40V P-CHANNEL ENHANCEMENT MODE MOSFET

Product Summary

BV_{DSS}	$R_{DS(on)}$ max	I_D max T_A = +25°C (Note 6)
-40V	25mΩ @ V_{GS} = -10V	-8.6A
	45mΩ @ V_{GS} = -4.5V	-7.0A

Description

This MOSFET has been designed to minimize the on-state resistance yet maintain superior switching performance, making it ideal for high efficiency power management applications.

Applications

- Motor controls
- Backlighting
- DC-DC converters
- Printer equipment

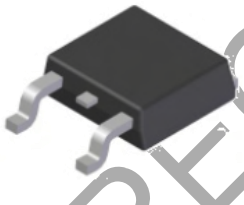
Features

- Low On-Resistance
- Fast Switching Speed
- Low Input/Output Leakage
- **Lead-Free Finish; RoHS Compliant (Notes 1 & 2)**
- **Halogen and Antimony Free. "Green" Device (Note 3)**
- **This part is qualified to JEDEC standards (as references in AEC-Q) for High Reliability. https://www.diodes.com/quality/product-definitions/**
- **An automotive-compliant part is available under separate datasheet (DMP4025LK3Q)**

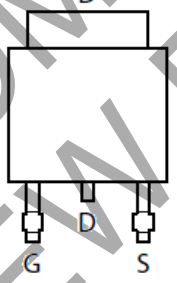
Mechanical Data

- Package: TO252
- Package Material: Molded Plastic, "Green" Molding Compound. UL Flammability Classification Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminals Connections: See Diagram Below
- Terminals: Finish - Matte Tin Annealed over Copper Lead Frame. Solderable per MIL-STD-202, Method 208 e3
- Weight: 0.315 grams (Approximate)

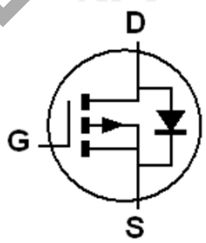
TO252 (DPAK)



Top View



Top View
Pin Out



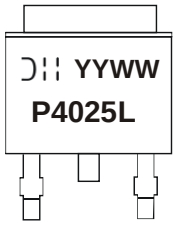
Device Symbol

Ordering Information (Note 4)

Part Number	Package	Marking	Reel Size (inches)	Tape Width (mm)	Packing	
					Qty.	Carrier
DMP4025LK3-13	TO252 (DPAK)	P4025L	13	16	2,500	Reel

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 https://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. For packaging details, go to our website at https://www.diodes.com/design/support/packaging/diodes-packaging/.

Marking Information



= Manufacturer's Marking
P4025L = Product Type Marking Code
YYWW = Date Code Marking
YY = Year (ex: 23 = 2023)
WW = Week (01 to 53)

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Maximum Ratings (@T_A = +25°C unless otherwise specified.)

Characteristic			Symbol	Value	Unit
Drain-Source Voltage			V_{DSS}	-40	V
Gate-Source Voltage			V_{GSS}	±20	
Continuous Drain Current	V_{GS} = -10V	(Note 6)	I_D	-8.6	A
		T_A = +70°C (Note 6)		-6.9	
		(Note 5)		-6.7	
Pulsed Drain Current	V_{GS} = -10V	(Note 7)	I_{DM}	-35	
Continuous Source Current (Body diode)		(Note 7)	I_S	-8.6	
Pulsed Source Current (Body diode)		(Note 7)	I_{SM}	-35	

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

Characteristic		Symbol	Value	Unit
Power Dissipation	(Note 5)	P_D	1.7	W
	(Note 6)		2.78	
Thermal Resistance, Junction to Ambient	(Note 5)	$R_{\theta JA}$	74	°C/W
	(Note 6)		45	
Thermal Resistance, Junction to Case	(Note 6)	$R_{\theta JC}$	7.1	
Thermal Resistance, Junction to Lead	(Note 8)	$R_{\theta JL}$	1.43	
Operating and Storage Temperature Range		T_J, T_{STG}	-55 to +150	°C

Notes:
5. For a device surface mounted on minimum recommended 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.
6. Same as note (5), except the device is surface mounted on 25mm X 25mm X 1.6mm FR4 PCB.
7. Repetitive rating on 25mm X 25mm FR4 PCB, D=0.02, pulse width 300µs – pulse width by maximum junction temperature.
8. Thermal resistance from junction to solder-point (at the end of the drain lead).

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Thermal Characteristics

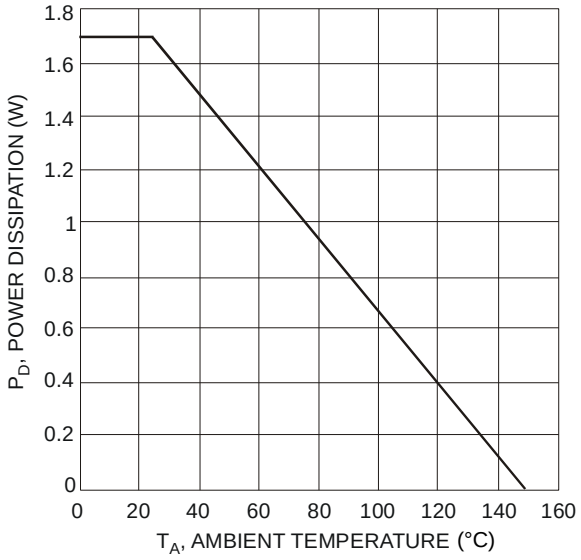


Figure 1. Power Dissipation vs. Ambient Temperature

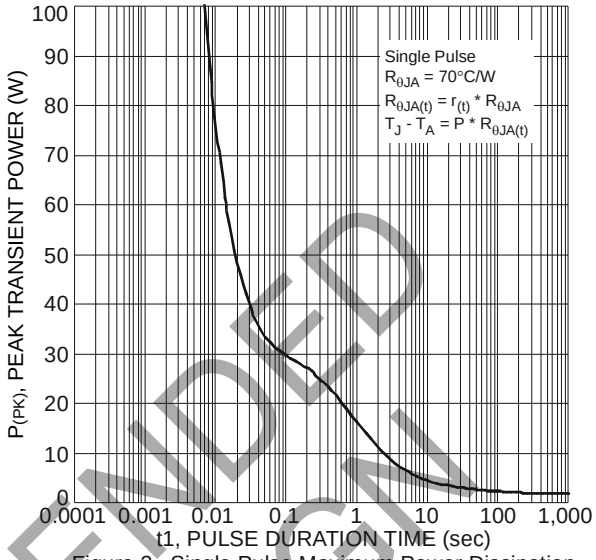


Figure 2. Single Pulse Maximum Power Dissipation

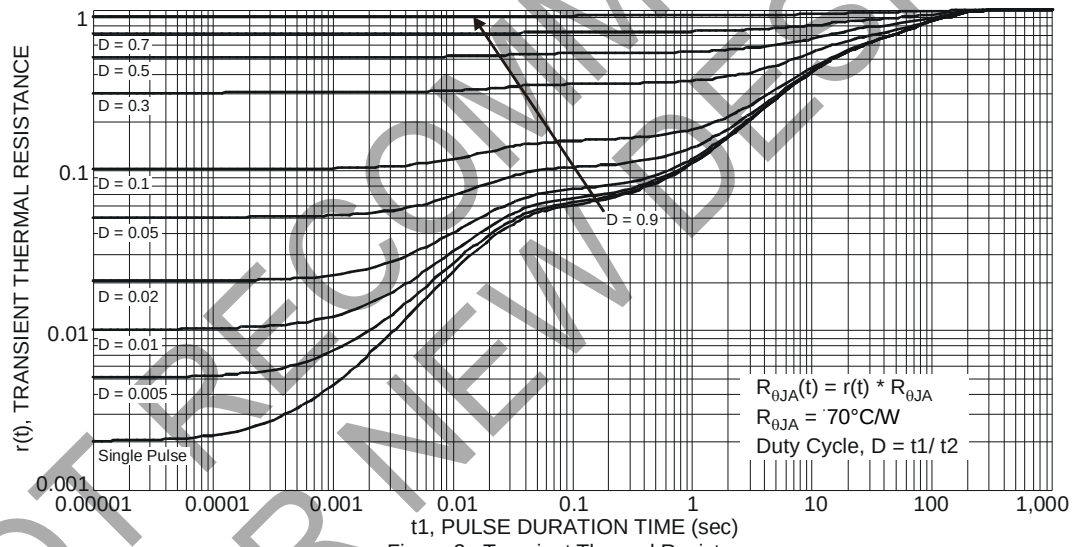


Figure 3. Transient Thermal Resistance

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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}	—	—	-1	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	$V_{GS(th)}$	-0.8	-1.3	-1.8	V	I_D = -250µA, V_{DS} = V_{GS}
Static Drain-Source On-Resistance (Note 9)	$R_{DS\ (ON)}$	—	18	25	mΩ	V_{GS} = -10V, I_D = -3A
			30	45		V_{GS} = -4.5V, I_D = -3A
Forward Transconductance (Notes 9 & 10)	g_{fs}	—	16.6	—	S	V_{DS} = -5V, I_D = -3A
Diode Forward Voltage (Note 9)	V_{SD}	—	-0.7	-1	V	I_S = -1A, V_{GS} = 0V
DYNAMIC CHARACTERISTICS (Note 10)						
Input Capacitance	C_{iss}	—	1643	—	pF	V_{DS} = -20V, V_{GS} = 0V f = 1MHz
Output Capacitance	C_{oss}	—	179	—		
Reverse Transfer Capacitance	C_{rss}	—	128	—		
Gate Resistance	R_g	—	6.43	—	Ω	V_{DS} = 0V, V_{GS} = 0V, f = 1MHz
Total Gate Charge (Note 11)	Q_g	—	14	—	nC	V_{GS} = -4.5V V_{DS} = -20V I_D = -3A
Total Gate Charge (Note 11)	Q_g	—	33.7	—		V_{GS} = -10V
Gate-Source Charge (Note 11)	Q_{gs}	—	5.5	—		
Gate-Drain Charge (Note 11)	Q_{gd}	—	7.3	—		
Turn-On Delay Time (Note 11)	$t_{D(on)}$	—	6.9	—	ns	V_{DD} = -20V, V_{GS} = -10V I_D = -3A
Turn-On Rise Time (Note 11)	t_r	—	14.7	—		
Turn-Off Delay Time (Note 11)	$t_{D(off)}$	—	53.7	—		
Turn-Off Fall Time (Note 11)	t_f	—	30.9	—		

Notes: 9. Measured under pulsed conditions. Pulse width ≤ 300µs; duty cycle ≤ 2%.
10. For design aid only, not subject to production testing.
11. Switching characteristics are independent of operating junction temperatures.

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Typical Characteristics

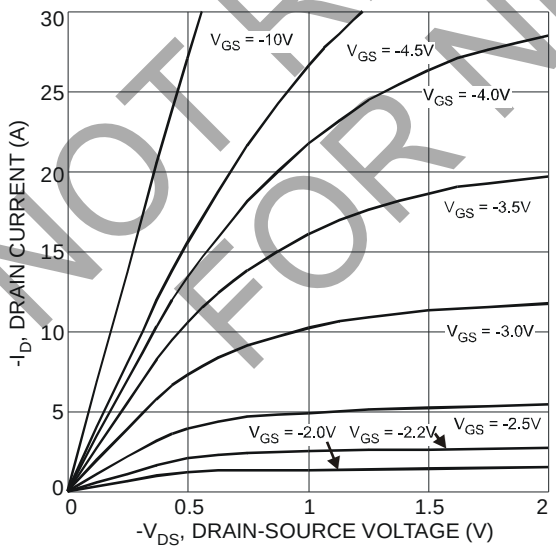


Figure 4. Typical Output Characteristic

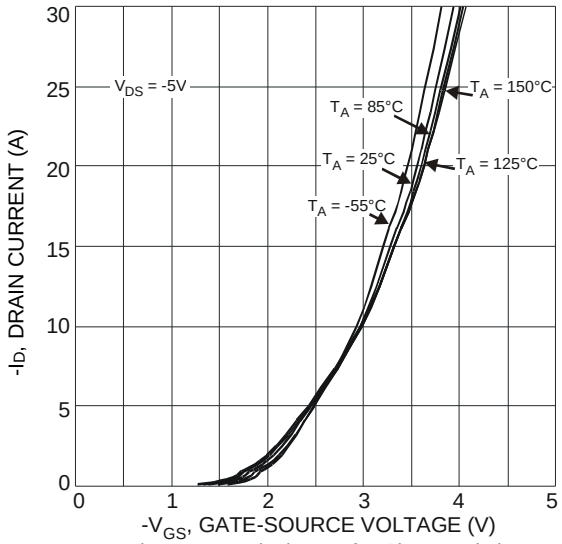


Figure 5. Typical Transfer Characteristic

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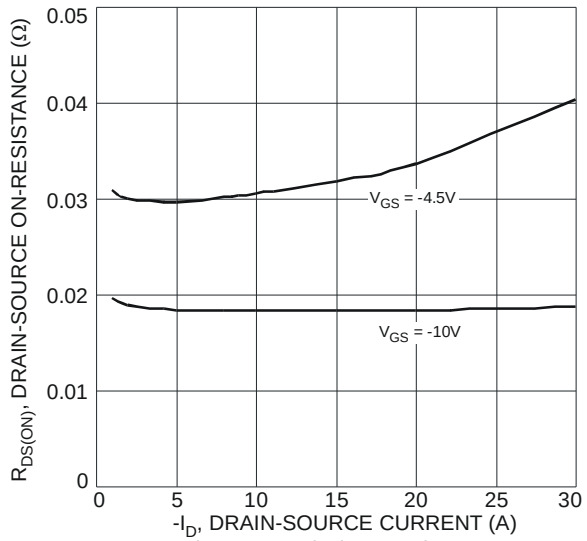


Figure 6. Typical On-Resistance vs. Drain Current and Gate Voltage

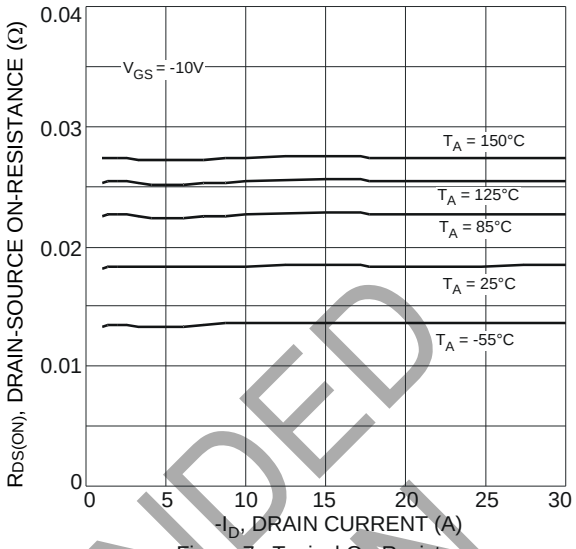


Figure 7. Typical On-Resistance vs. Drain Current and Temperature

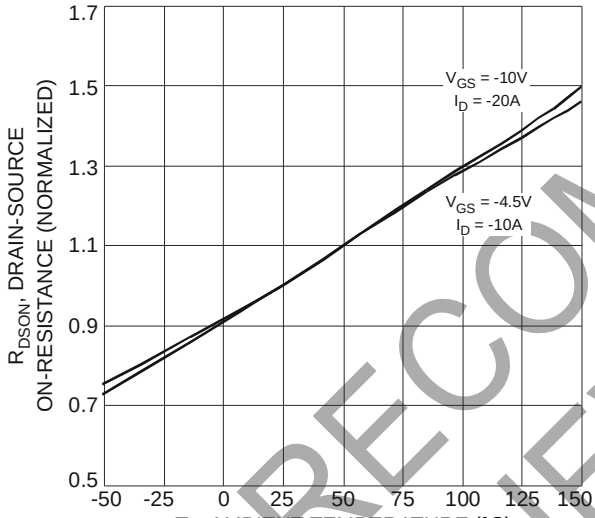


Figure 8. On-Resistance Variation with Temperature

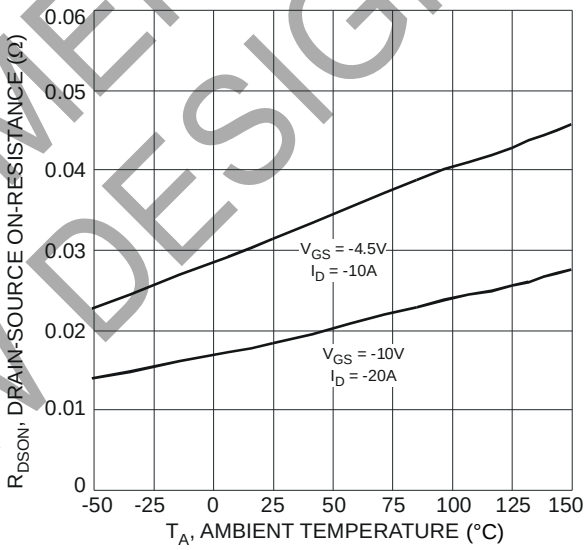


Figure 9. On-Resistance Variation with Temperature

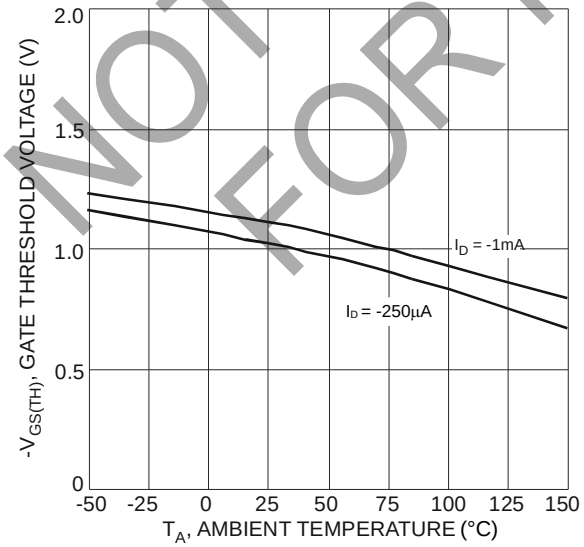


Figure 10. Gate Threshold Variation vs. Ambient Temperature

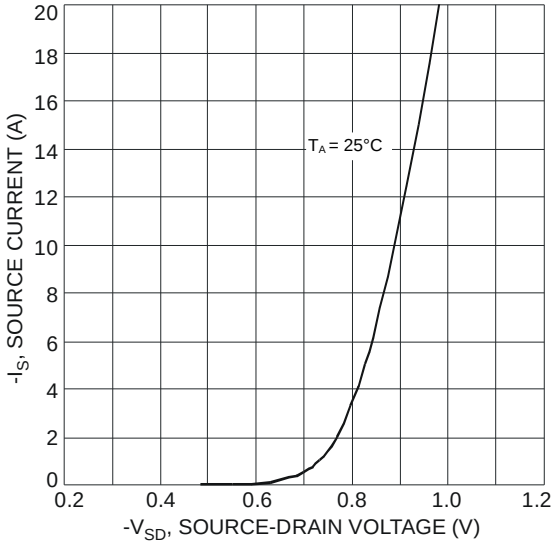


Figure 11. Diode Forward Voltage vs. Current

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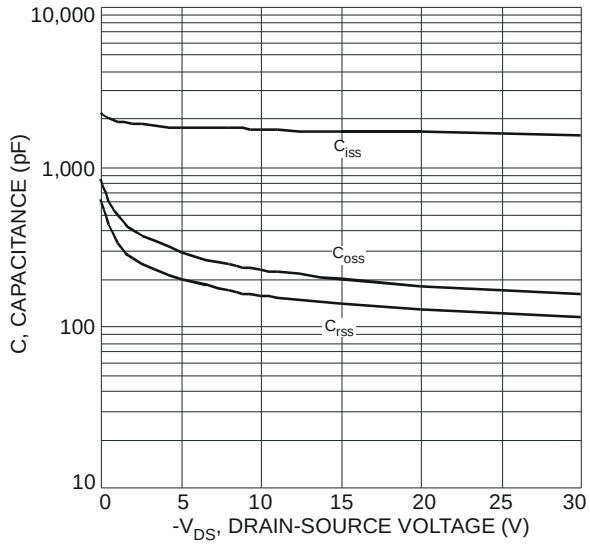


Figure 12. Typical Total Capacitance

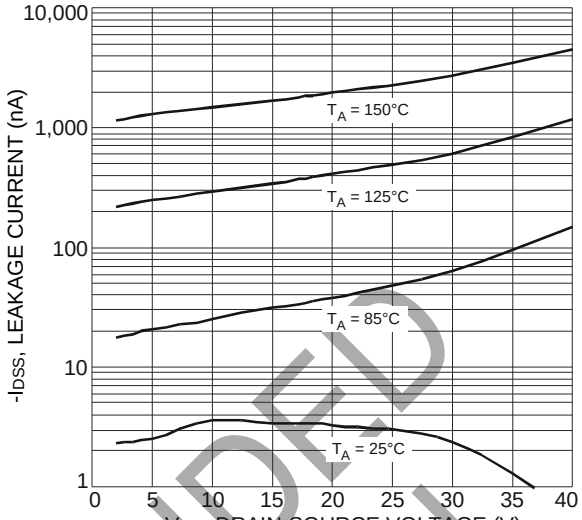


Figure 13. Typical Leakage Current vs. Drain-Source Voltage

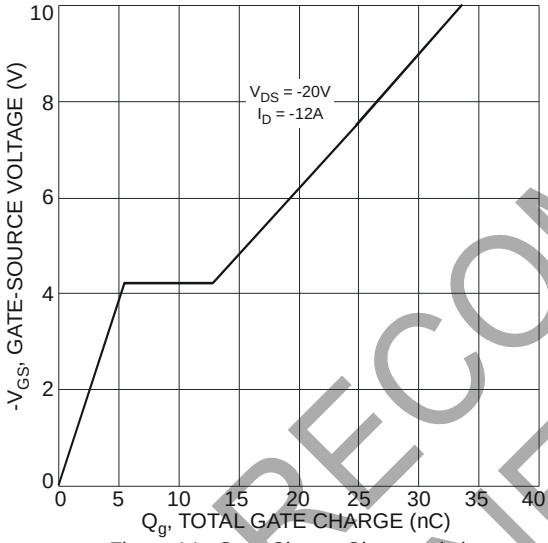


Figure 14. Gate-Charge Characteristics

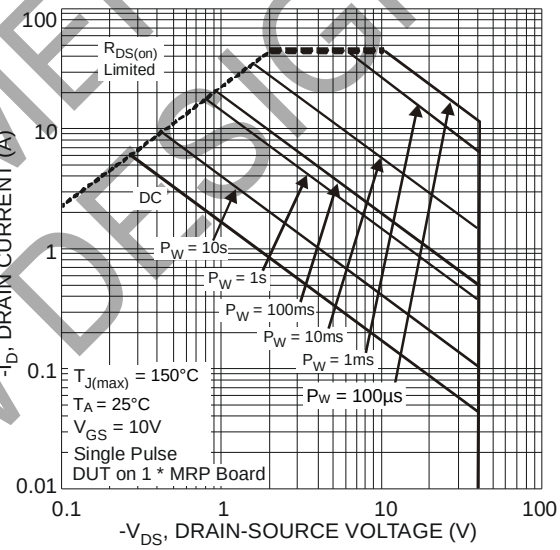


Figure 15. SOA, Safe Operation Area

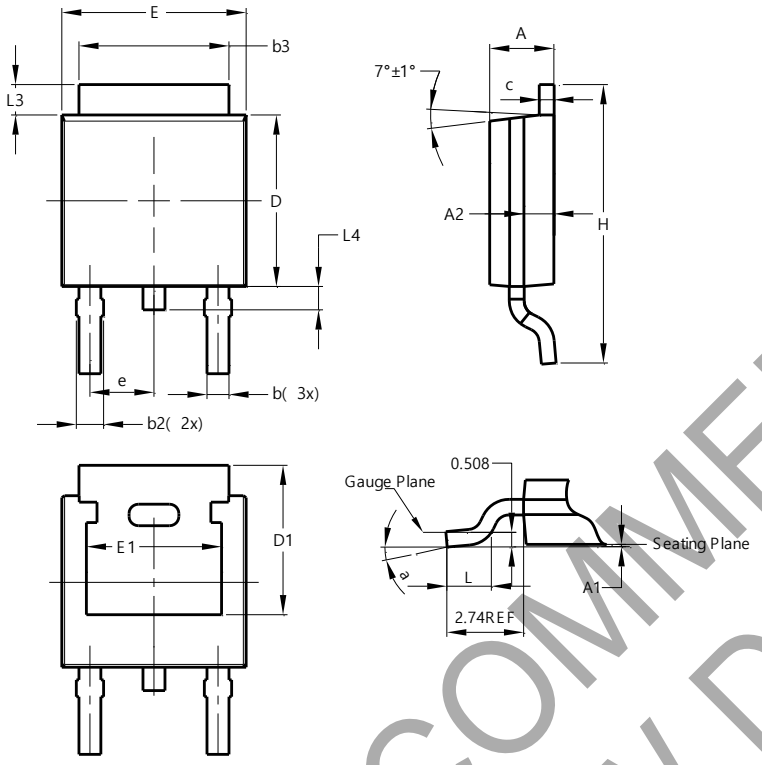
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Package Outline Dimensions

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TO252 (DPAK)



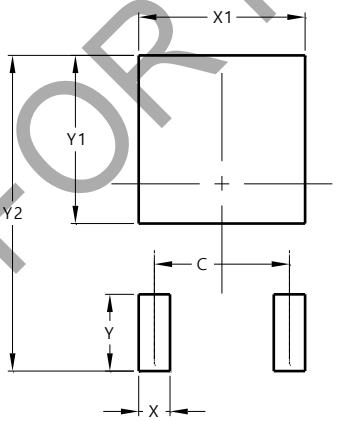
TO252 (DPAK)			
Dim	Min	Max	Typ
A	2.19	2.39	2.29
A1	0.00	0.13	0.08
A2	0.97	1.17	1.07
b	0.64	0.88	0.783
b2	0.76	1.14	0.95
b3	5.21	5.50	5.33
c	0.45	0.58	0.531
D	6.00	6.20	6.10
D1	5.21	--	--
e	2.286 BSC		
E	6.45	6.70	6.58
E1	4.32	--	--
H	9.40	10.41	9.91
L	1.40	1.78	1.59
L3	0.88	1.27	1.08
L4	0.64	1.02	0.83
a	0°	10°	--
All Dimensions in mm			

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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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