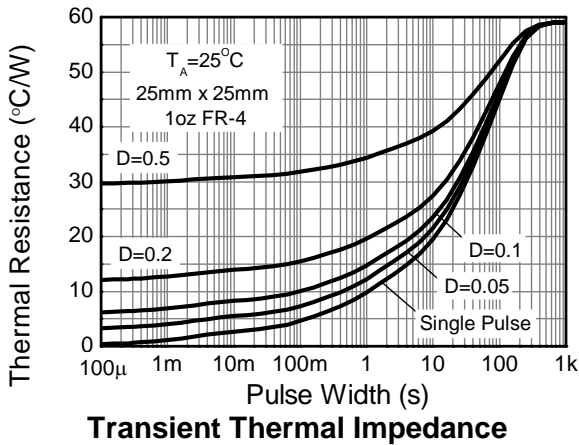
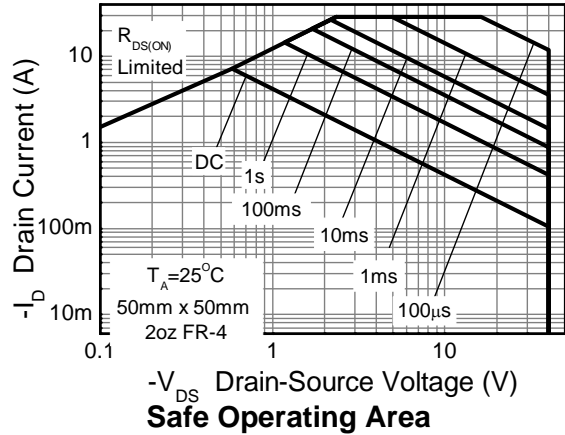
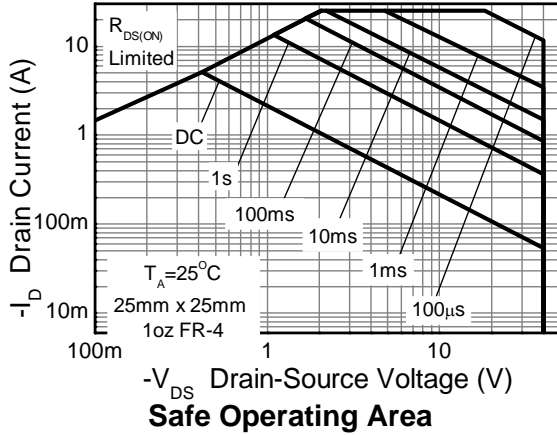
Characteristic			Symbol	Value	Unit
Drain-Source Voltage			V_{DS}	-40	V
Gate-Source Voltage		(Note 6)	V_{GS}	± 20	V
Single Pulsed Avalanche Energy		(Note 12)	E_{AS}	50	mJ
Single Pulsed Avalanche Current			I_{AS}	-20.3	A
Continuous Drain Current	$V_{GS} = -10\text{V}$	(Note 8)	I_D	-10.5	A
		$T_A = +70^\circ\text{C}$ (Note 8)		-8.40	
		(Note 7)		-7.2	
Pulsed Drain Current	$V_{GS} = -10\text{V}$	(Note 9)	I_{DM}	-28.9	A
Continuous Source Current (Body Diode)			I_S	-10.1	A
Pulsed Source Current (Body Diode)			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 7)	P_D	4.18	W mW/ $^\circ\text{C}$	
			33.4		
	(Note 8)		8.9		
	(Note 10)		71.4		
Thermal Resistance, Junction to Ambient	(Note 7)	$R_{\theta JA}$	2.14	$^\circ\text{C/W}$	
	(Note 8)		17.1		
	(Note 10)		29.9		
Thermal Resistance, Junction to Lead	(Note 8)	$R_{\theta JL}$	14.0	$^\circ\text{C/W}$	
	(Note 10)		58.4		
	(Note 11)		2.46		
Operating and Storage Temperature Range			T_J, T_{STG}	-55 to +150	$^\circ\text{C}$

- Notes:
- AEC-Q101 V_{GS} maximum is $\pm 16\text{V}$.
 - For a device surface mounted on 50mm x 50mm x 1.6mm FR-4 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 7, except the device is measured at $t \leq 10\text{s}$.
 - Same as note 7, except the device is pulsed with $D = 0.02$ and pulse width 300 μs . The pulse current is limited by the maximum junction temperature.
 - For a device surface mounted on 25mm x 25mm x 1.6mm FR-4 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

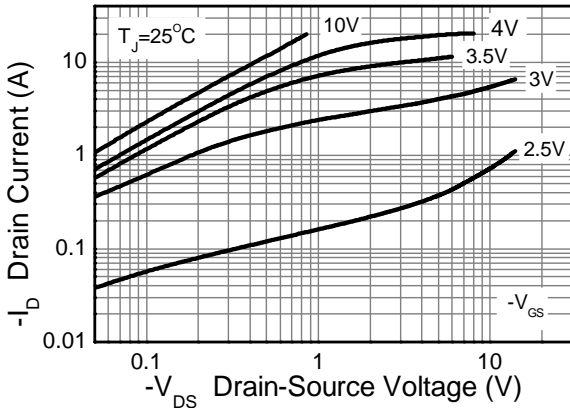


Electrical Characteristics (@T_A = +25°C, unless otherwise specified.)

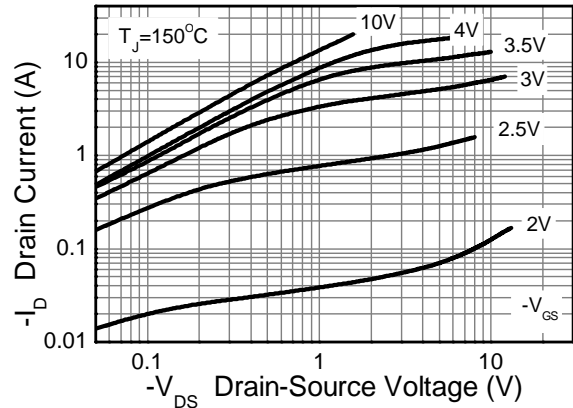
Characteristic	Symbol	Min	Typ	Max	Unit	Test Condition
OFF CHARACTERISTICS						
Drain-Source Breakdown Voltage	BV _{DSS}	-40	—	—	V	I _D = -250μA, V _{GS} = 0V
Zero Gate Voltage Drain Current	I _{DSS}	—	—	-0.5	μA	V _{DS} = -40V, V _{GS} = 0V
Gate-Source Leakage	I _{GSS}	—	—	±100	nA	V _{GS} = ±20V, V _{DS} = 0V
ON CHARACTERISTICS						
Gate Threshold Voltage	V _{GS(TH)}	-1.0	—	-3.0	V	I _D = -250μA, V _{DS} = V _{GS}
Static Drain-Source On-Resistance (Note 14)	R _{DS(ON)}	—	0.041	0.051	Ω	V _{GS} = -10V, I _D = -12A
			0.059	0.085		V _{GS} = -4.5V, I _D = -8A
Forward Transconductance (Notes 13 & 14)	g _{fs}	—	16.6	—	s	V _{DS} = -15V, I _D = -12A
Diode Forward Voltage (Note 13)	V _{SD}	—	-0.98	-1.2	V	I _S = -12A, V _{GS} = 0V
Reverse Recovery Time (Note 14)	t _{rr}	—	138	—	ns	I _S = -12A, di/dt = 100A/μs
Reverse Recovery Charge (Note 13)	Q _{rr}	—	841	—	nC	
DYNAMIC CHARACTERISTICS (Note 14)						
Input Capacitance	C _{ISS}	—	674	—	pF	V _{DS} = -20V, V _{GS} = 0V f = 1MHz
Output Capacitance	C _{OSS}	—	115	—	pF	
Reverse Transfer Capacitance	C _{RSS}	—	67.7	—	pF	
Total Gate Charge (Note 15)	Q _G	—	7.0	—	nC	V _{GS} = -4.5V
Total Gate Charge (Note 15)	Q _G	—	14	—	nC	V _{GS} = -10V V _{DS} = -20V I _D = -12A
Gate-Source Charge (Note 15)	Q _{GS}	—	2.2	—	nC	
Gate-Drain Charge (Note 15)	Q _{GD}	—	3.7	—	nC	
Turn-On Delay Time (Note 15)	t _{d(on)}	—	2.3	—	ns	V _{DD} = -20V, V _{GS} = -10V I _D = -12A, R _G ≅ 6.0Ω
Turn-On Rise Time (Note 15)	t _r	—	14.1	—	ns	
Turn-Off Delay Time (Note 15)	t _{d(off)}	—	25.1	—	ns	
Turn-Off Fall Time (Note 15)	t _f	—	14.3	—	ns	

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

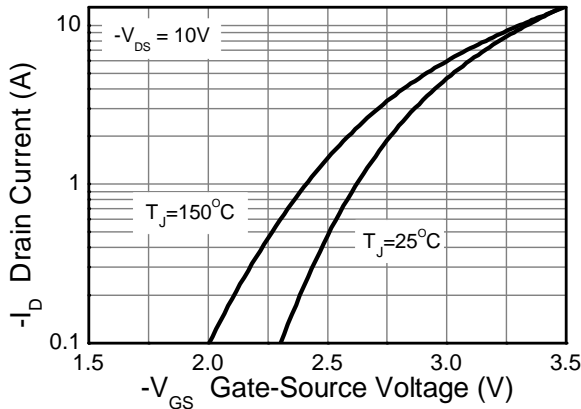
Typical Characteristics



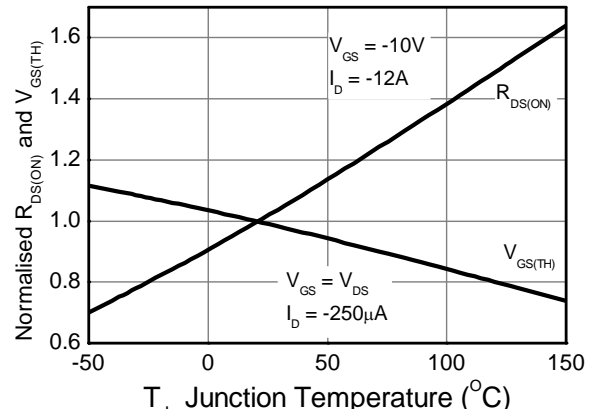
Output Characteristics



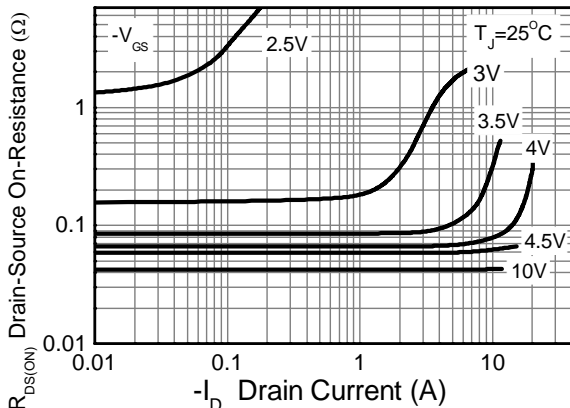
Output Characteristics



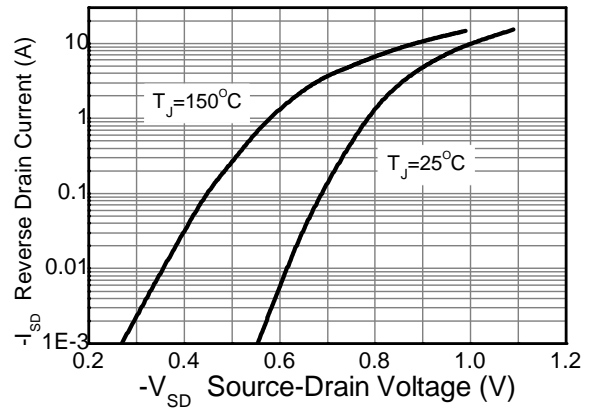
Typical Transfer Characteristics



Normalised Curves v Temperature

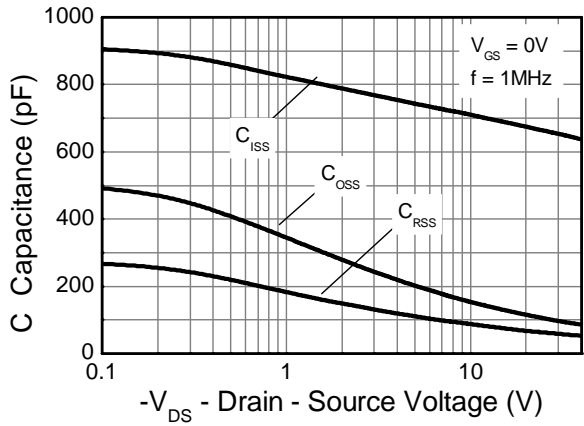


On-Resistance v Drain Current

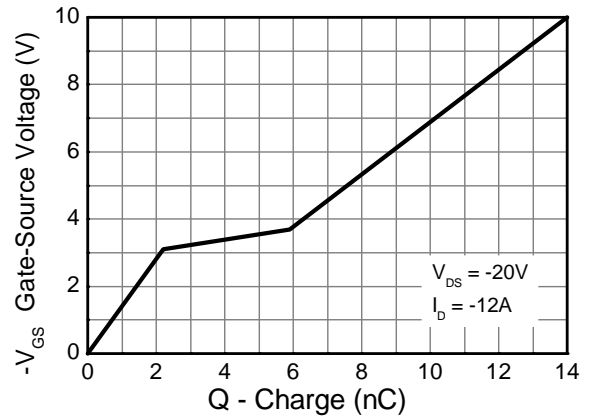


Source-Drain Diode Forward Voltage

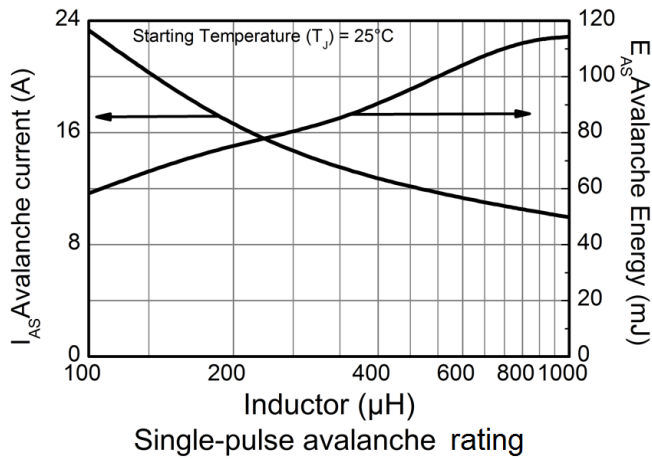
Typical Characteristics (Cont.)



Capacitance v Drain-Source Voltage

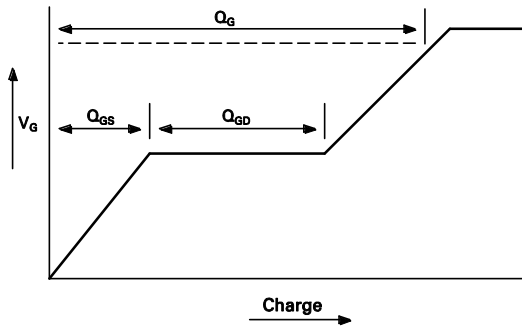


Gate-Source Voltage v Gate Charge

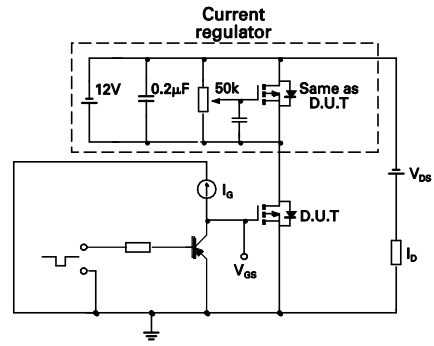


Single-pulse avalanche rating

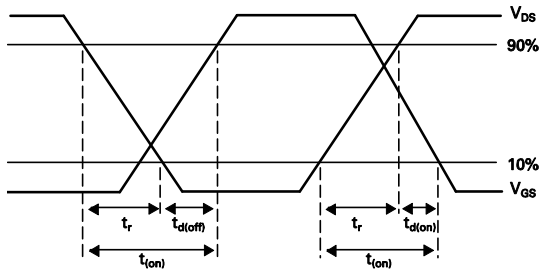
Test Circuits



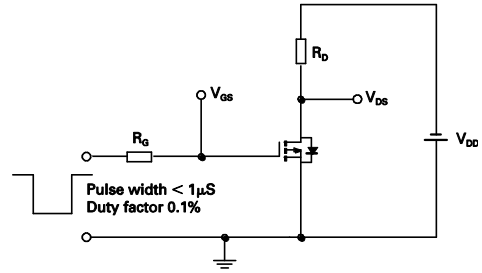
Basic gate charge waveform



Gate charge test circuit



Switching time waveforms

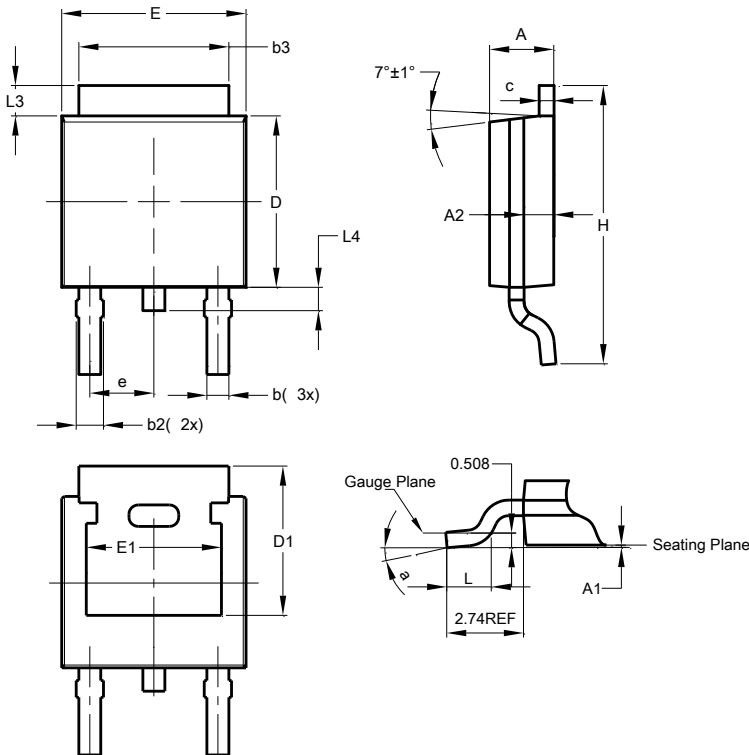


Switching time test circuit

Package Outline Dimensions

Please see <http://www.diodes.com/package-outlines.html> for the latest version.

TO252 (DPAK)

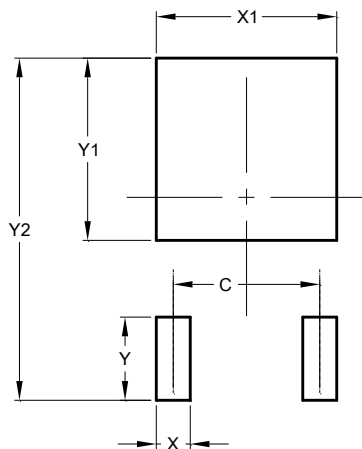


TO252 (DPAK)			
Dim	Min	Max	Typ
A	2.19	2.39	2.29
A1	0.00	0.13	0.08
A2	0.97	1.17	1.07
b	0.64	0.88	0.783
b2	0.76	1.14	0.95
b3	5.21	5.46	5.33
c	0.45	0.58	0.531
D	6.00	6.20	6.10
D1	5.21	-	-
e	-	-	2.286
E	6.45	6.70	6.58
E1	4.32	-	-
H	9.40	10.41	9.91
L	1.40	1.78	1.59
L3	0.88	1.27	1.08
L4	0.64	1.02	0.83
a	0°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

Suggested Pad Layout

Please see <http://www.diodes.com/package-outlines.html> for the latest version.

TO252 (DPAK)



Dimensions	Value (in mm)
C	4.572
X	1.060
X1	5.632
Y	2.600
Y1	5.700
Y2	10.700

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