40V P-CHANNEL ENHANCEMENT MODE MOSFET

Product Summary

BV_{DSS}	$R_{DS(ON)}$	I_D T_C = +25°C
-40V	45mΩ @ V_{GS} = -10V	-20A
	55mΩ @ V_{GS} = -4.5V	-18A

Features

- 100% Unclamped Inductive Switch (UIS) Test in Production
- Low On-Resistance
- Fast Switching Speed
- **Totally Lead-Free & Fully RoHS compliant (Notes 1 & 2)**
- **Halogen and Antimony Free. "Green" Device (Note 3)**

Description

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.

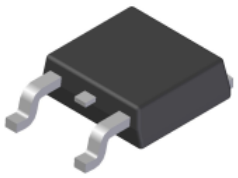
Mechanical Data

- 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: Matte Tin Finish Annealed over Copper Leadframe. Solderable per MIL-STD-202, Method 208 e3
- Weight: 0.33 grams (Approximate)

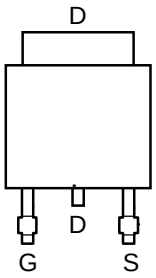
Applications

- Backlighting
- DC-DC Converters
- Power Management Functions

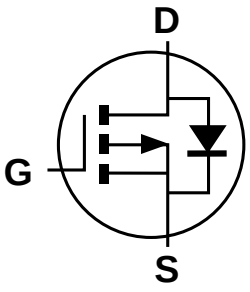
TO252 (DPAK)



Top View



Top View
Pin-Out



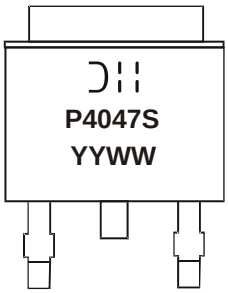
Equivalent Circuit

Ordering Information (Note 4)

Product	Case	Packaging
DMP4047SK3-13	TO252 (DPAK)	2,500/Tape & Reel

Notes:
1. No purposely added lead. Fully EU Directive 2002/95/EC (RoHS) & 2011/65/EU (RoHS 2) compliant.
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 https://www.diodes.com/design/support/packaging/diodes-packaging/.

Marking Information



= Manufacturer's Marking
P4047S = Product Type Marking Code
YYWW = Date Code Marking
YY = Year (ex: 17= 2017)
WW = Week (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) V_{GS} = -10V	Steady State	T_C = +25°C T_C = +100°C	I_D	-20 -12.7	A
Maximum Body Diode Continuous Current			I_S	-2.5	A
Pulsed Drain Current (10µs Pulse, Duty Cycle = 1%)			I_{DM}	-40	A
Avalanche Current (Note 7) L = 0.1mH			I_{AS}	-18	A
Avalanche Energy (Note 7) L = 0.1mH			E_{AS}	16	mJ

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

Characteristic		Symbol	Value	Unit
Total Power Dissipation (Note 5)	T_A = +25°C	P_D	1.6	W
	T_A = +70°C		1.0	
Thermal Resistance, Junction to Ambient (Note 5)	Steady state	$R_{\theta JA}$	77	°C/W
	t<10s		34	
Total Power Dissipation (Note 6)	T_A = +25°C	P_D	2.7	W
	T_A = +70°C		1.7	
Thermal Resistance, Junction to Ambient (Note 6)	Steady state	$R_{\theta JA}$	47	°C/W
	t<10s		30	
Thermal Resistance, Junction to Case (Note 6)		$R_{\theta JC}$	4.8	
Operating and Storage Temperature Range		T_J, T_{STG}	-55 to +150	°C

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

Characteristic	Symbol	Min	Typ	Max	Unit	Test Condition
OFF CHARACTERISTICS (Note 8)						
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 8)						
Gate Threshold Voltage	$V_{GS(TH)}$	-1.0	–	-3.0	V	V_{DS} = V_{GS}, I_D = -250µA
Static Drain-Source On-Resistance	$R_{DS(ON)}$	–	33	45	mΩ	V_{GS} = -10V, I_D = -4.4A
			40	55		V_{GS} = -4.5V, I_D = -3.7A
Diode Forward Voltage	V_{SD}	–	-0.75	-1.2	V	V_{GS} = 0V, I_S = -3.9A
DYNAMIC CHARACTERISTICS (Note 9)						
Input Capacitance	Ciss	–	1328	–	pF	V_{DS} = -20V, V_{GS} = 0V, f = 1.0MHz
Output Capacitance	Coss	–	103	–	pF	
Reverse Transfer Capacitance	Crss	–	81	–	pF	
Gate Resistance	R_G	–	7.7	–	Ω	V_{DS} = 0V, V_{GS} = 0V, f = 1MHz
Total Gate Charge (V_{GS} = -4.5V)	Qg	–	11.2	–	nC	V_{DS} = -20V, I_D = -4.9A
Total Gate Charge (V_{GS} = -10V)	Qg	–	23.2	–	nC	
Gate-Source Charge	Qgs	–	3.3	–	nC	
Gate-Drain Charge	Qgd	–	3.9	–	nC	
Turn-On Delay Time	$t_{D(ON)}$	–	18.5	–	ns	V_{DS} = -20V, I_D = -3.9A, V_{GS} = -4.5V, R_G = 1Ω
Turn-On Rise Time	t_R	–	28.2	–	ns	
Turn-Off Delay Time	$t_{D(OFF)}$	–	38.8	–	ns	
Turn-Off Fall Time	t_F	–	28.6	–	ns	
Body Diode Reverse Recovery Time	t_{RR}	–	15.4	–	ns	I_F = -3.9A, di/dt = 100A/µs
Body Diode Reverse Recovery Charge	Q_{RR}	–	5.4	–	nC	

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

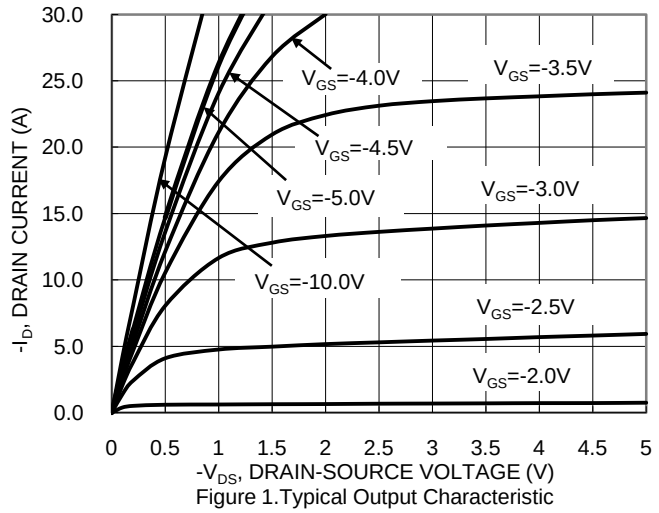


Figure 1.Typical Output Characteristic

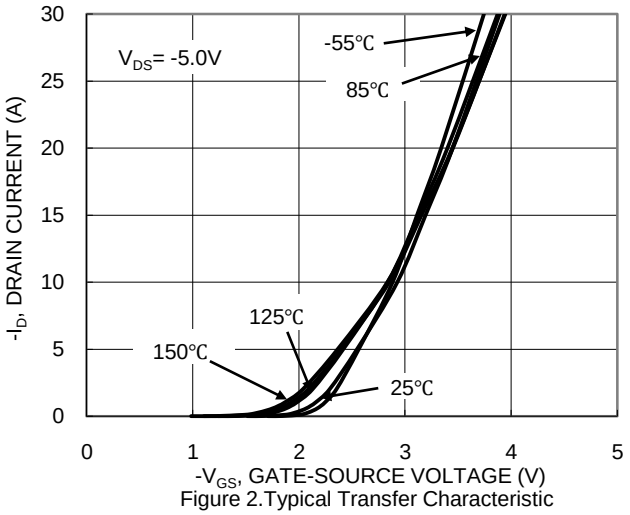


Figure 2.Typical Transfer Characteristic

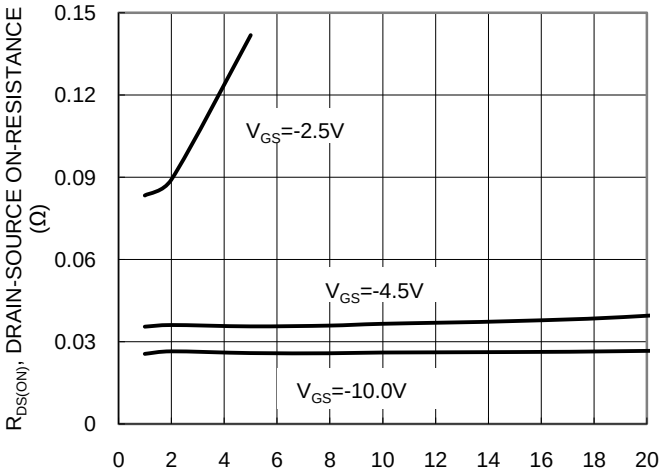


Figure 3.Typical On-Resistance vs. Drain Current and Gate Voltage

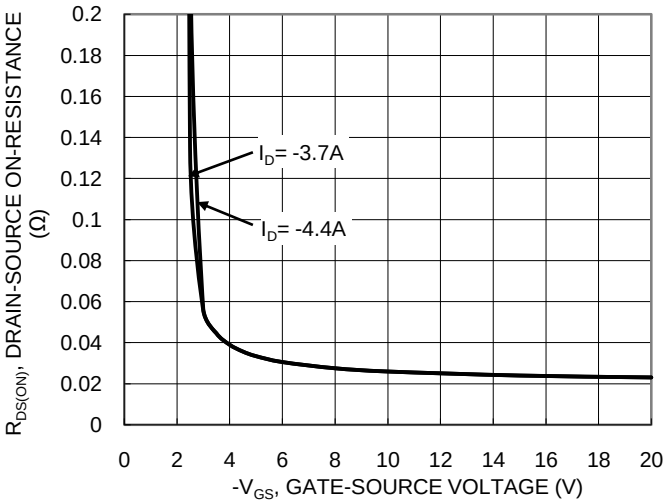


Figure 4. Typical On-Resistance vs. Gate Voltage

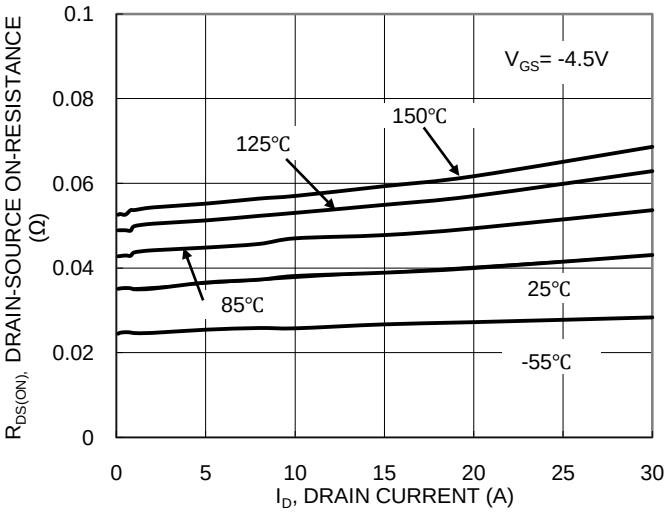


Figure 5.Typical On-Resistance vs. Drain Current and Temperature

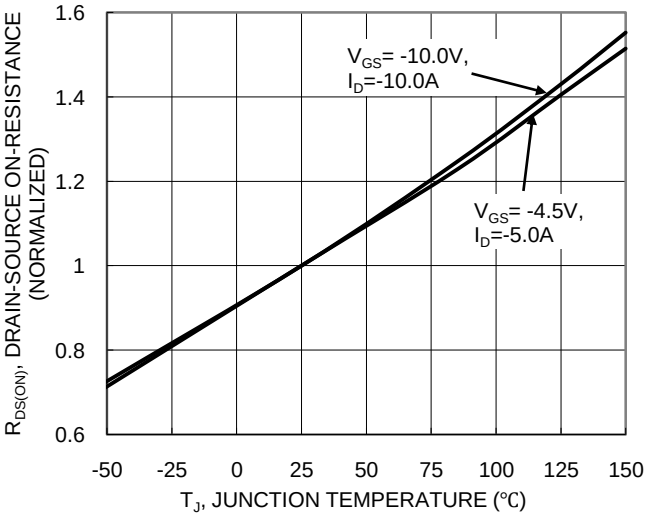


Figure 6. On-Resistance Variation with Temperature

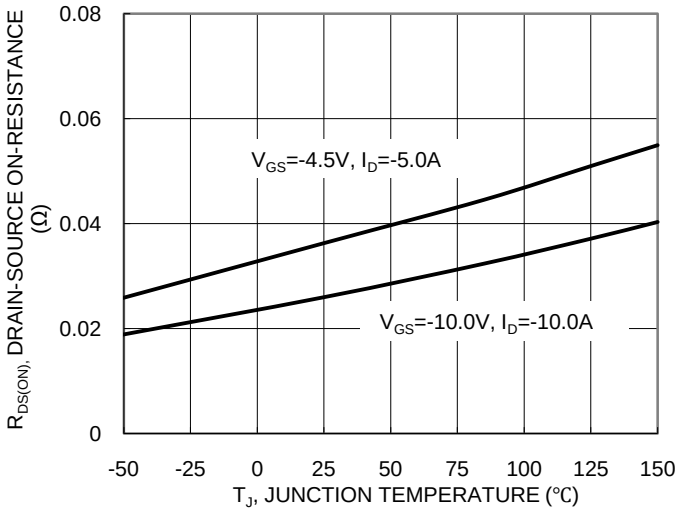


Figure 7. On-Resistance Variation with Temperature

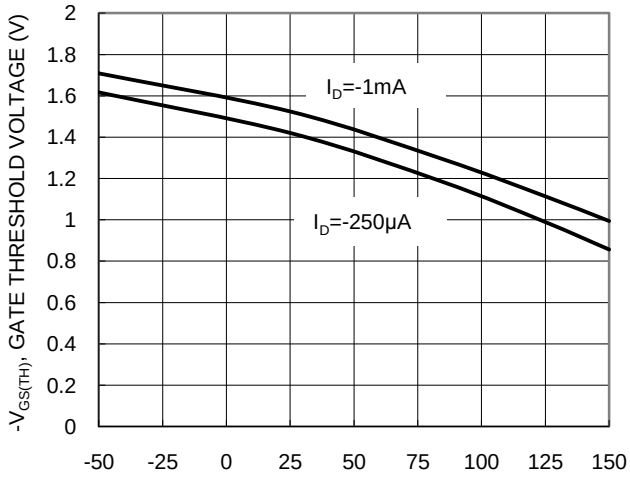


Figure 8. Gate Threshold Variation vs. Junction Temperature

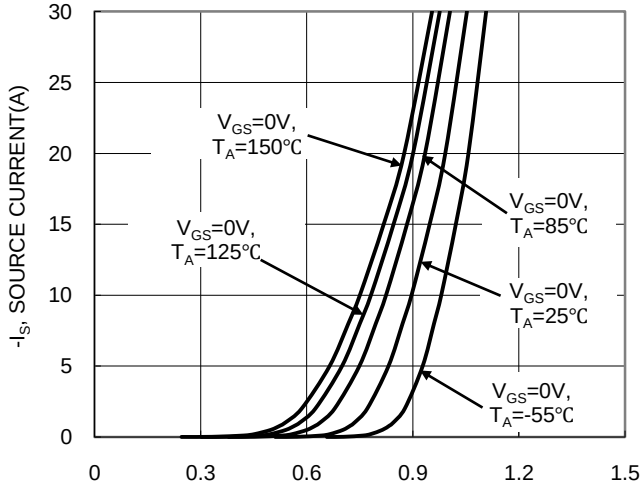


Figure 9. Diode Forward Voltage vs. Current

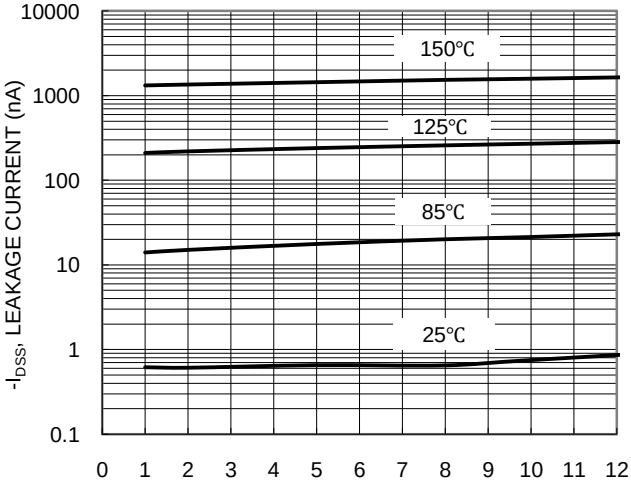


Figure 10.Typical Drain-Source Leakage Current vs. Voltage

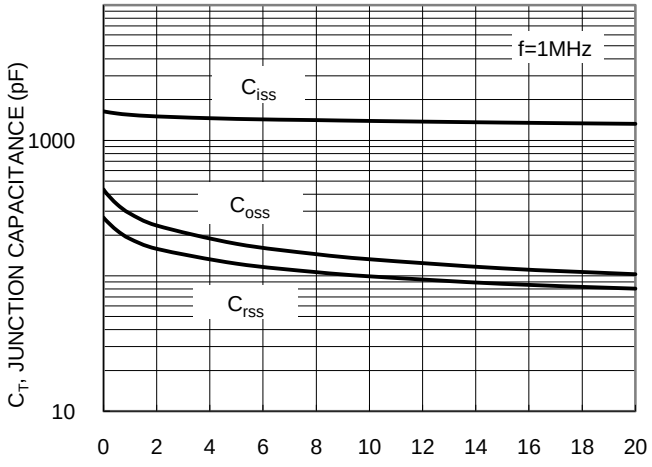


Figure 11.Typical Junction Capacitance

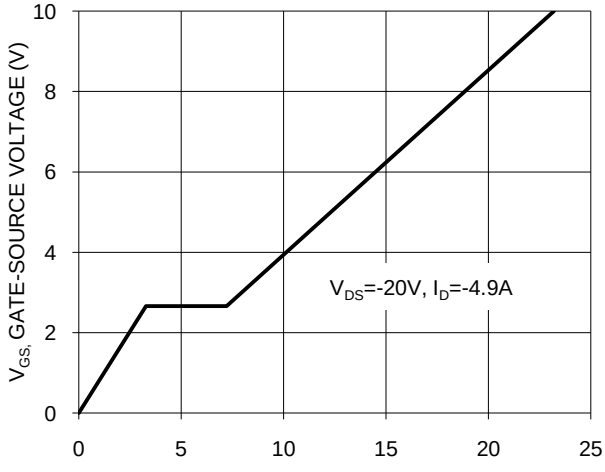


Figure 12.Gate Charge

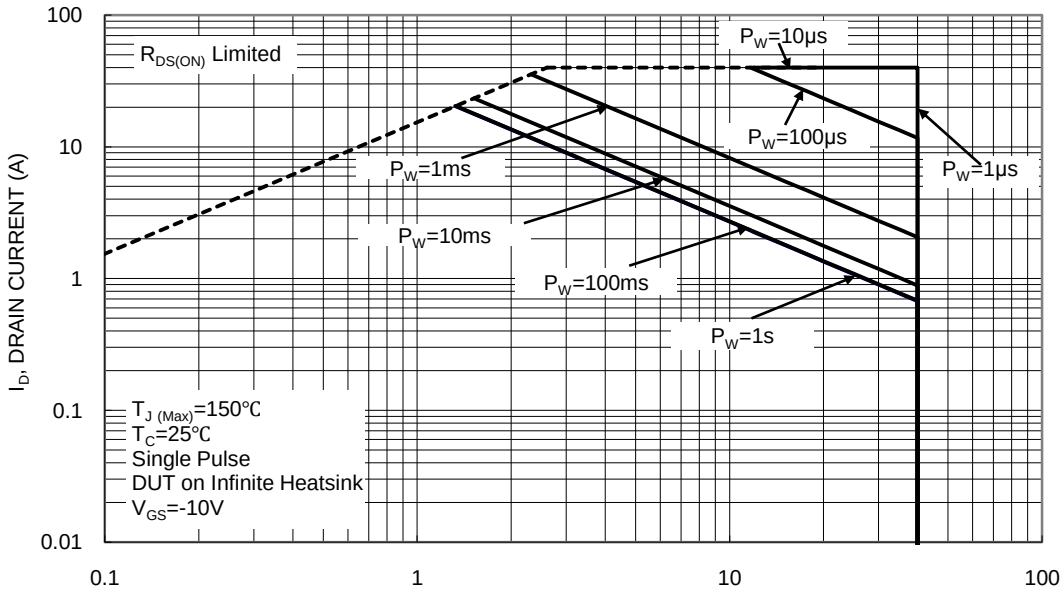


Figure 13. SOA, Safe Operation Area

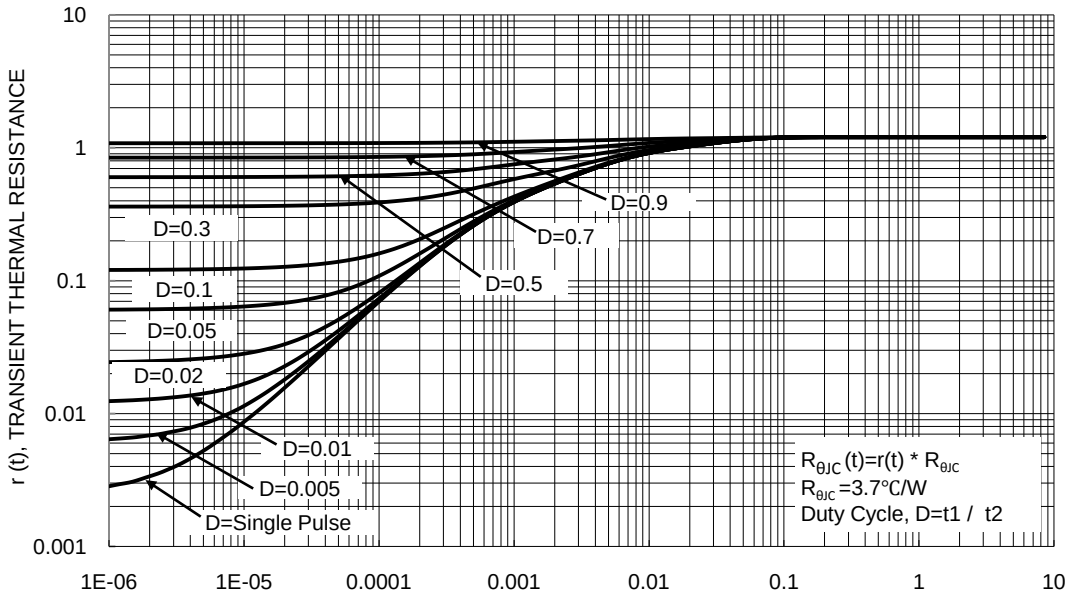
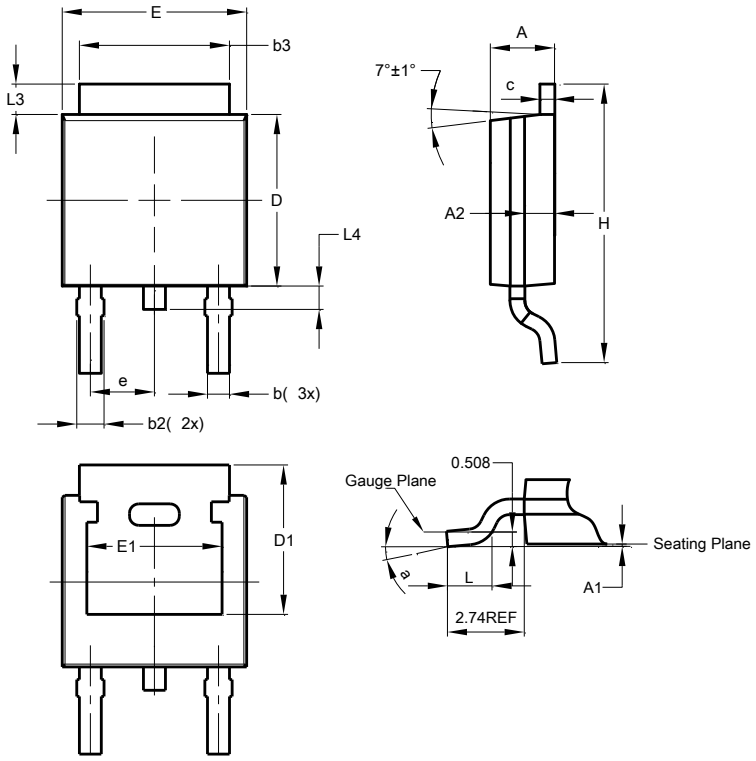


Figure 14. Transient Thermal Resistance

Package Outline Dimensions

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

TO252 (DPAK)

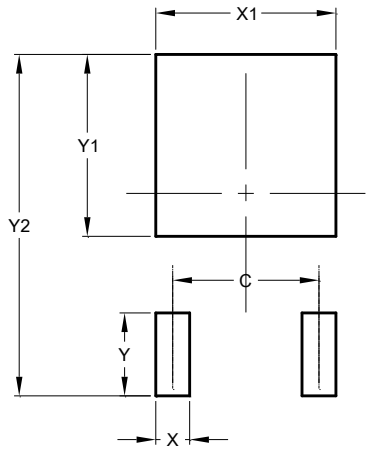


TO252 (DPAK)			
Dim	**Min**	**Max**	**Typ**
A	2.19	2.39	2.29
A1	0.00	0.13	0.08
A2	0.97	1.17	1.07
b	0.64	0.88	0.783
b2	0.76	1.14	0.95
b3	5.21	5.46	5.33
c	0.45	0.58	0.531
D	6.00	6.20	6.10
D1	5.21	-	-
e	-	-	2.286
E	6.45	6.70	6.58
E1	4.32	-	-
H	9.40	10.41	9.91
L	1.40	1.78	1.59
L3	0.88	1.27	1.08
L4	0.64	1.02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