40V 175°C N-CHANNEL ENHANCEMENT MODE MOSFET

Product Summary

BV_{DSS}	$R_{DS(ON)}$ Max	I_D Max T_C = +25°C
40V	6mΩ @ V_{GS} = 10V	140A

Description and Applications

This MOSFET is 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:

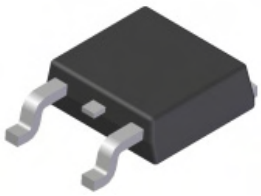
- Engine Management Systems
- Body Control Electronics
- DC-DC Converters

Features

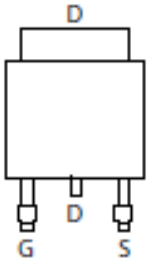
- Rated to +175°C – Ideal for High Ambient Temperature Environments
- 100% Unclamped Inductive Switching – Ensures More Reliable and Robust End Application
- Low Qg – Minimizes Switching Loss
- Low $R_{DS(ON)}$ – Minimizes On State Loss
- **Lead-Free Finish; RoHS Compliant (Notes 1 & 2)**
- **Halogen and Antimony Free. "Green" Device (Note 3)**
- **Qualified to AEC-Q101 Standards for High Reliability**
- **PPAP Capable (Note 4)**

Mechanical Data

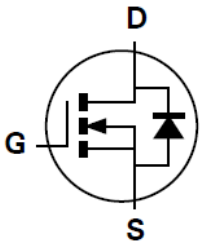
- Case: TO252 (DPAK)
- Case Material: Molded Plastic, "Green" Molding Compound.
- UL Flammability Classification Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminal Finish - Matte Tin Annealed over Copper Leadframe. Solderable per MIL-STD-202, Method 208 e3
- Weight: 0.315 grams (Approximate)



Top View



Pin Out Top View



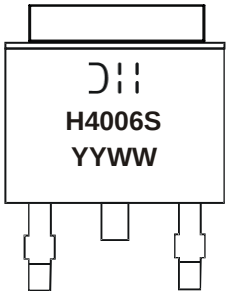
Equivalent Circuit

Ordering Information (Note 5)

Part Number	Case	Packaging
DMNH4006SK3Q-13	TO252 (DPAK)	2500/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. Automotive products are AEC-Q101 qualified and are PPAP capable. Refer to http://www.diodes.com/product_compliance_definitions.html.
5. For packaging details, go to our website at http://www.diodes.com/products/packages.html.

Marking Information



=Manufacturer's Marking
H4006S = Product Type Marking Code
YYWW = Date Code Marking
YY = Last Two Digits of Year
(ex: 16 = 2016)
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}	40	V
Gate-Source Voltage		V_{GSS}	±20	V
Continuous Drain Current , V_{GS} = 10V (Note 7)	T_A = +25°C T_A = +70°C	I_D	20 16	A
Continuous Drain Current , V_{GS} = 10V (Note 8)	T_C = +25°C T_C = +100°C	I_D	140 100	A
Pulsed Drain Current (380µs Pulse, Duty Cycle = 1%)		I_{DM}	200	A
Maximum Continuous Body Diode Forward Current (Note 8)		I_S	120	A
Avalanche Current, L = 0.1mH (Note 9)		I_{AS}	64	A
Avalanche Energy, L = 0.1mH (Note 9)		E_{AS}	208	mJ

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

Characteristic		Symbol	Value	Unit
Total Power Dissipation (Note 6)		P_D	2.2	W
Thermal Resistance, Junction to Ambient (Note 6)	Steady State	$R_{\theta JA}$	68	°C/W
	t<10s		29	
Total Power Dissipation (Note 7)		P_D	3.6	W
Thermal Resistance, Junction to Ambient (Note 7)	Steady State	$R_{\theta JA}$	42	°C/W
	t<10s		21	
Thermal Resistance, Junction to Case (Note 8)		$R_{\theta JC}$	0.8	
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 10)						
Drain-Source Breakdown Voltage	BV_{DSS}	40	—	—	V	V_{GS} = 0V, I_D = 250µA
Zero Gate Voltage Drain Current, T_J = +25°C	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 (Note 10)						
Gate Threshold Voltage	$V_{GS(TH)}$	2	—	4	V	V_{DS} = V_{GS}, I_D = 250µA
Static Drain-Source On-Resistance	$R_{DS(ON)}$	—	—	6	mΩ	V_{GS} = 10V, I_D = 86A
Diode Forward Voltage	V_{SD}	—	0.7	1.2	V	V_{GS} = 0V, I_S = 1.0A
DYNAMIC CHARACTERISTICS (Note 11)						
Input Capacitance	C_{iss}	—	2280	—	pF	V_{DS} = 25V, V_{GS} = 0V, f = 1MHz
Output Capacitance	C_{oss}	—	556	—	pF	
Reverse Transfer Capacitance	C_{rss}	—	282	—	pF	
Gate Resistance	R_g	—	1.7	—	Ω	V_{DS} = 0V, V_{GS} = 0V, f = 1MHz
Total Gate Charge (V_{GS} = 6V)	Q_g	—	32	—	nC	V_{DS} = 32V, I_D = 86A
Total Gate Charge (V_{GS} = 10V)	Q_g	—	51	—	nC	
Gate-Source Charge	Q_{gs}	—	9.6	—	nC	
Gate-Drain Charge	Q_{gd}	—	20.4	—	nC	
Turn-On Delay Time	$t_{D(ON)}$	—	7.7	—	ns	V_{GS} = 10V, V_{DS} = 20V, R_g = 3.5Ω, I_D = 86A
Turn-On Rise Time	t_R	—	9.3	—	ns	
Turn-Off Delay Time	$t_{D(OFF)}$	—	18	—	ns	
Turn-Off Fall Time	t_F	—	8.1	—	ns	
Body Diode Reverse Recovery Time	t_{RR}	—	32	—	ns	I_F = 50A, di/dt = 100A/µs
Body Diode Reverse Recovery Charge	Q_{RR}	—	28	—	nC	I_F = 50A, di/dt = 100A/µs

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

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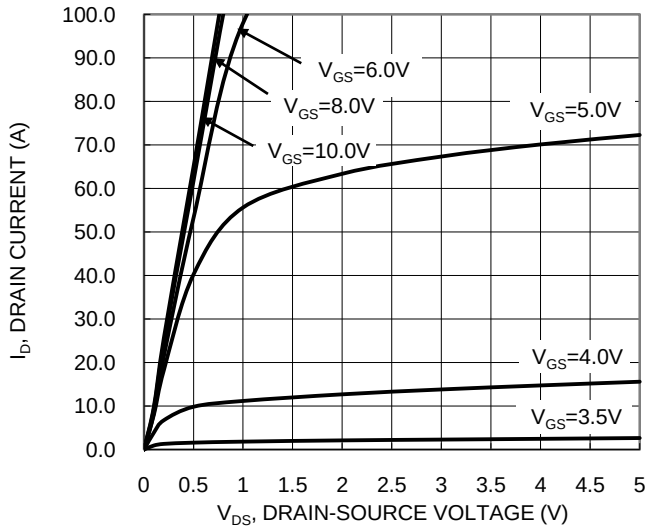

Figure 1. Typical Output Characteristic

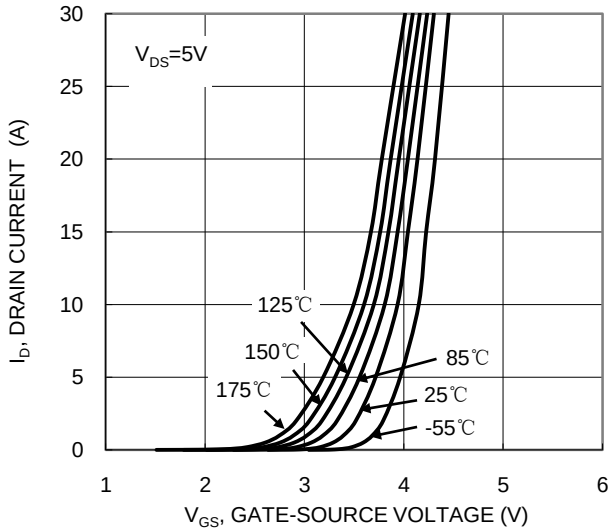

Figure 2. Typical Transfer Characteristic

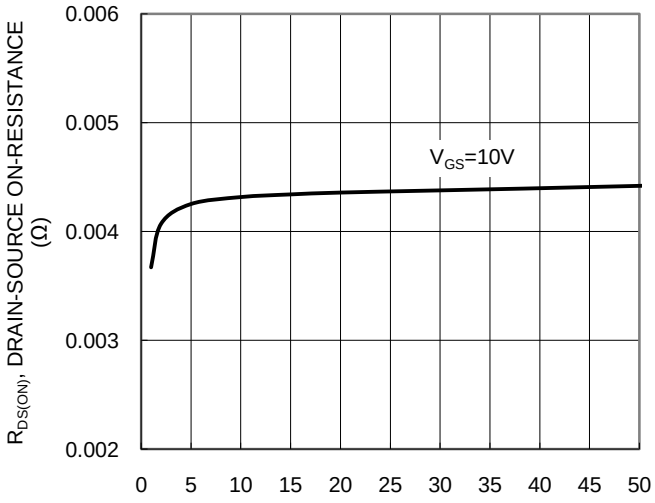

Figure 3. Typical On-Resistance vs. Drain Current and Gate Voltage

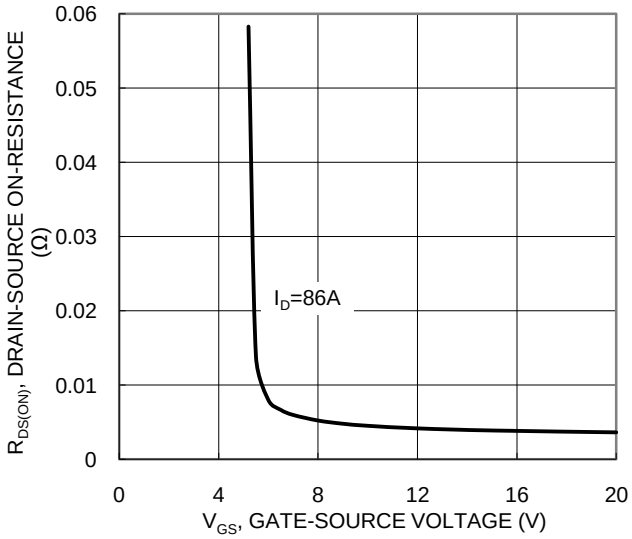

Figure 4. Typical Transfer Characteristic

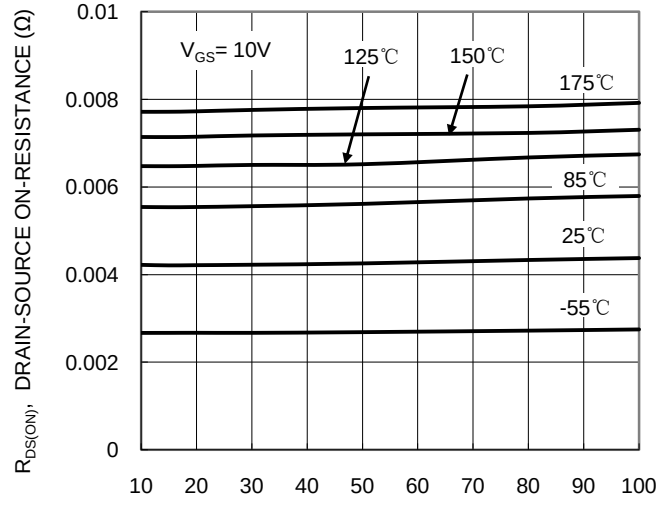

Figure 5. Typical On-Resistance vs. Drain Current and Junction Temperature

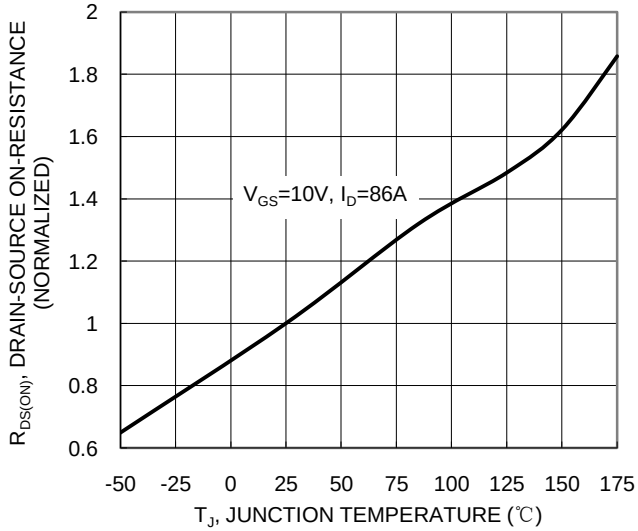

Figure 6. On-Resistance Variation with Junction Temperature

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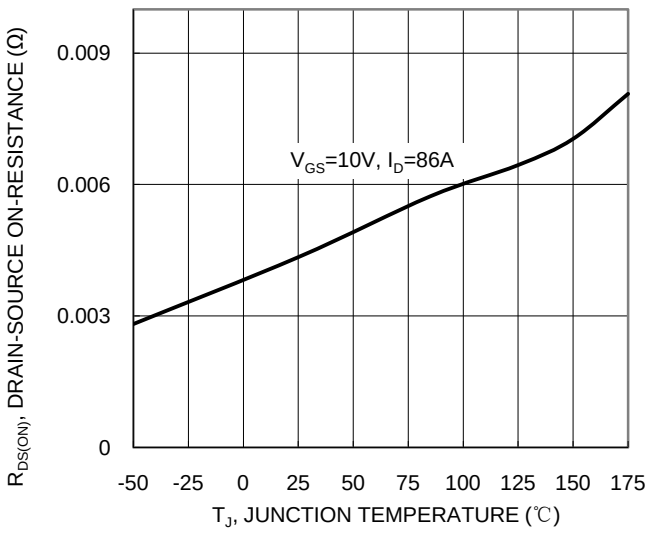

Figure 7. On-Resistance Variation with Junction Temperature

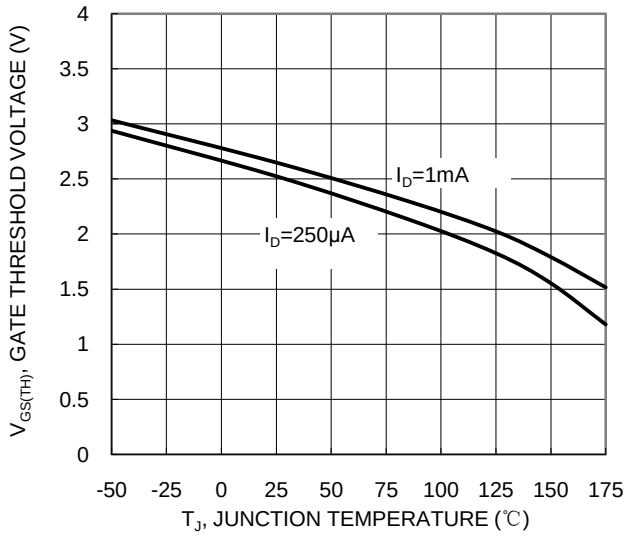

Figure 8. Gate Threshold Variation vs. Junction Temperature

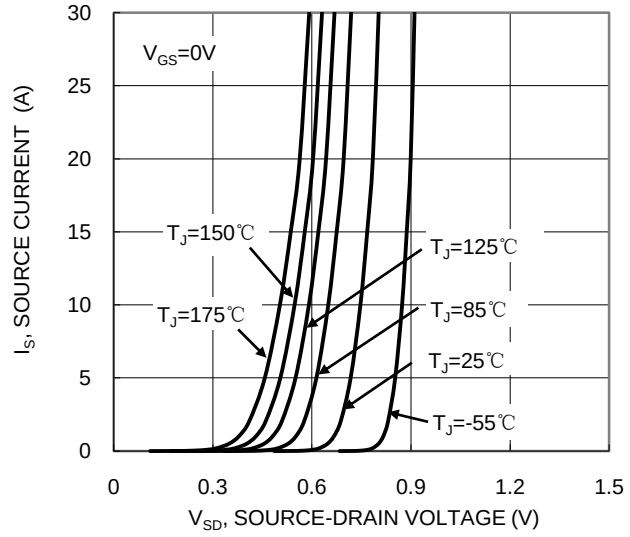

Figure 9. Diode Forward Voltage vs. Current

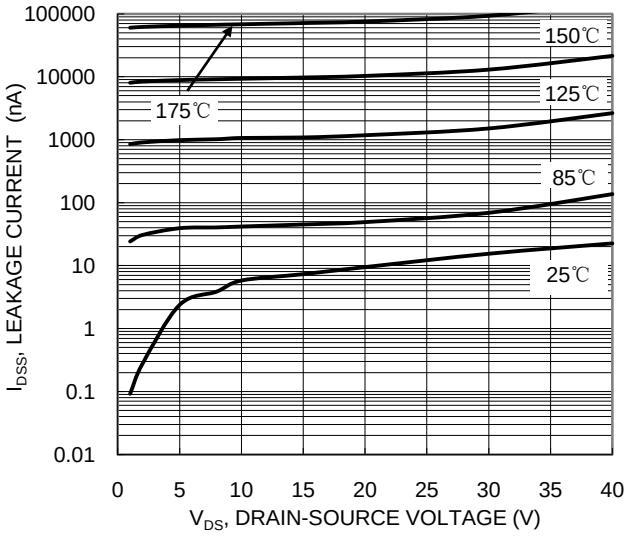

Figure 10. Typical Drain-Source Leakage Current vs. Voltage

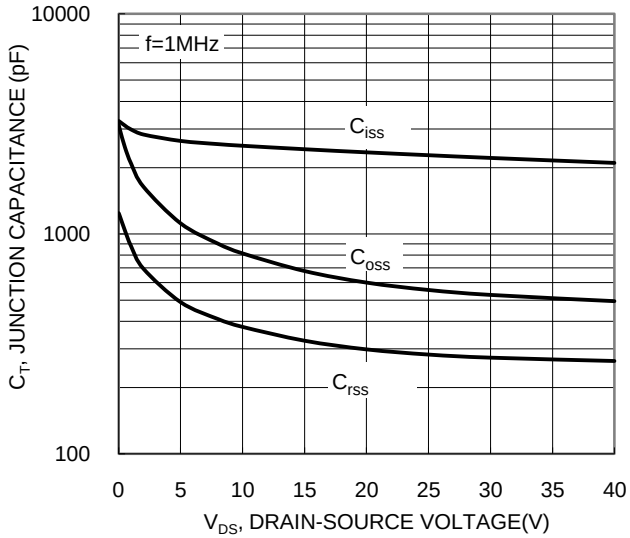

Figure 11. Typical Junction Capacitance

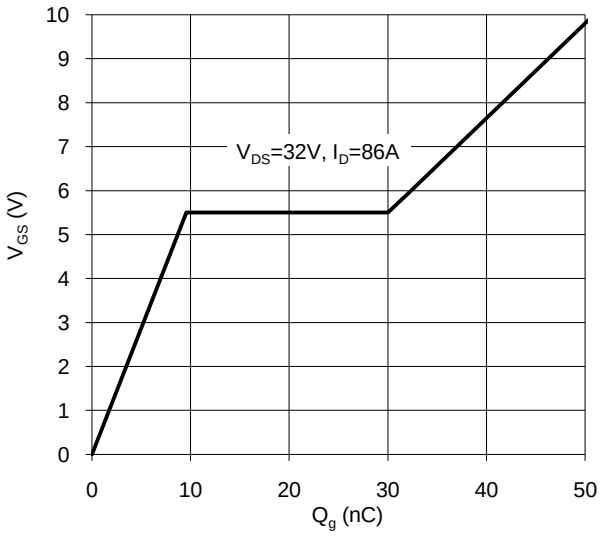

Figure 12. Gate Charge

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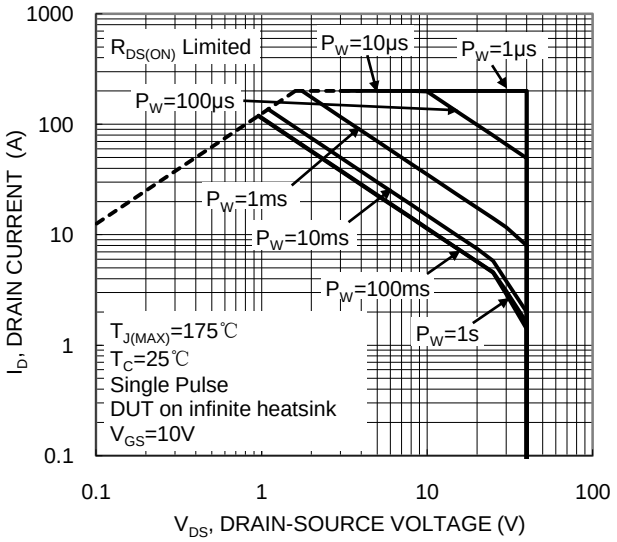

Figure 13. SOA, Safe Operation Area

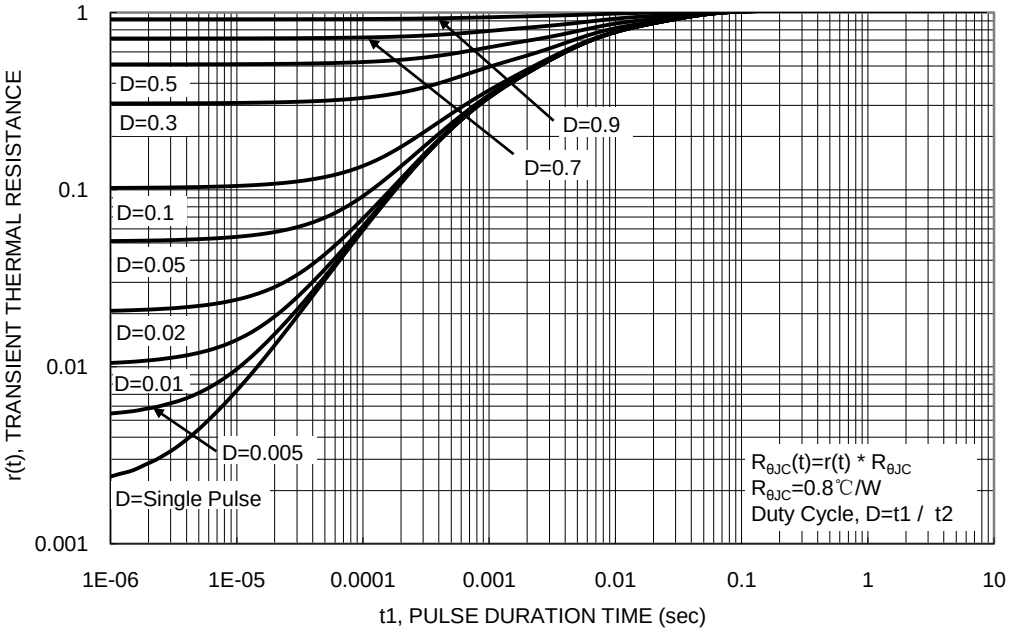

Figure 14. Transient Thermal Resistance

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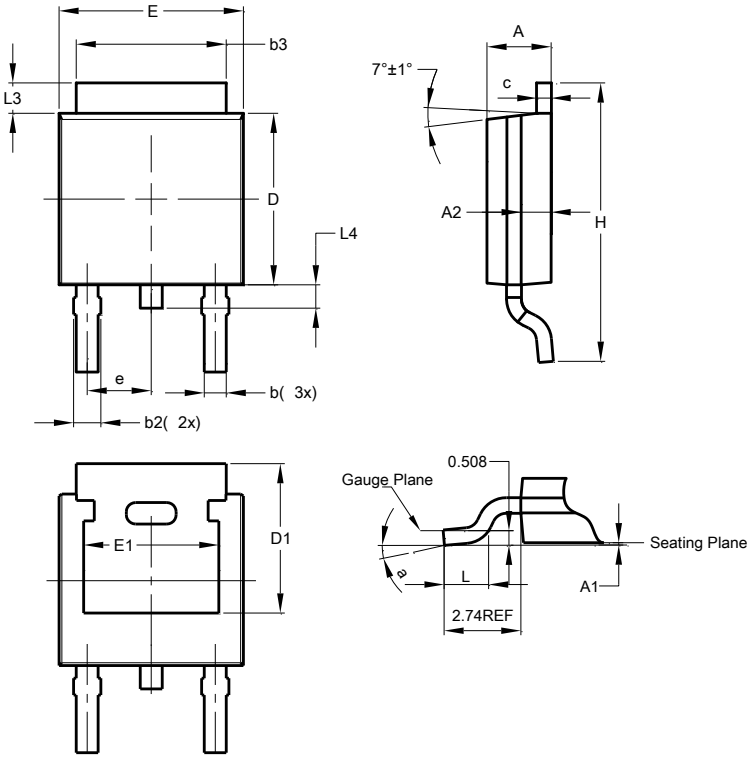
Package Outline Dimensions

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

TO252 (DPAK)

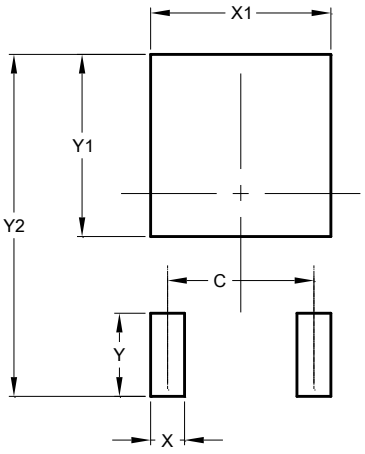


TO252 (DPAK)			
Dim	**Min**	**Max**	**Typ**
A	2.19	2.39	2.29
A1	0.00	0.13	0.08
A2	0.97	1.17	1.07
b	0.64	0.88	0.783
b2	0.76	1.14	0.95
b3	5.21	5.46	5.33
c	0.45	0.58	0.531
D	6.00	6.20	6.10
D1	5.21	-	-
e	-	-	2.286
E	6.45	6.70	6.58
E1	4.32	-	-
H	9.40	10.41	9.91
L	1.40	1.78	1.59
L3	0.88	1.27	1.08
L4	0.64	1.02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