

Product Summary

BV_{DSS}	$R_{DS(ON)}$ Max	I_D Max $T_C = +25^\circ\text{C}$
60V	23m Ω @ $V_{GS} = 10\text{V}$	50A
	28m Ω @ $V_{GS} = 4.5\text{V}$	45A

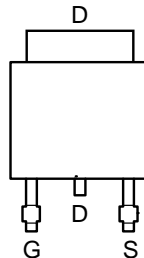
Description and Applications

This new generation 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.

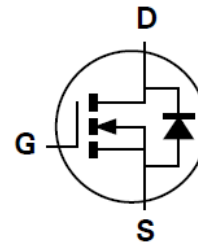
- Power Management
- Driving Solenoids
- Motor Control



Top View



Pin Out Top View



Equivalent Circuit

Features

- Rated to +175°C – Ideal for High Ambient Temperature Environments
- 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**
- **An Automotive-Compliant Part is Available Under Separate Datasheet ([DMNH6021SK3Q](#))**

Mechanical Data

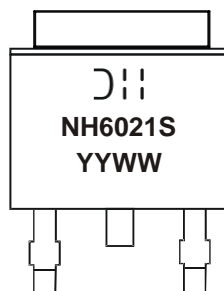
- Case: TO252 (DPAK)
- Case Material: Molded Plastic, "Green" Molding Compound. UL Flammability Classification Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminals: Finish – Matte Tin Annealed over Copper Leadframe. Solderable per MIL-STD-202, Method 208 (E3)
- Terminal Connections: See Diagram
- Weight: 0.33 grams (Approximate)

Ordering Information (Note 4)

Part Number	Case	Packaging
DMNH6021SK3-13	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



D|| = Manufacturer's Marking
 NH6021S = 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}	60	V
Gate-Source Voltage	V _{GSS}	±20	V
Continuous Drain Current (Note 7) V _{GS} = 10V	I _D	50	A
		35	
Pulsed Drain Current (10µs Pulse, Duty Cycle = 1%)	I _{DM}	80	A
Maximum Continuous Body Diode Forward Current (Note 7)	I _S	40	A
Avalanche Current, L = 0.1mH (Note 8)	I _{AS}	35	A
Avalanche Energy, L = 0.1mH (Note 8)	E _{AS}	64	mJ

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

Characteristic	Symbol	Value	Unit
Total Power Dissipation (Note 5)	P _D	2.1	W
Thermal Resistance, Junction to Ambient (Note 5)	R _{θJA}	73	°C/W
Steady State			
Total Power Dissipation (Note 6)	P _D	3.7	W
Thermal Resistance, Junction to Ambient (Note 6)	R _{θJA}	40	°C/W
Steady State			
Thermal Resistance, Junction to Case (Note 7)	R _{θJC}	1.8	°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 9)						
Drain-Source Breakdown Voltage	BV _{DSS}	60	-	-	V	V _{GS} = 0V, I _D = 250µA
Zero Gate Voltage Drain Current	I _{DSS}	-	-	1	µA	V _{DS} = 60V, V _{GS} = 0V
Gate-Source Leakage	I _{GSS}	-	-	±100	nA	V _{GS} = ±20V, V _{DS} = 0V
ON CHARACTERISTICS (Note 9)						
Gate Threshold Voltage	V _{GS(TH)}	1	-	3	V	V _{DS} = V _{GS} , I _D = 250µA
Static Drain-Source On-Resistance	R _{DS(ON)}	-	13	23	mΩ	V _{GS} = 10V, I _D = 12A
		-	18	28		V _{GS} = 4.5V, I _D = 12A
Diode Forward Voltage	V _{SD}	-	0.75	1.2	V	V _{GS} = 0V, I _S = 20A
DYNAMIC CHARACTERISTICS (Note 10)						
Input Capacitance	C _{iss}	-	1143	-	pF	V _{DS} = 25V, V _{GS} = 0V, f = 1MHz
Output Capacitance	C _{oss}	-	168	-	pF	
Reverse Transfer Capacitance	C _{rss}	-	69	-	pF	
Gate Resistance	R _g	-	2.5	-	Ω	V _{DS} = 0V, V _{GS} = 0V, f = 1MHz
Total Gate Charge (V _{GS} = 10V)	Q _g	-	20.1	-	nC	V _{DS} = 30V, I _D = 20A
Total Gate Charge (V _{GS} = 4.5V)	Q _g	-	12.1	-	nC	
Gate-Source Charge	Q _{gs}	-	4.3	-	nC	
Gate-Drain Charge	Q _{gd}	-	5.5	-	nC	
Turn-On Delay Time	t _{D(ON)}	-	4.4	-	ns	V _{DD} = 30V, V _{GS} = 10V, R _G = 4.7Ω, I _D = 10A
Turn-On Rise Time	t _R	-	6.0	-	ns	
Turn-Off Delay Time	t _{D(OFF)}	-	14.2	-	ns	
Turn-Off Fall Time	t _F	-	5.4	-	ns	I _F = 20A, di/dt = 100A/µs
Reverse Recovery Time	t _{RR}	-	21.2	-	ns	
Reverse Recovery Charge	Q _{RR}	-	15.2	-	nC	

- Notes:
- Device mounted on FR-4 PC board, with minimum recommended pad layout, single sided.
 - Device mounted on FR-4 substrate PC board, 2oz copper, with thermal bias to bottom layer 1inch square copper plate.
 - Thermal resistance from junction to soldering point (on the exposed drain pad).
 - I_{AS} and E_{AS} ratings are based on low frequency and duty cycles to keep T_J = +25°C.
 - Short duration pulse test used to minimize self-heating effect.
 - Guaranteed by design. Not subject to product testing.

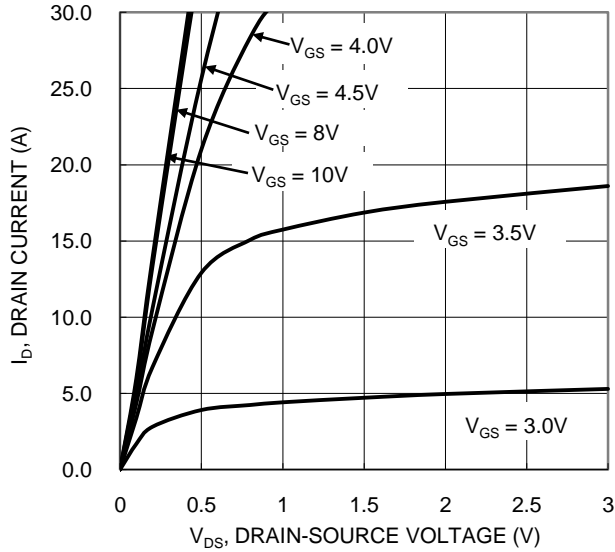


Figure 1. Typical Output Characteristic

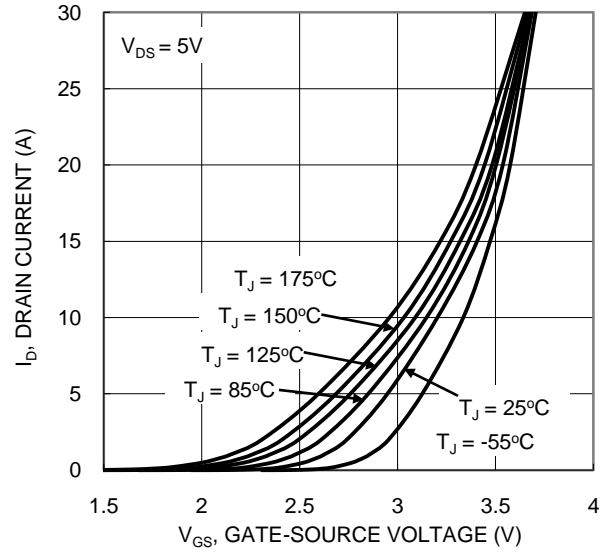


Figure 2. Typical Transfer Characteristic

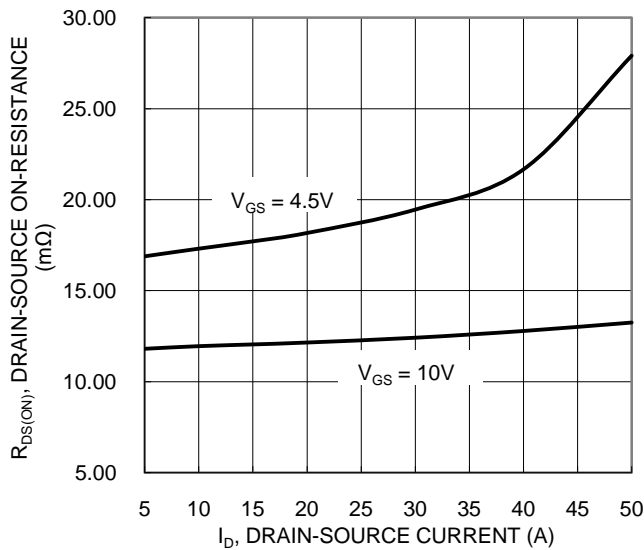


Figure 3. Typical On-Resistance vs Drain Current and Gate Voltage

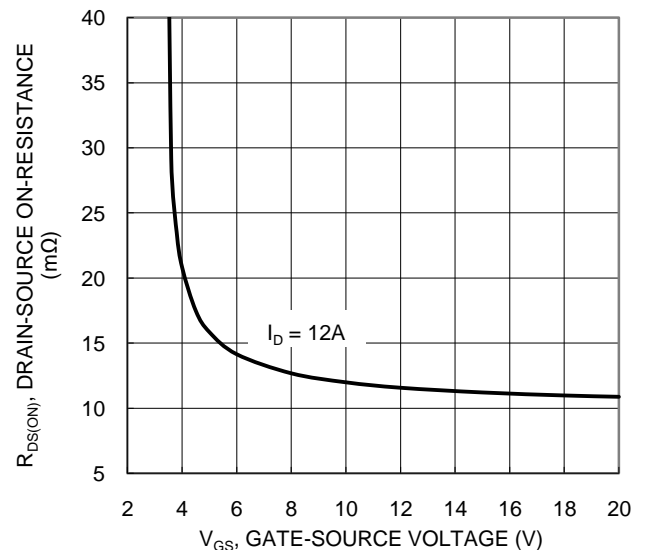


Figure 4. Typical Transfer Characteristic

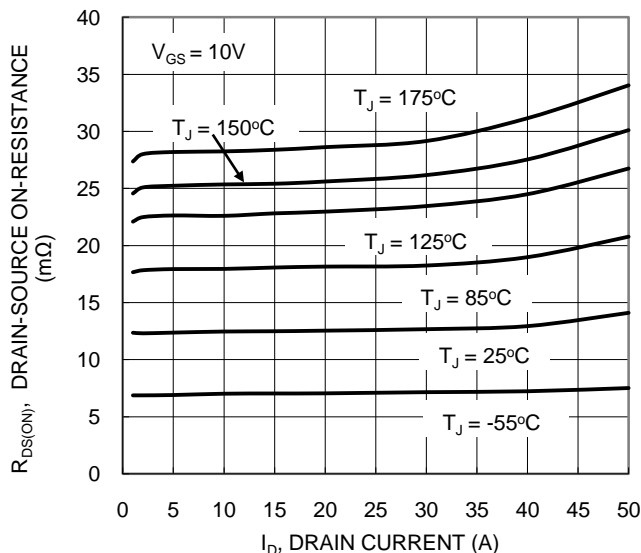


Figure 5. Typical On-Resistance vs Drain Current and Temperature

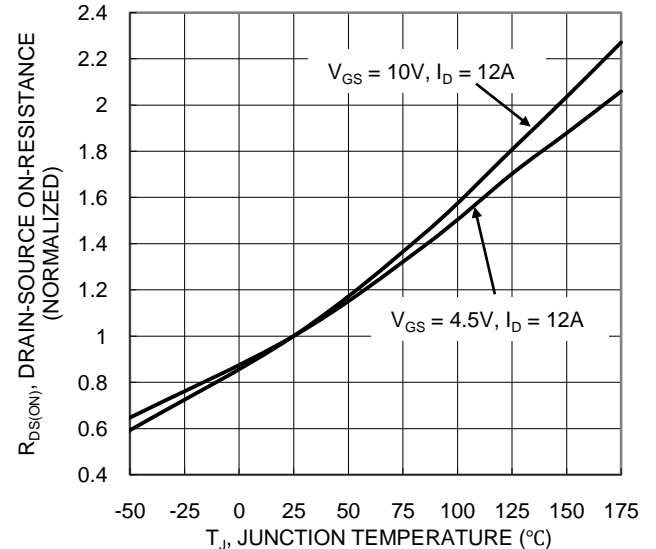


Figure 6. On-Resistance Variation with Temperature

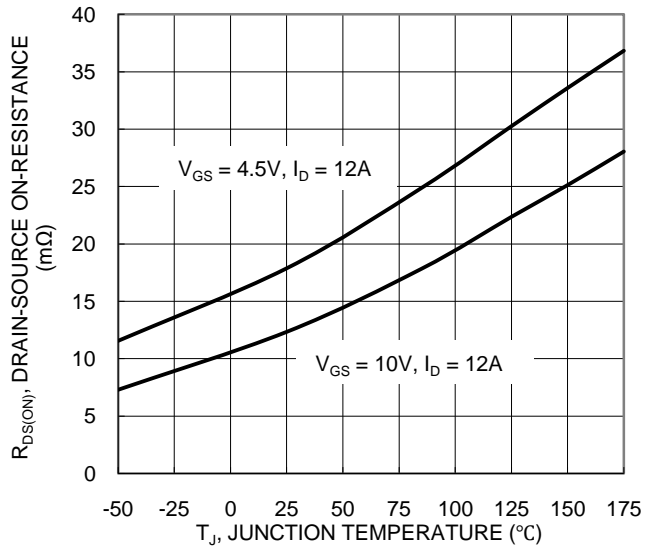


Figure 7. On-Resistance Variation with Temperature

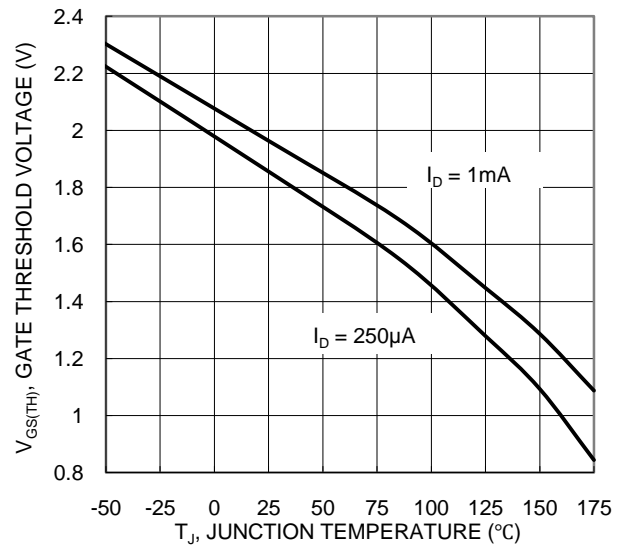


Figure 8. Gate Threshold Variation vs Junction Temperature

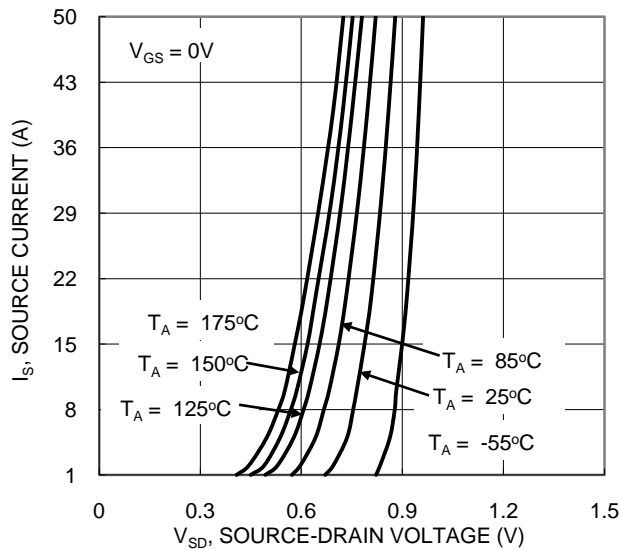


Figure 9. Diode Forward Voltage vs. Current

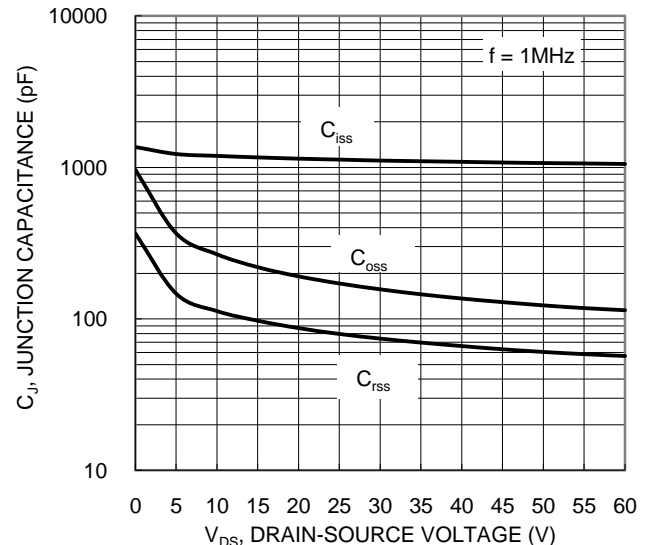


Figure 10. Typical Junction Capacitance

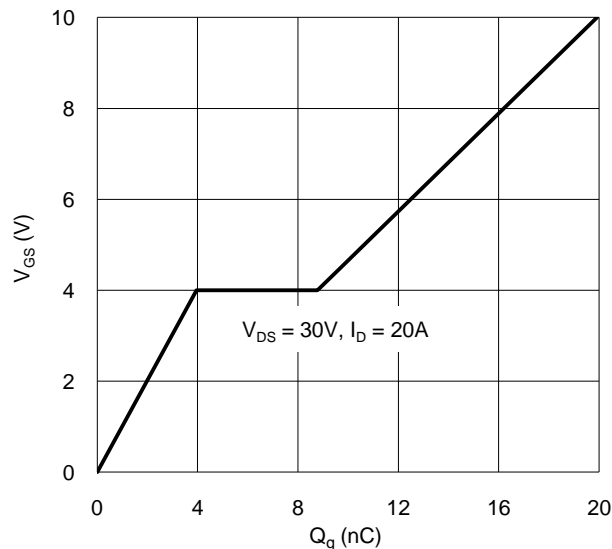


Figure 11. Gate Charge

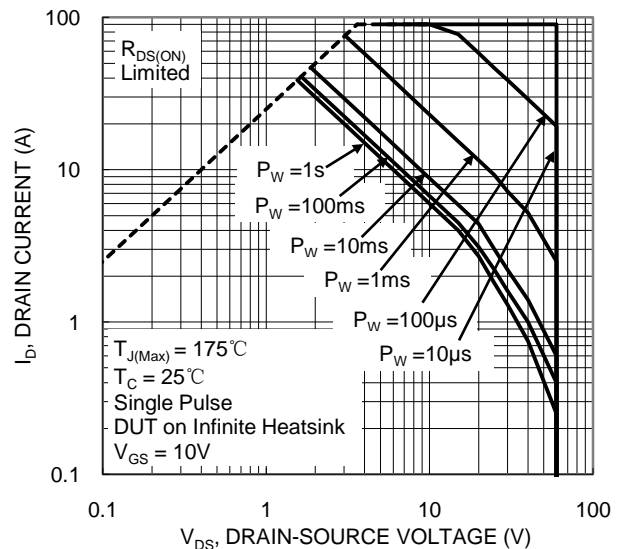


Figure 12. SOA, Safe Operation Area

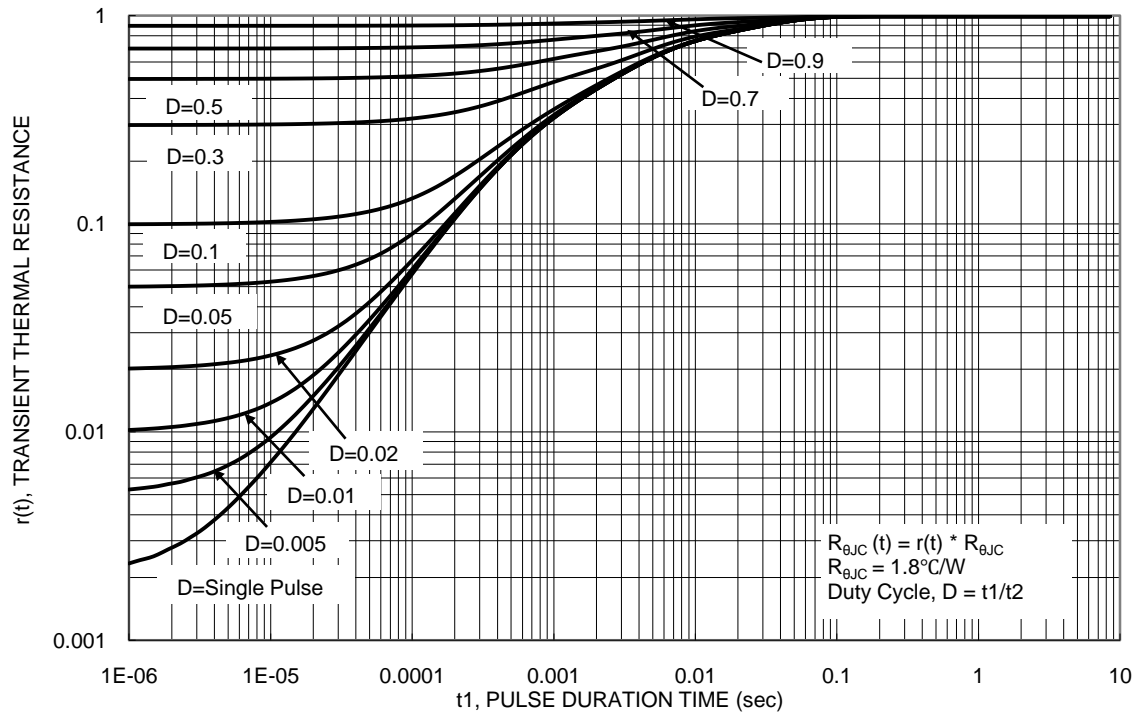
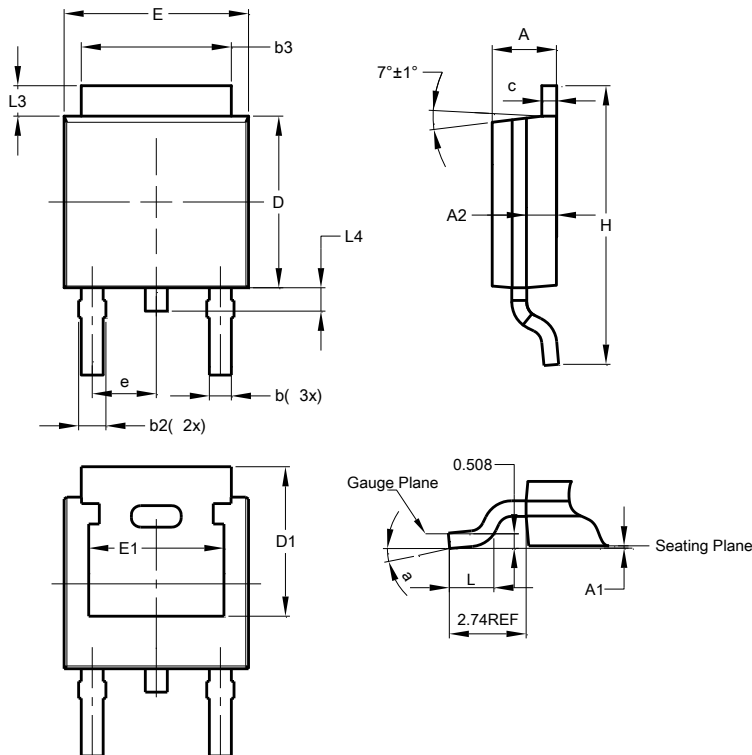


Figure 13. Transient Thermal Resistance

Package Outline Dimensions

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

TO252 (DPAK)

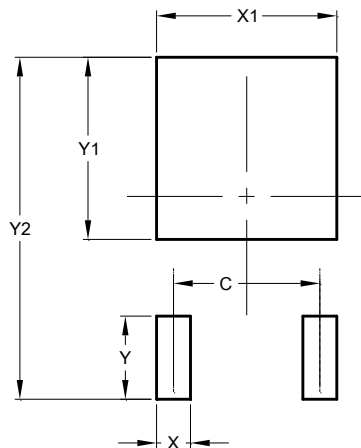


TO252 (DPAK)			
Dim	Min	Max	Typ
A	2.19	2.39	2.29
A1	0.00	0.13	0.08
A2	0.97	1.17	1.07
b	0.64	0.88	0.783
b2	0.76	1.14	0.95
b3	5.21	5.46	5.33
c	0.45	0.58	0.531
D	6.00	6.20	6.10
D1	5.21	-	-
e	-	-	2.286
E	6.45	6.70	6.58
E1	4.32	-	-
H	9.40	10.41	9.91
L	1.40	1.78	1.59
L3	0.88	1.27	1.08
L4	0.64	1.02	0.83
a	0°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