

## Product Summary

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

## 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.

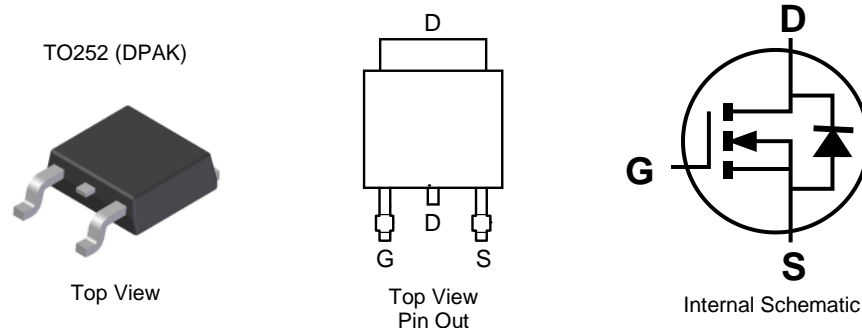
- Engine Management Systems
- Body Control Electronics
- DCDC Converters

## 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](#))**

## 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)

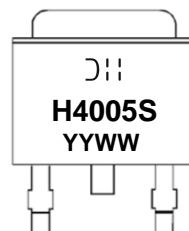


## Ordering Information (Note 4)

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](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<sub>A</sub> = +25°C, unless otherwise specified.)

Characteristic	Symbol	Value	Unit
Drain-Source Voltage	V <sub>DSS</sub>	40	V
Gate-Source Voltage	V <sub>GSS</sub>	±20	V
Continuous Drain Current (Note 6)	I <sub>D</sub>	T <sub>C</sub> = +25°C (Note 9)	95
		T <sub>C</sub> = +100°C	73
Maximum Body Diode Forward Current (Note 6)	I <sub>S</sub>	85	A
Pulsed Drain Current (10µs pulse, duty cycle = 1%)	I <sub>DM</sub>	150	A
Avalanche Current, L=0.1mH	I <sub>AS</sub>	32.5	A
Avalanche Energy, L=0.1mH	E <sub>AS</sub>	52.8	mJ

**Thermal Characteristics**

Characteristic	Symbol	Value	Unit
Total Power Dissipation (Note 5)	P <sub>D</sub>	2.1	W
Thermal Resistance, Junction to Ambient (Note 5)	R <sub>θJA</sub>	38	°C/W
Total Power Dissipation (Note 6)	P <sub>D</sub>	100	W
Thermal Resistance, Junction to Case (Note 6)	R <sub>θJC</sub>	1.5	°C/W
Operating and Storage Temperature Range	T <sub>J</sub> , T <sub>STG</sub>	-55 to +175	°C

**Electrical Characteristics** (@T<sub>A</sub> = +25°C, unless otherwise specified.)

Characteristic	Symbol	Min	Typ	Max	Unit	Test Condition
<b>OFF CHARACTERISTICS (Note 7)</b>						
Drain-Source Breakdown Voltage	BV <sub>DSS</sub>	40	—	—	V	V <sub>GS</sub> = 0V, I <sub>D</sub> = 1mA
Zero Gate Voltage Drain Current	I <sub>DSS</sub>	—	—	1	µA	V <sub>DS</sub> = 32V, 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 (Note 7)</b>						
Gate Threshold Voltage	V <sub>GS(TH)</sub>	2	—	4	V	V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = 250µA
Static Drain-Source On-Resistance	R <sub>DS(ON)</sub>	—	3.6	4.5	mΩ	V <sub>GS</sub> = 10V, I <sub>D</sub> = 50A
Diode Forward Voltage	V <sub>SD</sub>	—	0.9	—	V	V <sub>GS</sub> = 0V, I <sub>S</sub> = 50A
<b>DYNAMIC CHARACTERISTICS (Note 8)</b>						
Input Capacitance	C <sub>iss</sub>	—	3062	—	pF	V <sub>DS</sub> = 20V, V <sub>GS</sub> = 0V, f = 1MHz
Output Capacitance	C <sub>oss</sub>	—	902	—		
Reverse Transfer Capacitance	C <sub>riss</sub>	—	179	—		
Gate Resistance	R <sub>G</sub>	—	0.67	—	Ω	V <sub>DS</sub> = 0V, V <sub>GS</sub> = 0V, f = 1MHz
Total Gate Charge	Q <sub>g</sub>	—	49.1	—	nC	V <sub>DD</sub> = 20V, I <sub>D</sub> = 50A, V <sub>GS</sub> = 10V
Gate-Source Charge	Q <sub>gs</sub>	—	10.3	—		
Gate-Drain Charge	Q <sub>gd</sub>	—	13	—		
Turn-On Delay Time	t <sub>D(ON)</sub>	—	8.7	—	ns	V <sub>DD</sub> = 20V, V <sub>GS</sub> = 10V, I <sub>D</sub> = 50A, R <sub>G</sub> = 3Ω
Turn-On Rise Time	t <sub>R</sub>	—	6.8	—		
Turn-Off Delay Time	t <sub>D(OFF)</sub>	—	18.6	—		
Turn-Off Fall Time	t <sub>F</sub>	—	7.3	—		
Body Diode Reverse Recovery Time	t <sub>RR</sub>	—	31.8	—	ns	I <sub>F</sub> = 50A, di/dt = 100A/µs
Body Diode Reverse Recovery Charge	Q <sub>RR</sub>	—	26.5	—	nC	

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

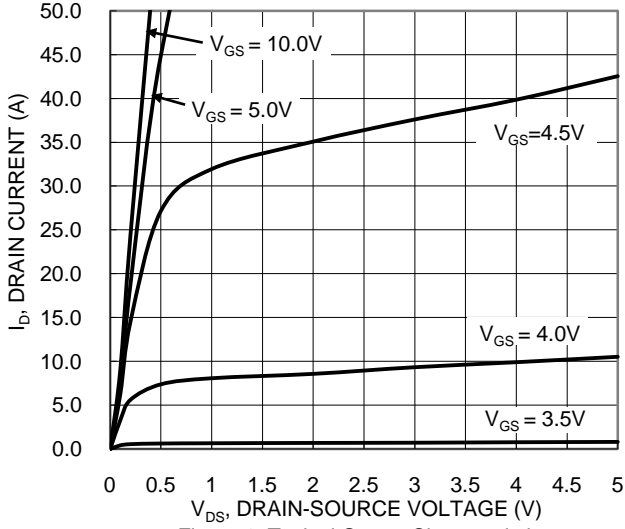


Figure 1. Typical Output Characteristic

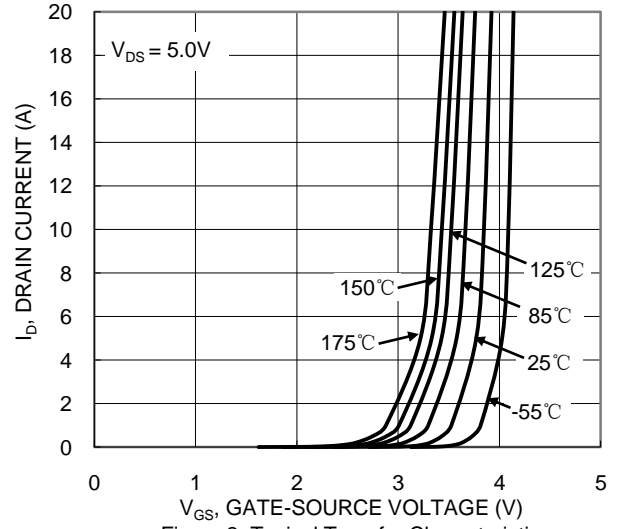


Figure 2. Typical Transfer Characteristic

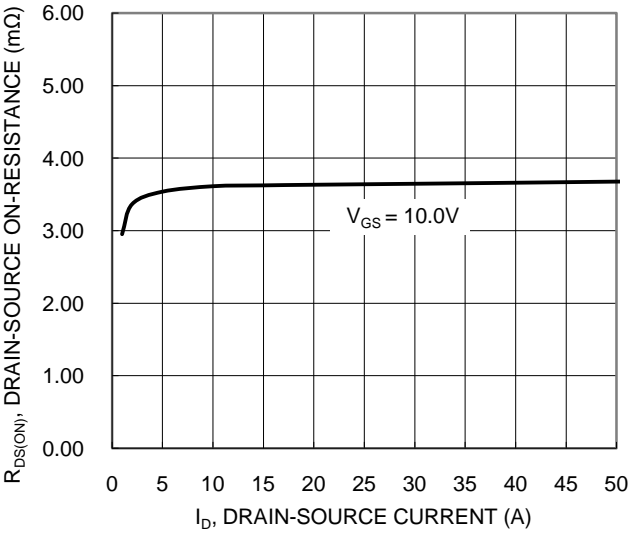


Figure 3. Typical On-Resistance vs. Drain Current and Gate Voltage

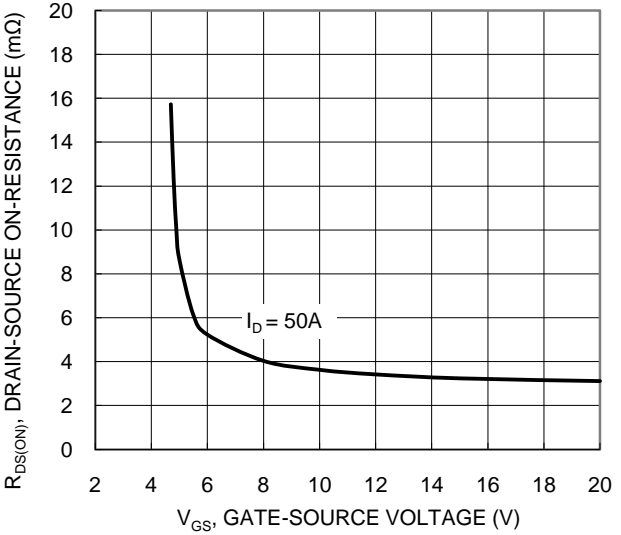


Figure 4. Typical Transfer Characteristic

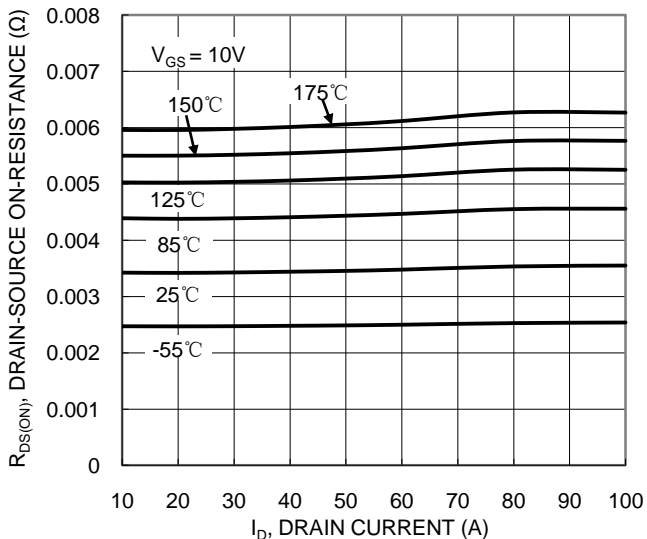


Figure 5. Typical On-Resistance vs. Drain Current and Temperature

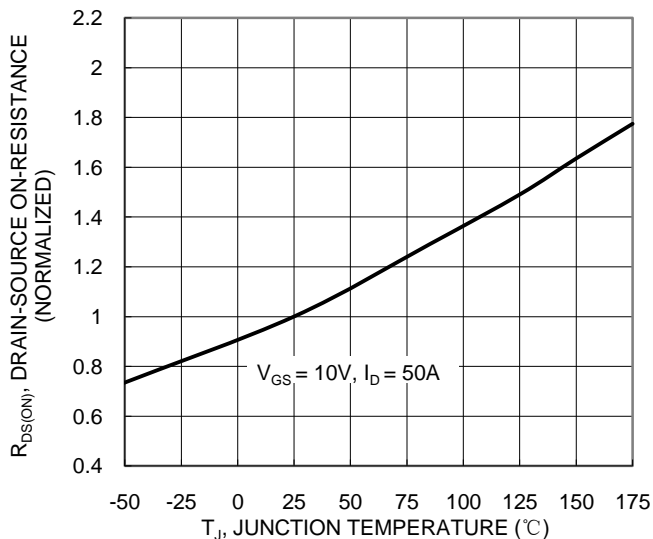


Figure 6. On-Resistance Variation with Temperature

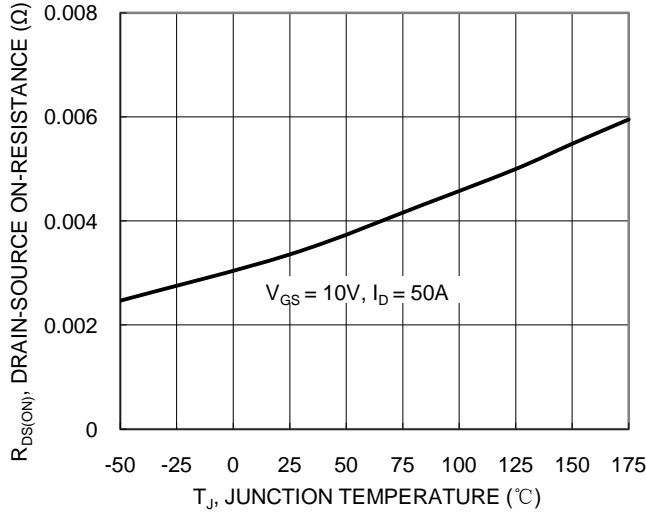


Figure 7. On-Resistance Variation with Temperature

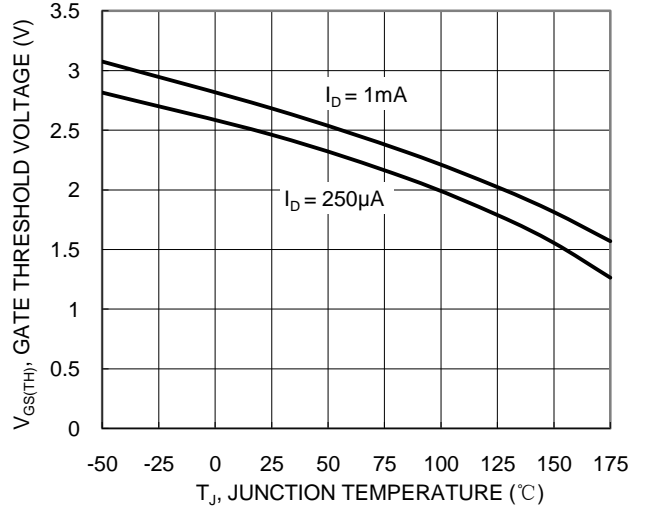


Figure 8. Gate Threshold Variation vs. Temperature

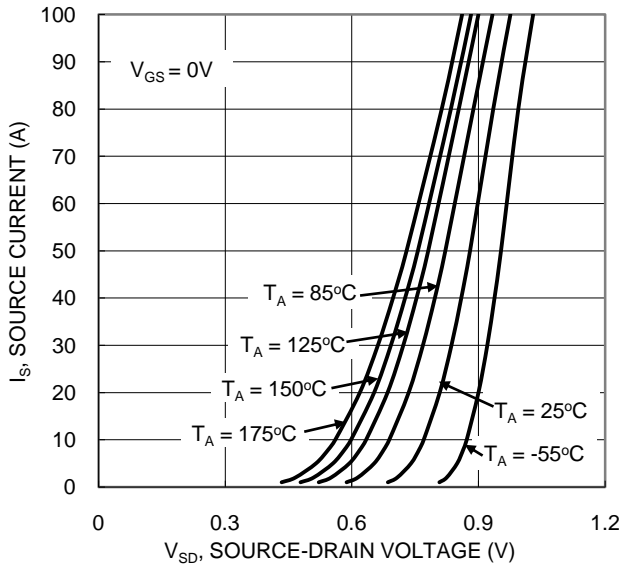


Figure 9. Diode Forward Voltage vs. Current

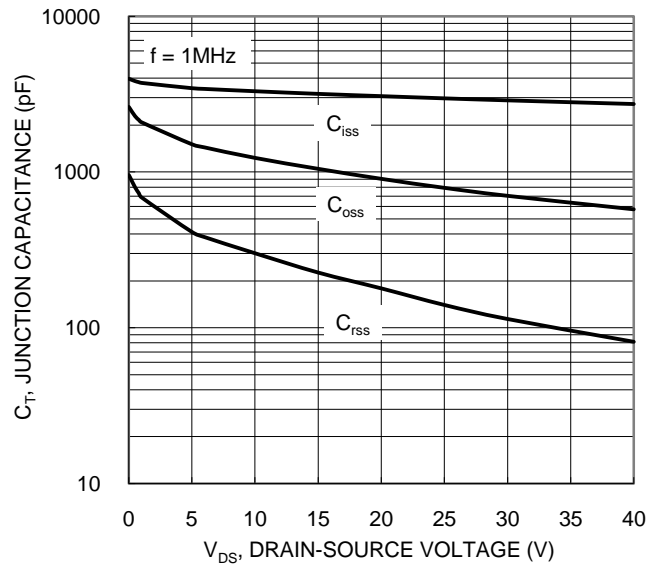


Figure 10. Typical Junction Capacitance

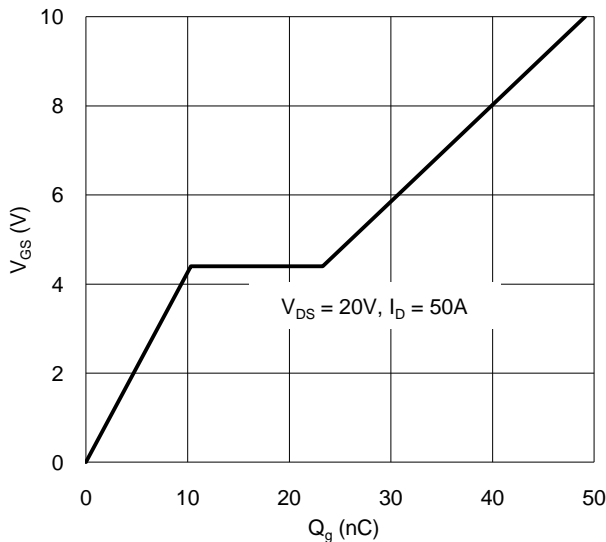


Figure 11. Gate Charge

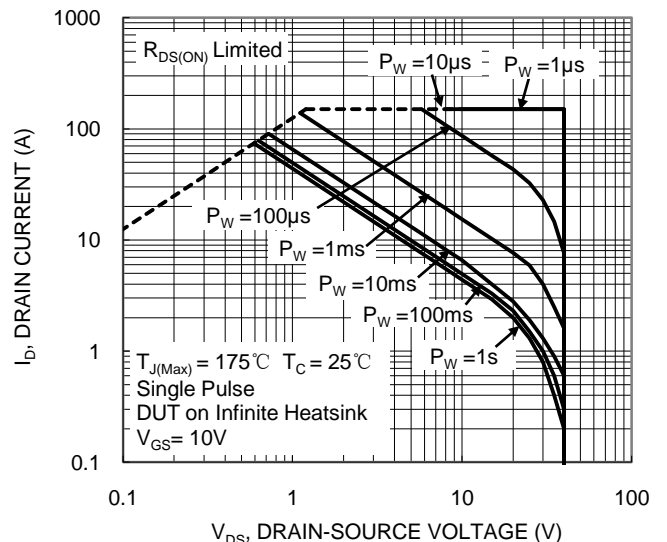


Figure 12. SOA, Safe Operation Area

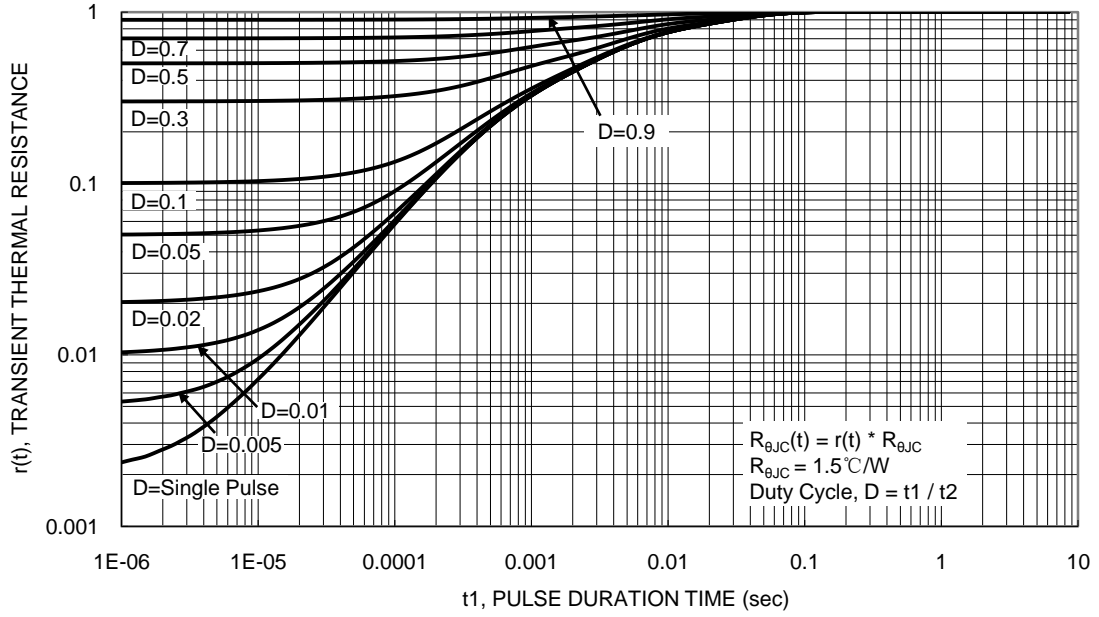
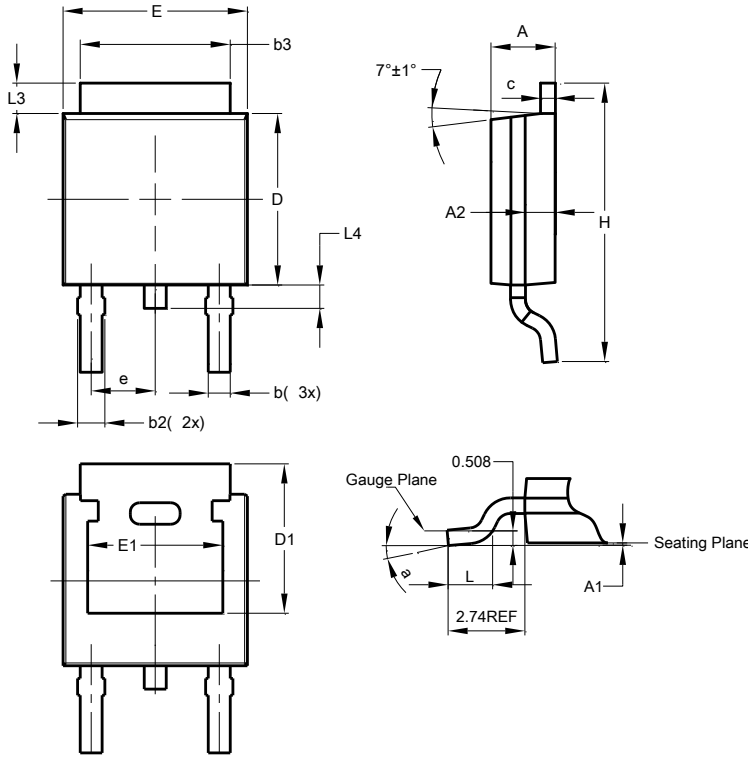


Figure 13. Transient Thermal Resistance

**Package Outline Dimensions**

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

**TO252 (DPAK)**

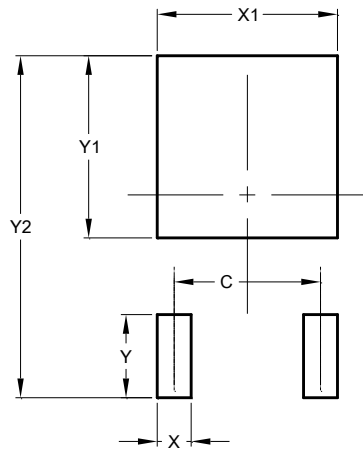


TO252 (DPAK)			
Dim	Min	Max	Typ
A	2.19	2.39	2.29
A1	0.00	0.13	0.08
A2	0.97	1.17	1.07
b	0.64	0.88	0.783
b2	0.76	1.14	0.95
b3	5.21	5.46	5.33
c	0.45	0.58	0.531
D	6.00	6.20	6.10
D1	5.21	-	-
e	-	-	2.286
E	6.45	6.70	6.58
E1	4.32	-	-
H	9.40	10.41	9.91
L	1.40	1.78	1.59
L3	0.88	1.27	1.08
L4	0.64	1.02	0.83
a	0°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