

Product Summary

BV _{DSS}	R _{D(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

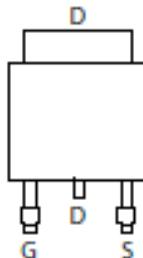
- Rated to +175°C – Ideal for High Ambient Temperature Environments
- 100% Unclamped Inductive Switching – Ensures More Reliable and Robust End Application
- Low Q_g – Minimizes Switching Loss
- Low R_{D(on)} – Minimizes On State Loss
- **Lead-Free Finish; RoHS Compliant (Notes 1 & 2)**
- **Halogen and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

Mechanical Data

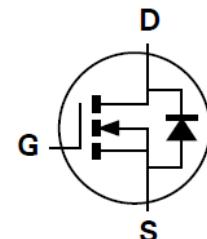
- Case: TO252 (DPAK)
- Case Material: Molded Plastic, "Green" Molding Compound.
- UL Flammability Classification Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminal Finish - Matte Tin Annealed over Copper Leadframe. Solderable per MIL-STD-202, Method 208 (E3)
- Weight: 0.315 grams (Approximate)



Top View



Pin Out Top View



Equivalent Circuit

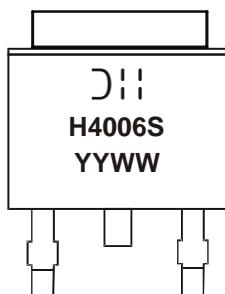
Ordering Information (Note 5)

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



DII = 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)

Maximum Ratings (@ $T_A = +25^\circ\text{C}$, unless otherwise specified.)

Characteristic	Symbol	Value	Unit	
Drain-Source Voltage	V_{DSS}	40	V	
Gate-Source Voltage	V_{GSS}	± 20	V	
Continuous Drain Current, $V_{GS} = 10\text{V}$ (Note 7)	$T_A = +25^\circ\text{C}$ $T_A = +70^\circ\text{C}$	I_D	20 16	A
Continuous Drain Current, $V_{GS} = 10\text{V}$ (Note 8)	$T_C = +25^\circ\text{C}$ $T_C = +100^\circ\text{C}$	I_D	140 100	A
Pulsed Drain Current (380 μs Pulse, Duty Cycle = 1%)	I_{DM}	200	A	
Maximum Continuous Body Diode Forward Current (Note 8)	I_S	120	A	
Avalanche Current, $L = 0.1\text{mH}$ (Note 9)	I_{AS}	64	A	
Avalanche Energy, $L = 0.1\text{mH}$ (Note 9)	E_{AS}	208	mJ	

Thermal Characteristics (@ $T_A = +25^\circ\text{C}$, 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	68	°C/W
	$t < 10\text{s}$	29	
Total Power Dissipation (Note 7)	P_D	3.6	W
Thermal Resistance, Junction to Ambient (Note 7)	Steady State	42	°C/W
	$t < 10\text{s}$	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 (@ $T_A = +25^\circ\text{C}$, unless otherwise specified.)

Characteristic	Symbol	Min	Typ	Max	Unit	Test Condition
OFF CHARACTERISTICS (Note 10)						
Drain-Source Breakdown Voltage	BV_{DSS}	40	—	—	V	$V_{GS} = 0\text{V}, I_D = 250\mu\text{A}$
Zero Gate Voltage Drain Current, $T_J = +25^\circ\text{C}$	I_{DSS}	—	—	1	μA	$V_{DS} = 40\text{V}, V_{GS} = 0\text{V}$
Gate-Source Leakage	I_{GSS}	—	—	± 100	nA	$V_{GS} = \pm 20\text{V}, V_{DS} = 0\text{V}$
ON CHARACTERISTICS (Note 10)						
Gate Threshold Voltage	$V_{GS(TH)}$	2	—	4	V	$V_{DS} = V_{GS}, I_D = 250\mu\text{A}$
Static Drain-Source On-Resistance	$R_{DS(ON)}$	—	—	6	$\text{m}\Omega$	$V_{GS} = 10\text{V}, I_D = 86\text{A}$
Diode Forward Voltage	V_{SD}	—	0.7	1.2	V	$V_{GS} = 0\text{V}, I_S = 1.0\text{A}$
DYNAMIC CHARACTERISTICS (Note 11)						
Input Capacitance	C_{iss}	—	2280	—	pF	$V_{DS} = 25\text{V}, V_{GS} = 0\text{V}, f = 1\text{MHz}$
Output Capacitance	C_{oss}	—	556	—	pF	
Reverse Transfer Capacitance	C_{rss}	—	282	—	pF	
Gate Resistance	R_g	—	1.7	—	Ω	
Total Gate Charge ($V_{GS} = 6\text{V}$)	Q_g	—	32	—	nC	$V_{DS} = 32\text{V}, I_D = 86\text{A}$
Total Gate Charge ($V_{GS} = 10\text{V}$)	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	$V_{GS} = 10\text{V}, V_{DS} = 20\text{V}, R_g = 3.5\Omega, I_D = 86\text{A}$
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	$I_F = 50\text{A}, di/dt = 100\text{A}/\mu\text{s}$
Body Diode Reverse Recovery Charge	Q_{RR}	—	28	—	nC	$I_F = 50\text{A}, di/dt = 100\text{A}/\mu\text{s}$

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 $T_J = +25^\circ\text{C}$.

10. Short duration pulse test used to minimize self-heating effect.

11. Guaranteed by design. Not subject to product testing.

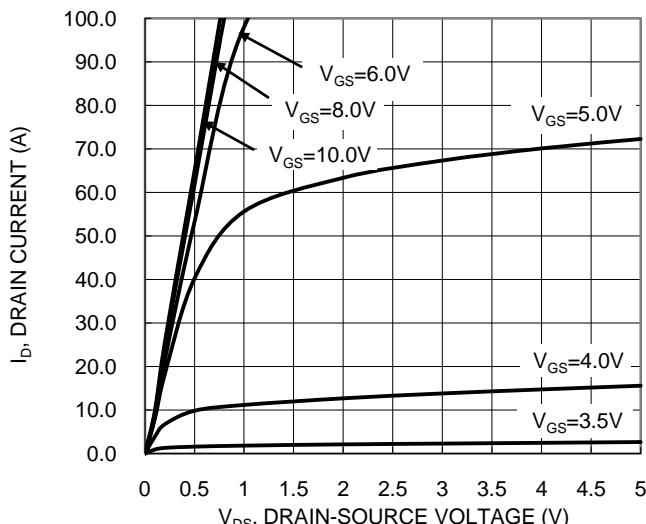


Figure 1. Typical Output Characteristic

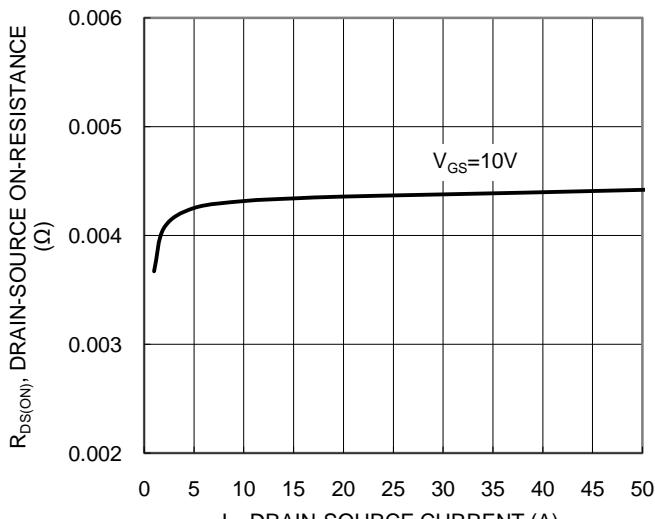


Figure 3. Typical On-Resistance vs. Drain Current and Gate Voltage

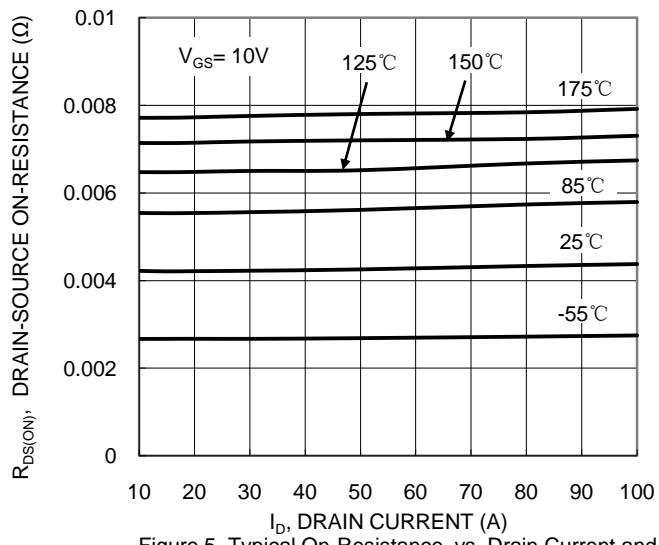


Figure 5. Typical On-Resistance vs. Drain Current and Junction Temperature

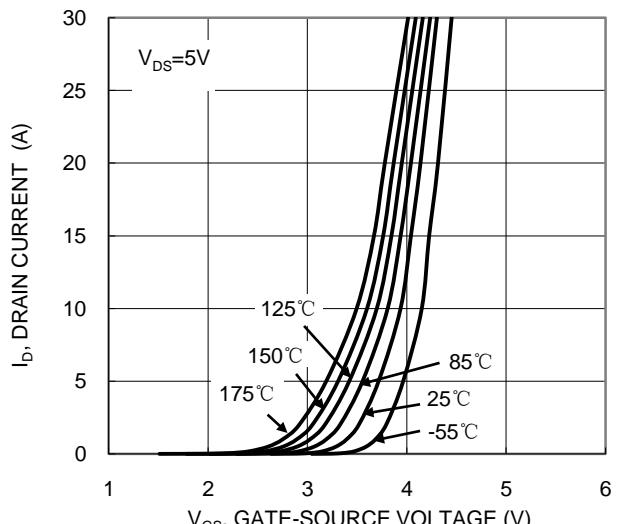


Figure 2. Typical Transfer Characteristic

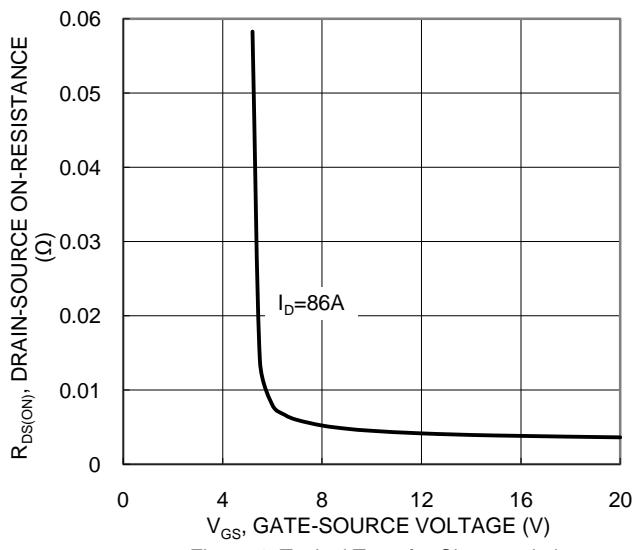


Figure 4. Typical Transfer Characteristic

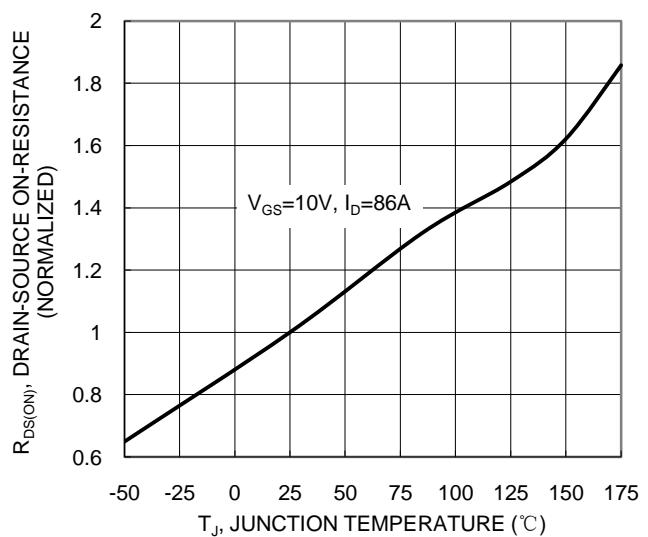
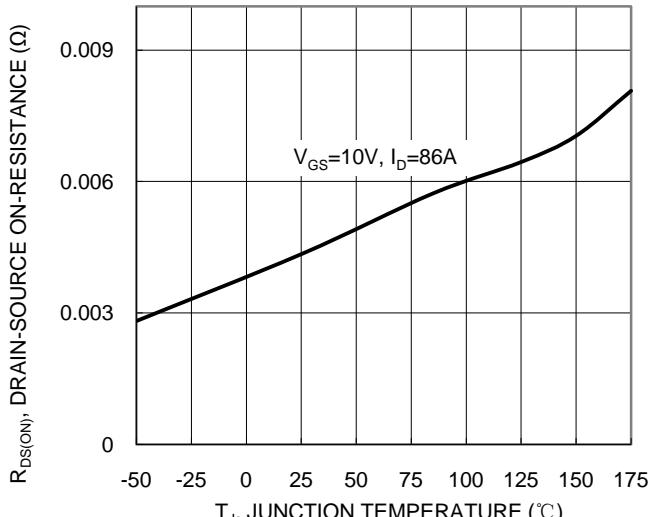
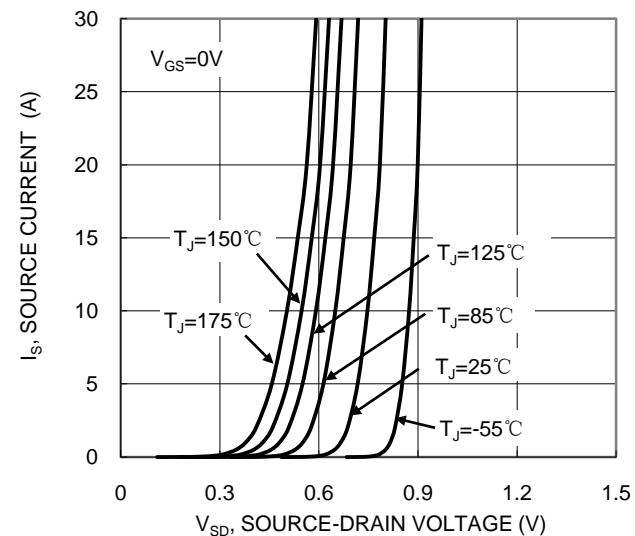


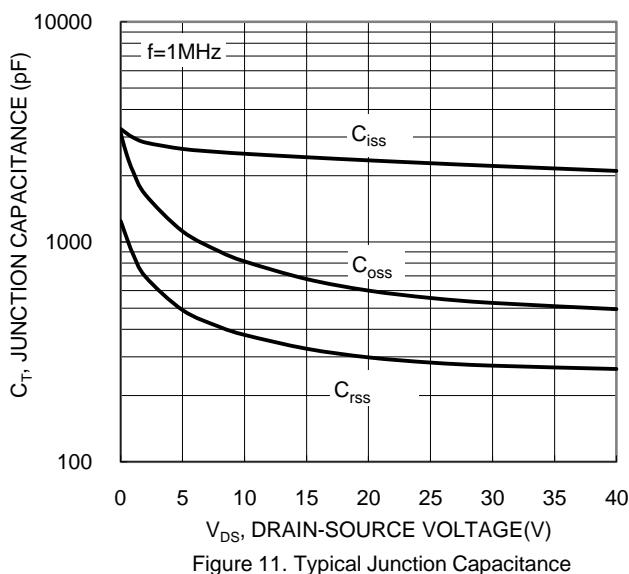
Figure 6. On-Resistance Variation with Junction Temperature



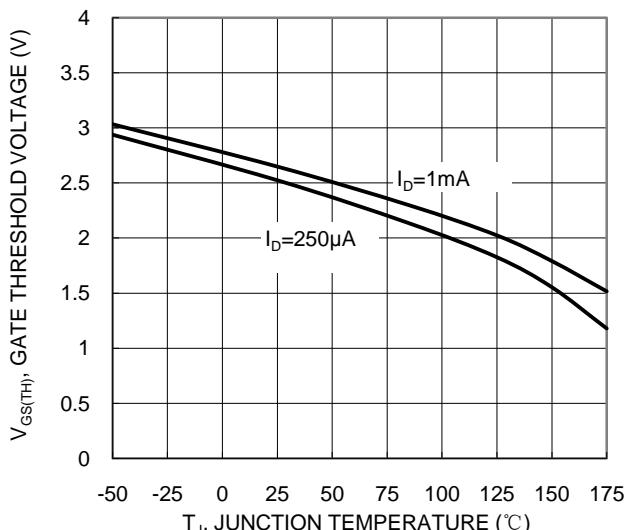
$V_{GS} = 10V, I_D = 86A$



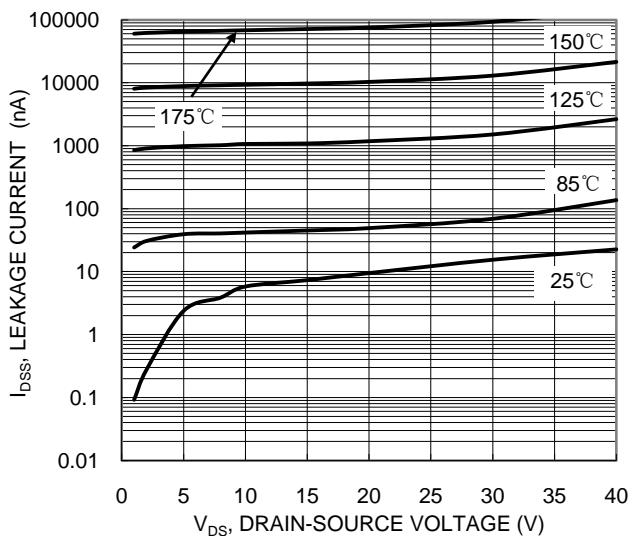
$V_{GS} = 0V$



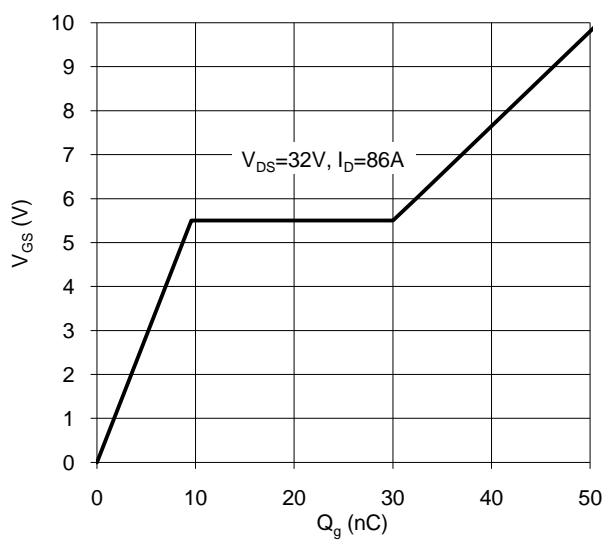
$f = 1MHz$



$I_D = 250\mu A$
 $I_D = 1mA$



$150^\circ C$
 $125^\circ C$
 $85^\circ C$
 $25^\circ C$



$V_{DS} = 32V, I_D = 86A$

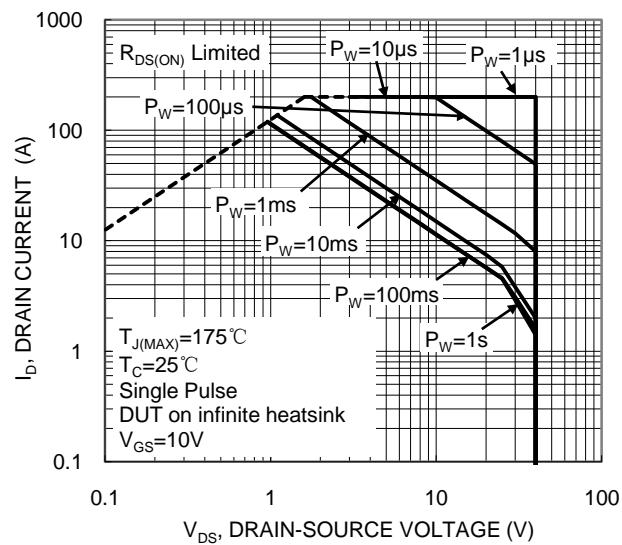


Figure 13. SOA, Safe Operation Area

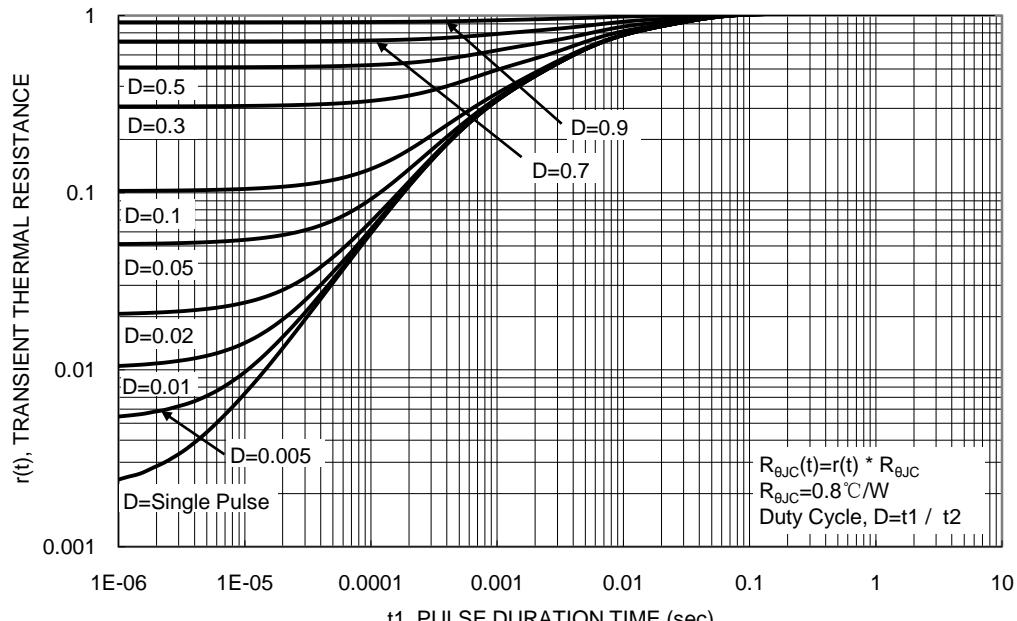
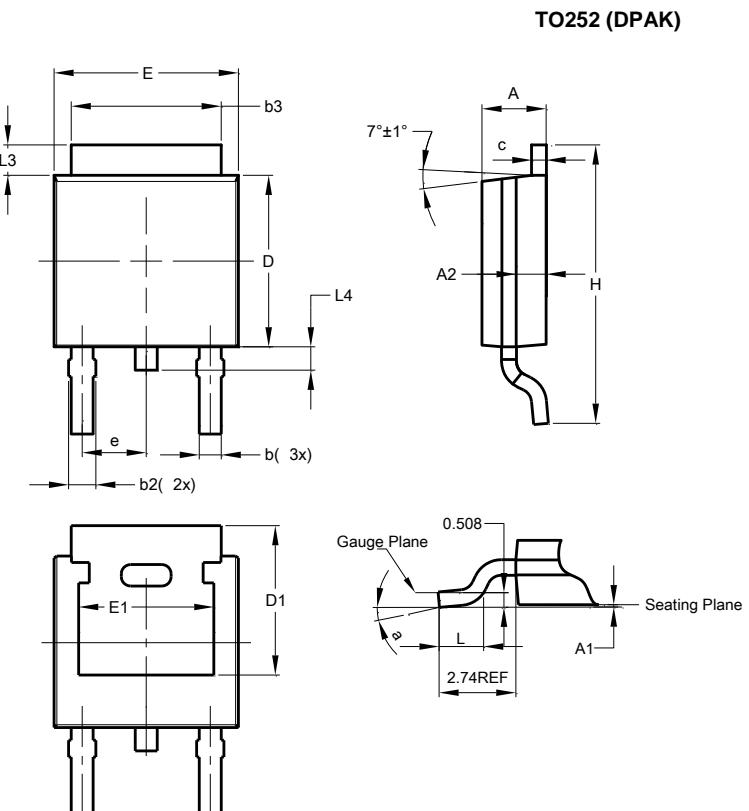


Figure 14. Transient Thermal Resistance

Package Outline Dimensions

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

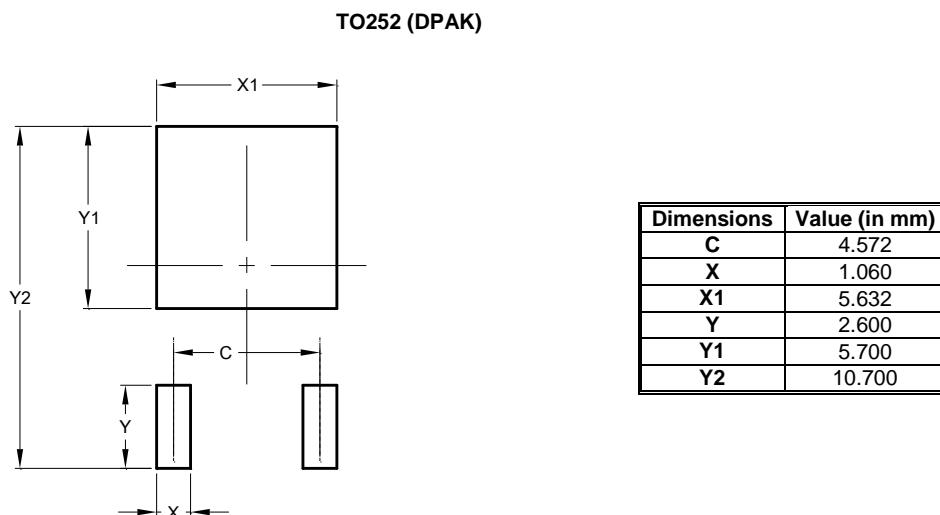


TO252 (DPAK)			
Dim	Min	Max	Typ
A	2.19	2.39	2.29
A1	0.00	0.13	0.08
A2	0.97	1.17	1.07
b	0.64	0.88	0.783
b2	0.76	1.14	0.95
b3	5.21	5.46	5.33
c	0.45	0.58	0.531
D	6.00	6.20	6.10
D1	5.21	-	-
e	-	-	2.286
E	6.45	6.70	6.58
E1	4.32	-	-
H	9.40	10.41	9.91
L	1.40	1.78	1.59
L3	0.88	1.27	1.08
L4	0.64	1.02	0.83
a	0°	10°	-

All Dimensions in mm

Suggested Pad Layout

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



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