40V +175°C N-CHANNEL ENHANCEMENT MODE MOSFET

Product Summary

BV_{DSS}	$R_{DS(ON)}$ max	I_D T_C = +25°C
40V	4.5mΩ @ V_{GS} = 10V	95A

Features

- Rated to +175°C – Ideal for High Ambient Temperature Environments
- 100% Unclamped Inductive Switching – ensures more reliable and robust end application
- Low $R_{DS(ON)}$ – minimizes power losses
- Low Q_g – minimizes switching losses
- **Lead-Free Finish; RoHS Compliant (Notes 1 & 2)**
- **Halogen and Antimony Free. "Green" Device (Note 3)**
- **Qualified to AEC-Q101 Standards for High Reliability**
- **An Automotive-Compliant Part is Available Under Separate Datasheet (DMTH4005SK3Q)**

Description and Applications

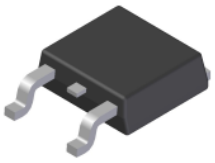
This MOSFET has been designed to minimize the on-state resistance ($R_{DS(ON)}$) and yet maintain superior switching performance, making it ideal for high efficiency power management applications.

- Engine Management Systems
- Body Control Electronics
- DCDC Converters

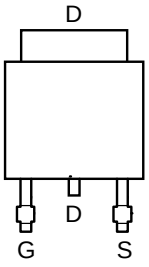
Mechanical Data

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

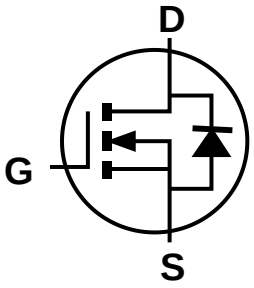
TO252 (DPAK)



Top View



Top View
Pin Out



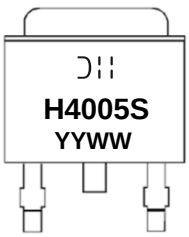
Internal Schematic

Ordering Information (Note 4)

Part Number	Case	Packaging
DMTH4005SK3-13	TO252 (DPAK)	2,500/Tape & Reel

Notes:
1. EU Directive 2002/95/EC (RoHS) & 2011/65/EU (RoHS 2) compliant. All applicable RoHS exemptions applied.
2. See http://www.diodes.com/quality/lead_free.html 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 http://www.diodes.com/products/packages.html.

Marking Information



= Manufacturer's Marking
H4005S = Product Type Marking Code
YYWW = Date Code Marking
YY = Last Two Digits of Year (ex: 16 = 2016)
WW = Week Code (01 to 53)

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	V
Continuous Drain Current (Note 6)	T_C = +25°C (Note 9) T_C = +100°C	I_D	95 73	A
Maximum Body Diode Forward Current (Note 6)	T_C = +25°C	I_S	85	A
Pulsed Drain Current (10µs pulse, duty cycle = 1%)		I_{DM}	150	A
Avalanche Current, L=0.1mH		I_{AS}	32.5	A
Avalanche Energy, L=0.1mH		E_{AS}	52.8	mJ

Thermal Characteristics

Characteristic		Symbol	Value	Unit
Total Power Dissipation (Note 5)	T_A = +25°C	P_D	2.1	W
Thermal Resistance, Junction to Ambient (Note 5)		$R_{\theta JA}$	38	°C/W
Total Power Dissipation (Note 6)	T_C = +25°C	P_D	100	W
Thermal Resistance, Junction to Case (Note 6)		$R_{\theta JC}$	1.5	°C/W
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 7)						
Drain-Source Breakdown Voltage	BV_{DSS}	40	—	—	V	V_{GS} = 0V, I_D = 1mA
Zero Gate Voltage Drain Current	I_{DSS}	—	—	1	µA	V_{DS} = 32V, V_{GS} = 0V
Gate-Source Leakage	I_{GSS}	—	—	±100	nA	V_{GS} = ±20V, V_{DS} = 0V
ON CHARACTERISTICS (Note 7)						
Gate Threshold Voltage	$V_{GS(TH)}$	2	—	4	V	V_{DS} = V_{GS}, I_D = 250µA
Static Drain-Source On-Resistance	$R_{DS(ON)}$	—	3.6	4.5	mΩ	V_{GS} = 10V, I_D = 50A
Diode Forward Voltage	V_{SD}	—	0.9	—	V	V_{GS} = 0V, I_S = 50A
DYNAMIC CHARACTERISTICS (Note 8)						
Input Capacitance	C_{iss}	—	3062	—	pF	V_{DS} = 20V, V_{GS} = 0V, f = 1MHz
Output Capacitance	C_{oss}	—	902	—		
Reverse Transfer Capacitance	C_{rss}	—	179	—		
Gate Resistance	R_G	—	0.67	—	Ω	V_{DS} = 0V, V_{GS} = 0V, f = 1MHz
Total Gate Charge	Q_g	—	49.1	—	nC	V_{DD} = 20V, I_D = 50A, V_{GS} = 10V
Gate-Source Charge	Q_{gs}	—	10.3	—		
Gate-Drain Charge	Q_{gd}	—	13	—		
Turn-On Delay Time	$t_{D(ON)}$	—	8.7	—	ns	V_{DD} = 20V, V_{GS} = 10V, I_D = 50A, R_G = 3Ω
Turn-On Rise Time	t_R	—	6.8	—		
Turn-Off Delay Time	$t_{D(OFF)}$	—	18.6	—		
Turn-Off Fall Time	t_F	—	7.3	—		
Body Diode Reverse Recovery Time	t_{RR}	—	31.8	—	ns	I_F = 50A, di/dt = 100A/µs
Body Diode Reverse Recovery Charge	Q_{RR}	—	26.5	—	nC	

Notes:
5. Device mounted on FR-4 substrate PC board, 2oz copper, with 1inch square copper pad layout.
6. Thermal resistance from junction to soldering point (on the exposed drain pad).
7. Short duration pulse test used to minimize self-heating effect.
8. Guaranteed by design. Not subject to production testing.
9. Package limited.

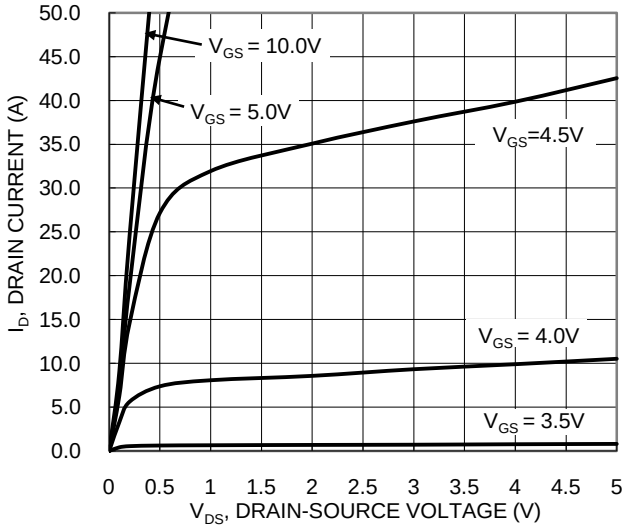


Figure 1. Typical Output Characteristic

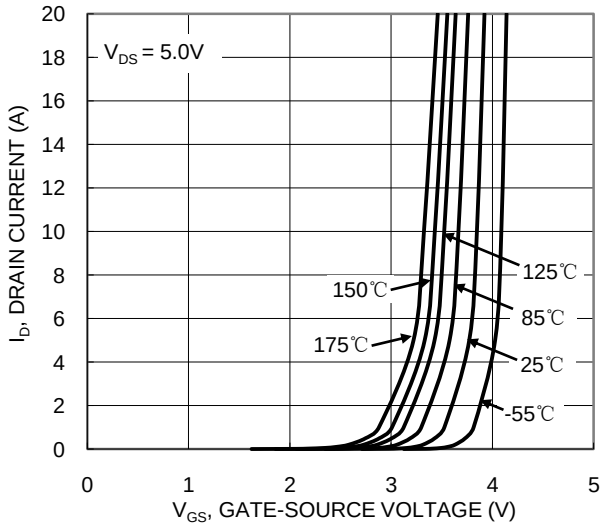


Figure 2. Typical Transfer Characteristic

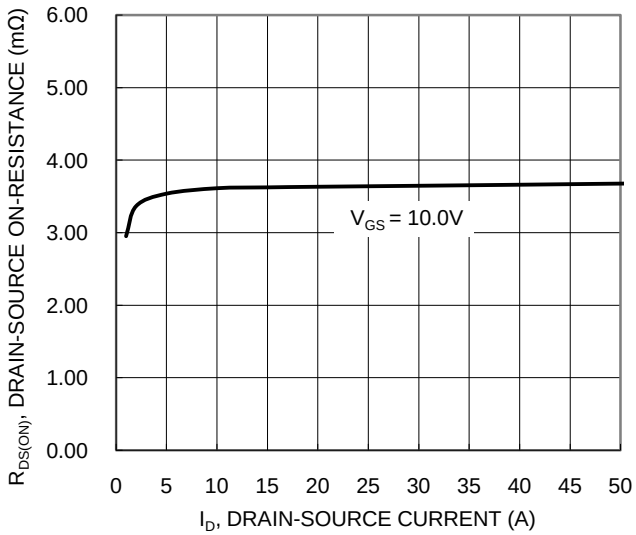


Figure 3. Typical On-Resistance vs. Drain Current and Gate Voltage

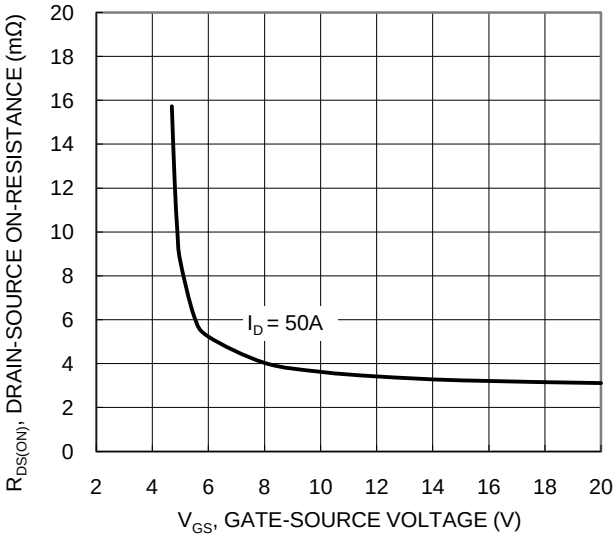


Figure 4. Typical Transfer Characteristic

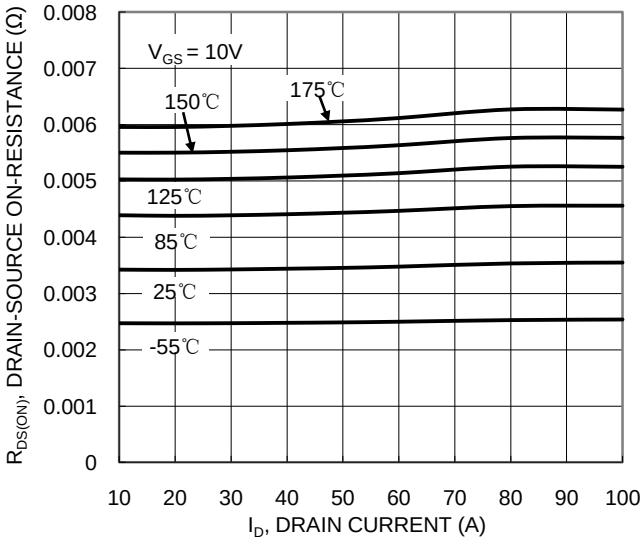


Figure 5. Typical On-Resistance vs. Drain Current and Temperature

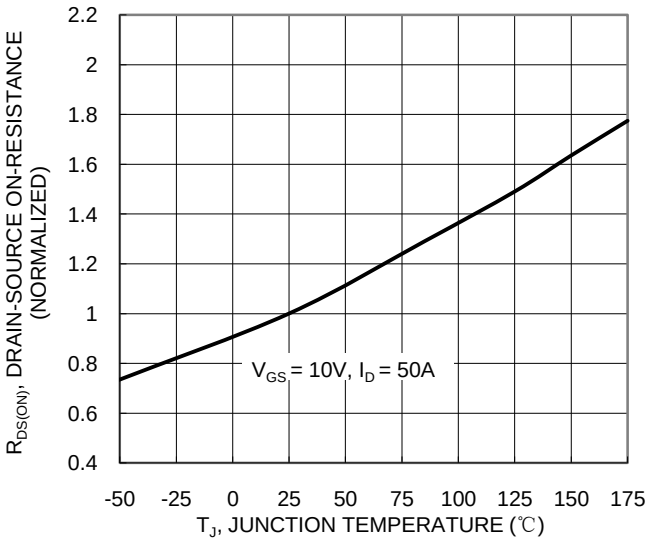


Figure 6. On-Resistance Variation with Temperature

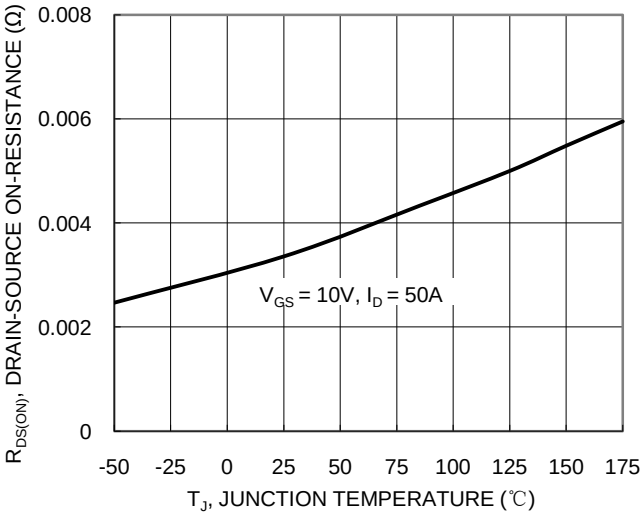


Figure 7. On-Resistance Variation with Temperature

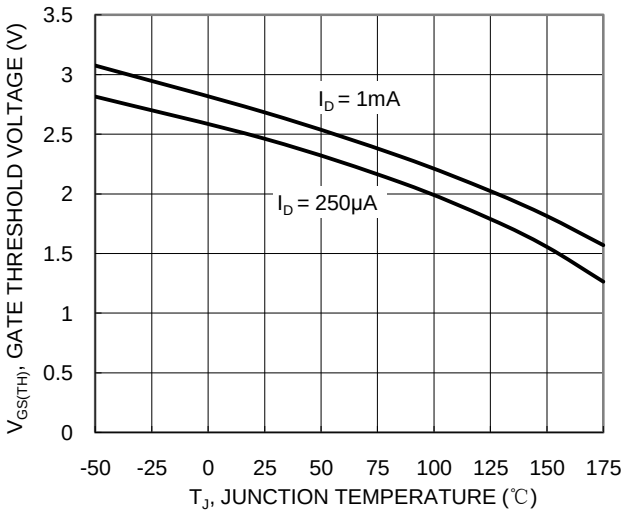


Figure 8. Gate Threshold Variation vs. Temperature

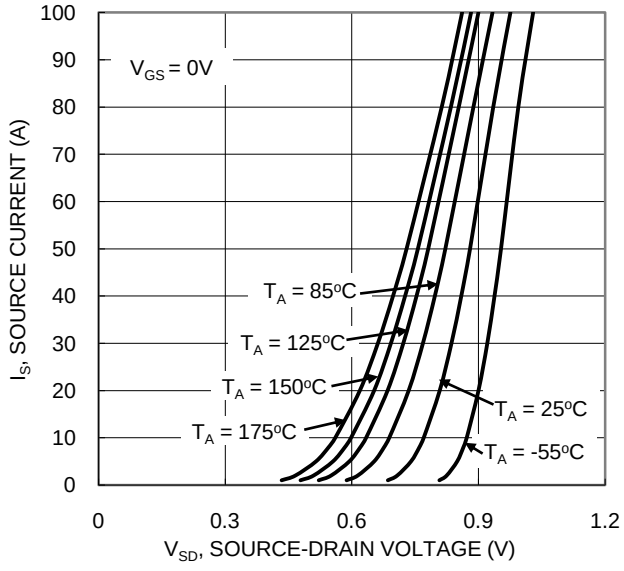


Figure 9. Diode Forward Voltage vs. Current

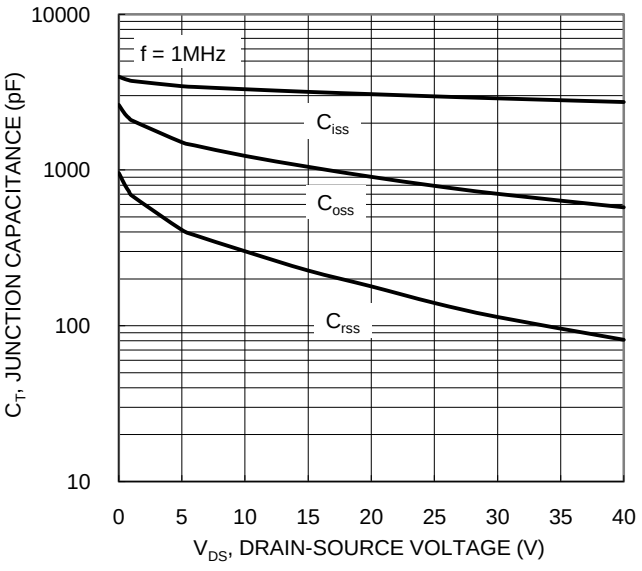


Figure 10. Typical Junction Capacitance

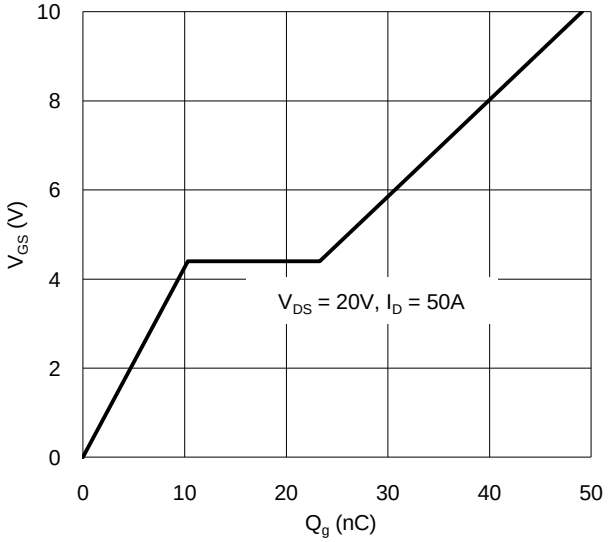


Figure 11. Gate Charge

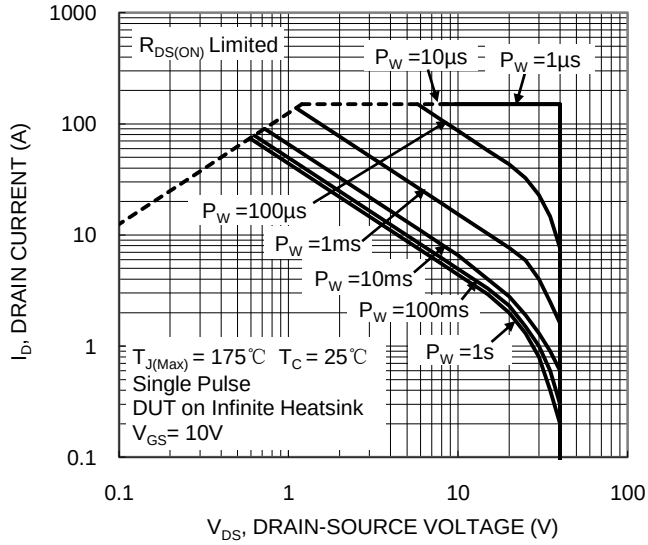


Figure 12. SOA, Safe Operation Area

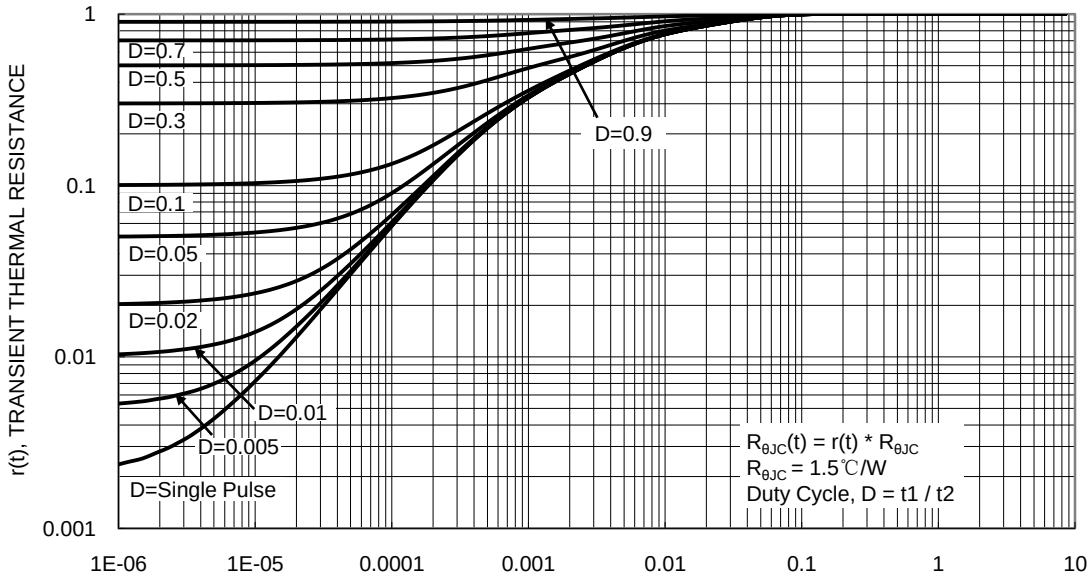
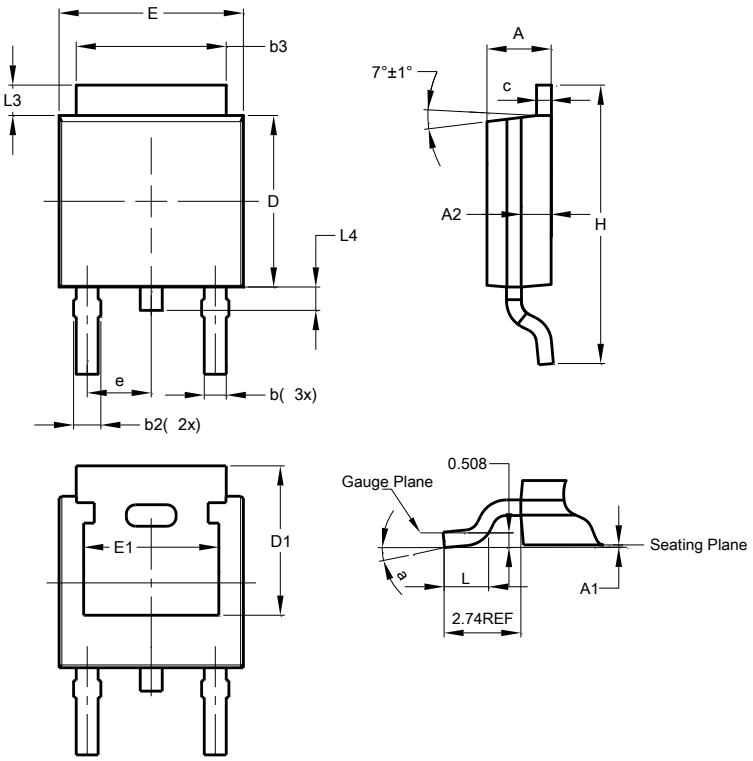


Figure 13. Transient Thermal Resistance

Package Outline Dimensions

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

TO252 (DPAK)

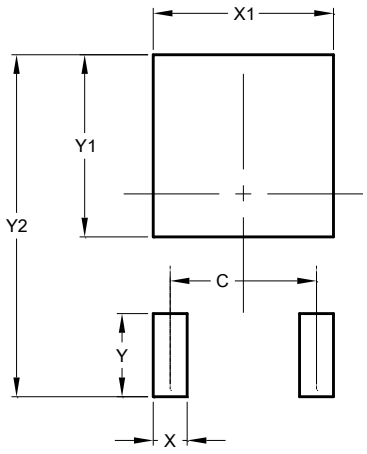


TO252 (DPAK)			
Dim	**Min**	**Max**	**Typ**
A	2.19	2.39	2.29
A1	0.00	0.13	0.08
A2	0.97	1.17	1.07
b	0.64	0.88	0.783
b2	0.76	1.14	0.95
b3	5.21	5.46	5.33
c	0.45	0.58	0.531
D	6.00	6.20	6.10
D1	5.21	-	-
e	-	-	2.286
E	6.45	6.70	6.58
E1	4.32	-	-
H	9.40	10.41	9.91
L	1.40	1.78	1.59
L3	0.88	1.27	1.08
L4	0.64	1.02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