60V 175°C P-CHANNEL ENHANCEMENT MODE MOSFET

Product Summary

BV_{DSS}	$R_{DS(ON)}$ Max	I_D Max T_C = +25°C
-60V	33mΩ @ V_{GS} = -10V	-35A
	40mΩ @ V_{GS} = -4.5V	-32A

Features and Benefits

- Rated to +175°C – Ideal for High Ambient Temperature Environments
- 100% Unclamped Inductive Switching – Ensures More Reliable and Robust End Application
- Low On-Resistance
- Low Input Capacitance
- **Lead-Free Finish; RoHS Compliant (Notes 1 & 2)**
- **Halogen and Antimony Free. "Green" Device (Note 3)**
- **The DMPH6023SK3Q is suitable for automotive applications requiring specific change control; this part is AEC-Q101 qualified, PPAP capable, and manufactured in IATF 16949 certified facilities.**
  https://www.diodes.com/quality/product-definitions/

Description and Applications

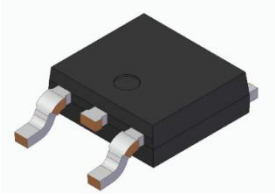
This MOSFET has been designed to meet the stringent requirements of automotive applications. It is qualified to AEC-Q101, supported by a PPAP and is ideal for use in:

- Engine management systems
- Body control electronics
- DC-DC converters

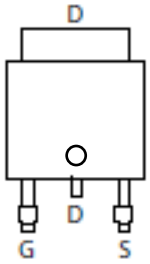
Mechanical Data

- Package: TO252
- Package Material: Molded Plastic, "Green" Molding Compound. UL Flammability Classification Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminals: Finish – Matte Tin Annealed over Copper Leadframe. Solderable per MIL-STD-202, Method 208 e3
- Terminal Connections: See Diagram
- Weight: 0.33 grams (Approximate)

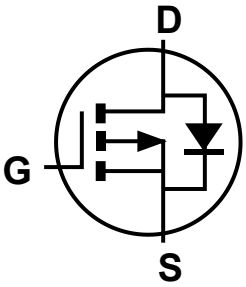
TO252 (DPAK)



Top View



Pinout Top View



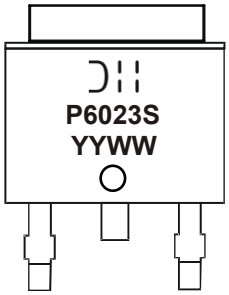
Equivalent Circuit

Ordering Information (Note 4)

Orderable Part Number	Package	Packing	
		Qty.	Carrier
DMPH6023SK3Q-13	TO252 (DPAK)	2,500	Tape & 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
P6023S = Product Type Marking Code
YYWW = Date Code Marking
YY = Last Two Digits of Year (ex: 25 = 2025)
WW = Week Code (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}	-60	V
Gate-Source Voltage			V_{GSS}	±20	V
Continuous Drain Current (Note 6) V_{GS} = -10V	Steady State	T_C = +25°C T_C = +100°C	I_D	-35 -27	A
	Steady State	T_A = +25°C T_A = +70°C	I_D	-7.3 -6.1	A
Pulsed Drain Current (380µs Pulse, Duty Cycle = 1%)			I_{DM}	-60	A
Maximum Continuous Body Diode Forward Current (Note 6)			I_S	-2.2	A
Avalanche Current (Note 7) L = 0.1mH			I_{AS}	-35	A
Avalanche Energy (Note 7) L = 0.1mH			E_{AS}	60	mJ

Thermal Characteristics

Characteristic		Symbol	Value	Unit
Total Power Dissipation (Note 5)		P_D	2.0	W
Thermal Resistance, Junction to Ambient (Note 5)	Steady State	$R_{\theta JA}$	80	°C/W
Total Power Dissipation (Note 6)		P_D	3.2	W
Thermal Resistance, Junction to Ambient (Note 6)	Steady State	$R_{\theta JA}$	41	°C/W
Thermal Resistance, Junction to Case		$R_{\theta JC}$	1.6	
Operating and Storage Temperature Range		T_J, T_{STG}	-55 to +175	°C

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

Characteristic	Symbol	Min	Typ	Max	Unit	Test Condition
OFF CHARACTERISTICS (Note 8)						
Drain-Source Breakdown Voltage	BV_{DSS}	-60	—	—	V	V_{GS} = 0, I_D = -250µA
Zero Gate Voltage Drain Current , T_J = +25°C	I_{DSS}	—	—	-1	µA	V_{DS} = -60V, V_{GS} = 0
Gate-Source Leakage	I_{GSS}	—	—	±100	nA	V_{GS} = ±20V, V_{DS} = 0
ON CHARACTERISTICS (Note 8)						
Gate Threshold Voltage	$V_{GS(TH)}$	-1.0	—	-3.0	V	V_{DS} = V_{GS}, I_D = -250µA
Static Drain-Source On-Resistance	$R_{DS(ON)}$	—	27	33	mΩ	V_{GS} = -10V, I_D = -10A
		—	32	40		V_{GS} = -4.5V, I_D = -8A
Diode Forward Voltage	V_{SD}	—	-0.7	-1.2	V	V_{GS} = 0, I_S = -1A
DYNAMIC CHARACTERISTICS (Note 9)						
Input Capacitance	C_{iss}	—	2,569	—	pF	V_{DS} = -30V, V_{GS} = 0, f = 1.0MHz
Output Capacitance	C_{oss}	—	179	—	pF	
Reverse Transfer Capacitance	C_{rss}	—	143	—	pF	
Gate Resistance	R_g	—	5	—	Ω	V_{DS} = 0, V_{GS} = 0, f = 1MHz
Total Gate Charge (V_{GS} = -4.5V)	Q_g	—	26.5	—	nC	V_{DS} = -30V, I_D = -5A
Total Gate Charge (V_{GS} = -10V)	Q_g	—	53.1	—	nC	
Gate-Source Charge	Q_{gs}	—	7.1	—	nC	
Gate-Drain Charge	Q_{gd}	—	12.6	—	nC	
Turn-On Delay Time	$t_{D(ON)}$	—	6	—	ns	V_{GS} = -10V, V_{DS} = -30V, R_G = 3Ω, I_D = -5A
Turn-On Rise Time	t_R	—	7.1	—	ns	
Turn-Off Delay Time	$t_{D(OFF)}$	—	110	—	ns	
Turn-Off Fall Time	t_F	—	62	—	ns	
Body Diode Reverse-Recovery Time	t_{RR}	—	20	—	ns	I_F = -5A, di/dt = 100A/µs
Body Diode Reverse-Recovery Charge	Q_{RR}	—	14	—	nC	

Notes:
5. Device mounted on FR-4 substrate PC board, 2oz copper, with minimum recommended pad layout.
6. Device mounted on FR-4 substrate PC board, 2oz copper, with 1-inch square copper plate.
7. I_{AS} and E_{AS} ratings are based on low frequency and duty cycles to keep T_J = +25°C.
8. Short duration pulse test used to minimize self-heating effect.
9. Guaranteed by design. Not subject to product testing.

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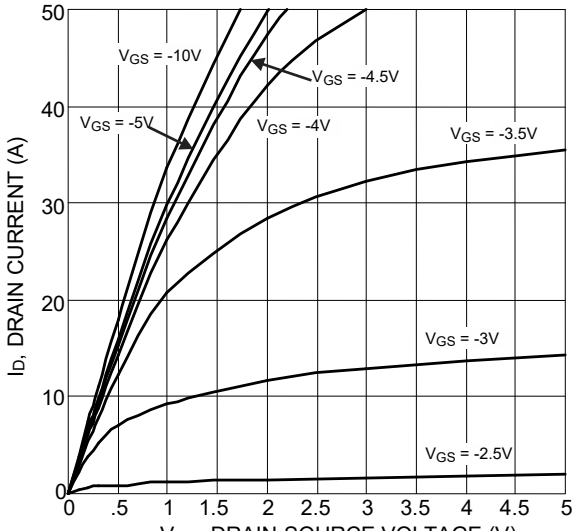


Figure 1 Typical Output Characteristic

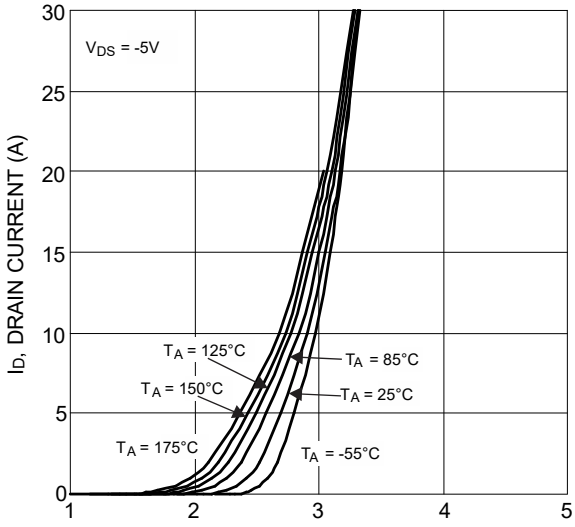


Figure 2 Typical Transfer Characteristics

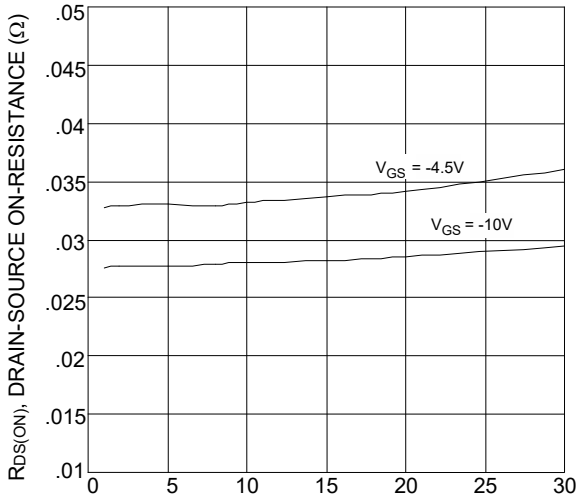


Figure 3 Typical On-Resistance vs. Drain Current and Gate Voltage

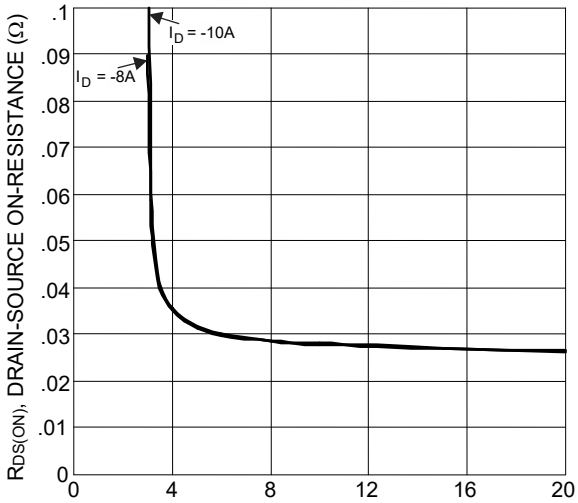


Figure 4 Typical Drain-Source On-Resistance vs. Gate-Source Voltage

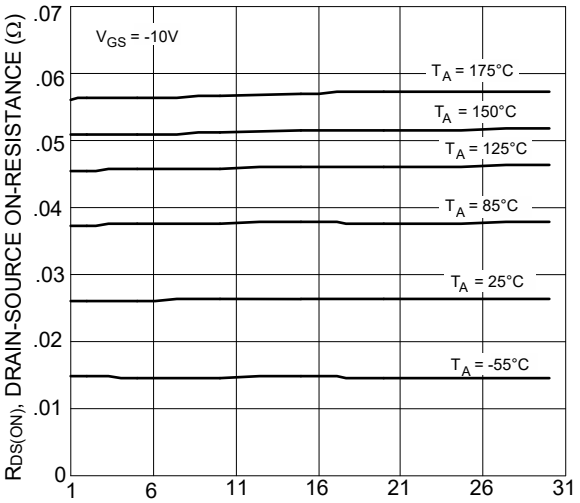


Figure 5 Typical On-Resistance vs. Drain Current and Temperature

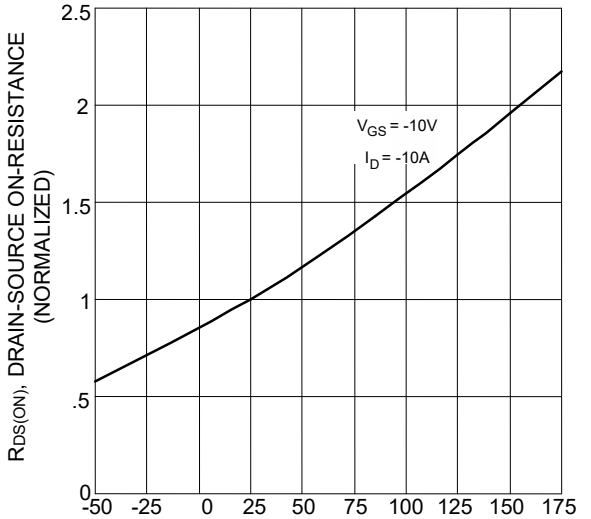


Figure 6 On-Resistance Variation with Temperature

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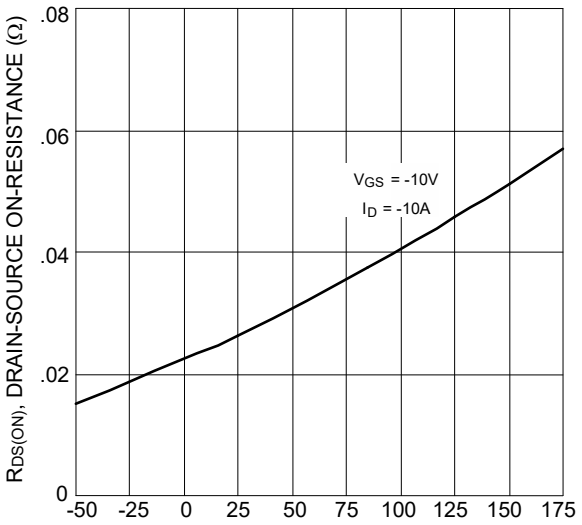


Figure 7 On-Resistance Variation with Temperature

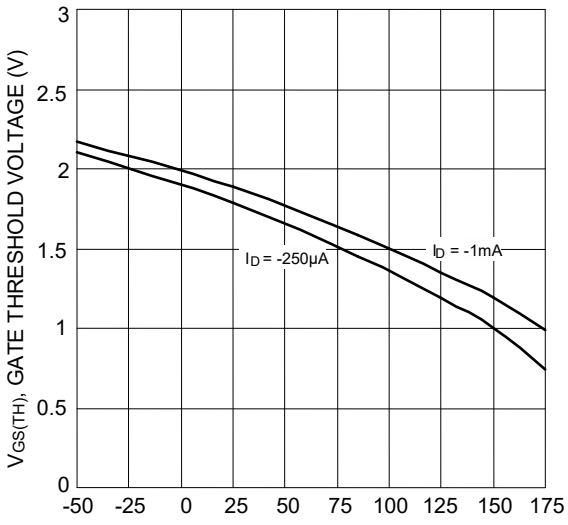


Figure 8 Gate Threshold Variation vs. Junction Temperature

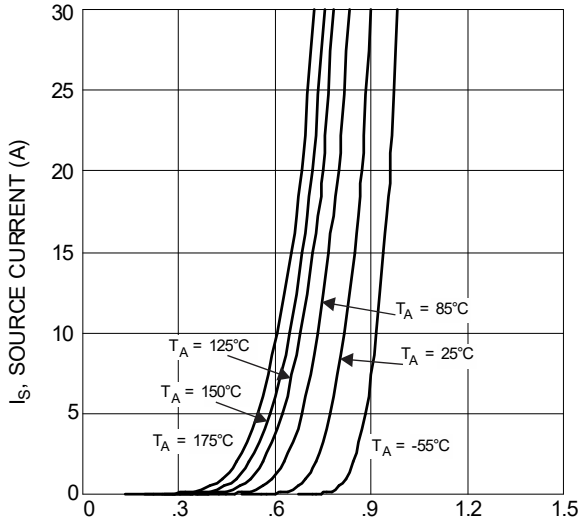


Figure 9 Diode Forward Voltage vs. Current

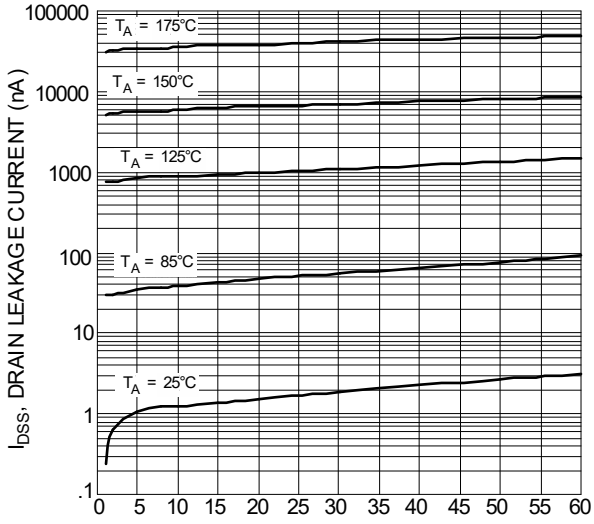


Figure 10 Typical Drain-Source Leakage Current vs. Voltage

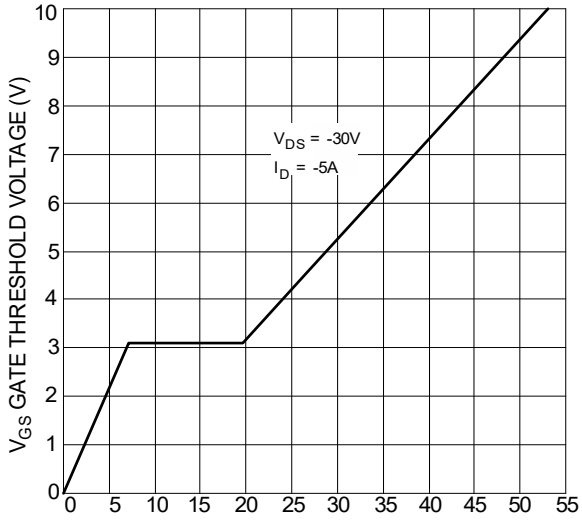


Figure 11 Gate Charge

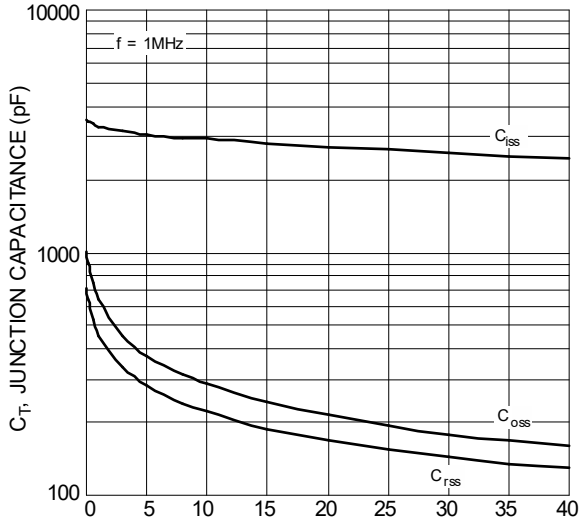


Figure 12 Typical Junction Capacitance

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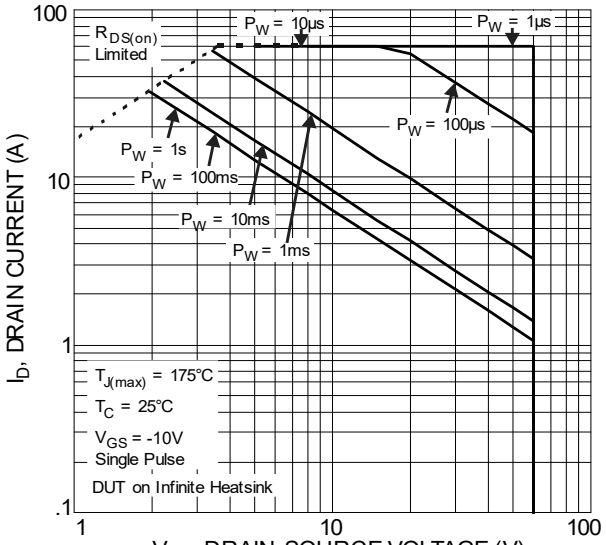


Figure 13 SOA, Safe Operation Area

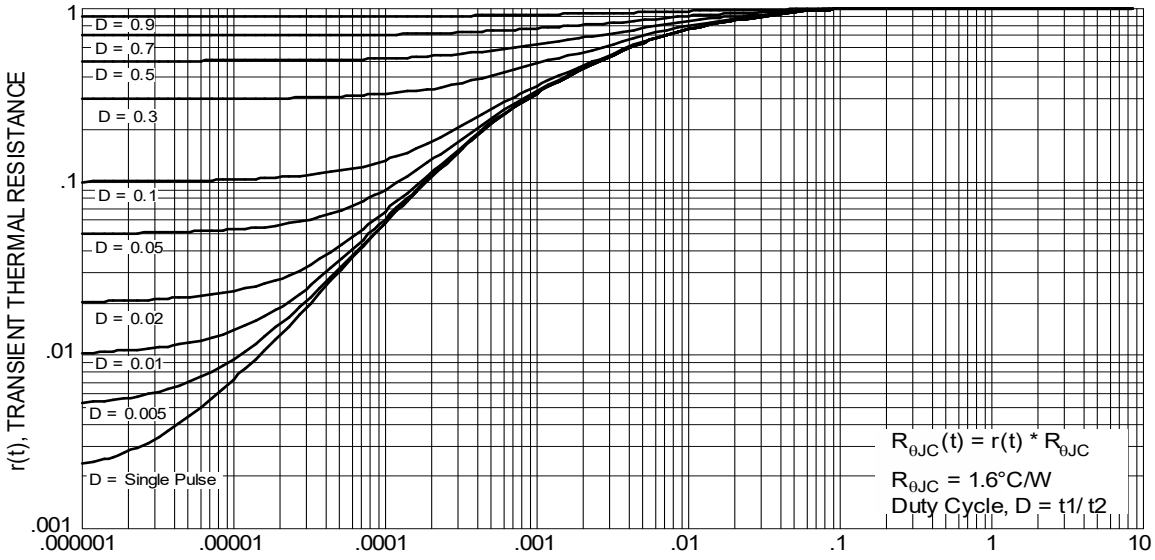


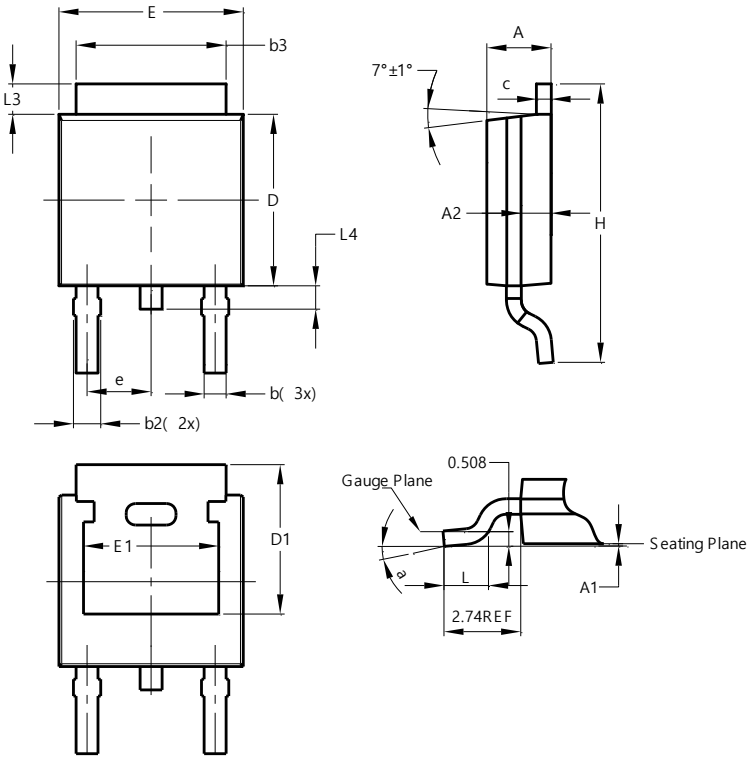
Figure 14 Transient Thermal Resistance

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Package Outline Dimensions

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

TO252 (DPAK)

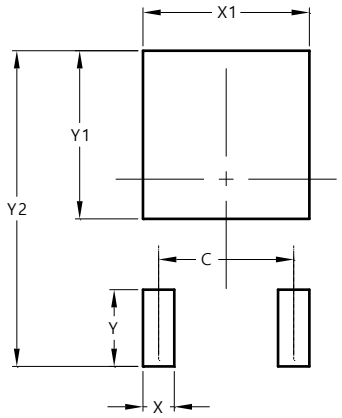


TO252 (DPAK)			
Dim	**Min**	**Max**	**Typ**
A	2.19	2.39	2.29
A1	0.00	0.13	0.08
A2	0.97	1.17	1.07
b	0.64	0.88	0.783
b2	0.76	1.14	0.95
b3	5.21	5.50	5.33
c	0.45	0.58	0.531
D	6.00	6.20	6.10
D1	5.21	--	--
e	2.286 BSC		
E	6.45	6.70	6.58
E1	4.32	--	--
H	9.40	10.41	9.91
L	1.40	1.78	1.59
L3	0.88	1.27	1.08
L4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

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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