

## Product Summary

$V_{(BR)DSS}$	$R_{DS(ON)}$	$I_D$ $T_C = +25^\circ C$
-40V	45m $\Omega$ @ $V_{GS} = -10V$	-20A
	55m $\Omega$ @ $V_{GS} = -4.5V$	-18A

## 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.

## Applications

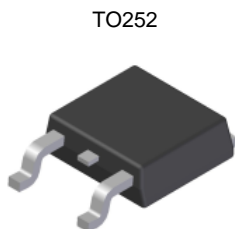
- Backlighting
- DC-DC Converters
- Power Management Functions

## Features

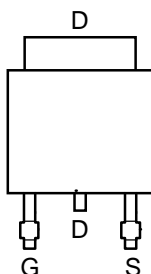
- 100% Unclamped Inductive Switch (UIS) Test in Production
- Low On-resistance
- Fast Switching Speed
- **Totally Lead-Free & Fully RoHS compliant (Notes 1 & 2)**
- **Halogen and Antimony Free. "Green" Device (Note 3)**

## Mechanical Data

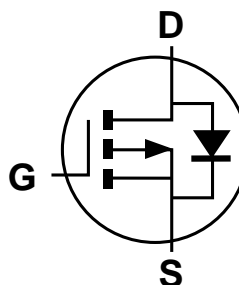
- Case: TO252
- Case Material: Molded Plastic, "Green" Molding Compound. UL Flammability Classification Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminals: Matte Tin Finish Annealed over Copper Leadframe. Solderable per MIL-STD-202, Method 208  $\text{e3}$
- Weight: 0.33 grams (Approximate)



Top View



Top View Pin-Out



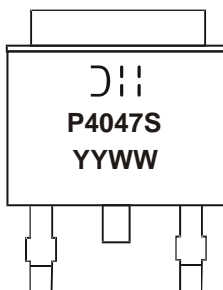
Equivalent Circuit

## Ordering Information (Note 4)

Product	Case	Packaging
DMP4047SK3-13	TO252	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](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



$\text{D}|||$  = Manufacturer's Marking  
 P4047S = Product Type Marking Code  
 YYWW = Date Code Marking  
 YY = Year (ex: 15 = 2015)  
 WW = Week (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) V <sub>GS</sub> = -10V	Steady State	T <sub>C</sub> = +25°C	I <sub>D</sub>	-20	A
		T <sub>C</sub> = +100°C		-12.7	
Maximum Body Diode Continuous Current			I <sub>S</sub>	-2.5	A
Pulsed Drain Current (10µs pulse, Duty Cycle = 1%)			I <sub>DM</sub>	-40	A
Avalanche Current (Note 7) L = 0.1mH			I <sub>AS</sub>	-18	A
Avalanche Energy (Note 7) L = 0.1mH			E <sub>AS</sub>	16	mJ

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

Characteristic		Symbol	Value	Unit
Total Power Dissipation (Note 5)	T <sub>A</sub> = +25°C	P <sub>D</sub>	1.6	W
	T <sub>A</sub> = +70°C		1.0	
Thermal Resistance, Junction to Ambient (Note 5)	Steady state	R <sub>θJA</sub>	77	°C/W
	t < 10s		34	
Total Power Dissipation (Note 6)	T <sub>A</sub> = +25°C	P <sub>D</sub>	2.7	W
	T <sub>A</sub> = +70°C		1.7	
Thermal Resistance, Junction to Ambient (Note 6)	Steady state	R <sub>θJA</sub>	47	°C/W
	t < 10s		30	
Thermal Resistance, Junction to Case (Note 6)		R <sub>θJC</sub>	4.8	
Operating and Storage Temperature Range		T <sub>J</sub> , T <sub>STG</sub>	-55 to +150	°C

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

Characteristic	Symbol	Min	Typ	Max	Unit	Test Condition
<b>OFF CHARACTERISTICS</b> (Note 8)						
Drain-Source Breakdown Voltage	BV <sub>DSS</sub>	-40	-	-	V	V <sub>GS</sub> = 0V, I <sub>D</sub> = -250µA
Zero Gate Voltage Drain Current T <sub>J</sub> = +25°C	I <sub>DSS</sub>	-	-	-1	µA	V <sub>DS</sub> = -40V, 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</b> (Note 8)						
Gate Threshold Voltage	V <sub>GS(TH)</sub>	-1.0	-	-3.0	V	V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = -250µA
Static Drain-Source On-Resistance	R <sub>DS(ON)</sub>	-	33	45	mΩ	V <sub>GS</sub> = -10V, I <sub>D</sub> = -4.4A
			40	55		
Diode Forward Voltage	V <sub>SD</sub>	-	-0.75	-1.2	V	V <sub>GS</sub> = 0V, I <sub>S</sub> = -3.9A
<b>DYNAMIC CHARACTERISTICS</b> (Note 9)						
Input Capacitance	C <sub>iss</sub>	-	1328	-	pF	V <sub>DS</sub> = -20V, V <sub>GS</sub> = 0V, f = 1.0MHz
Output Capacitance	C <sub>oss</sub>	-	103	-	pF	
Reverse Transfer Capacitance	C <sub>rss</sub>	-	81	-	pF	
Gate Resistance	R <sub>G</sub>	-	7.7	-	Ω	V <sub>DS</sub> = 0V, V <sub>GS</sub> = 0V, f = 1MHz
Total Gate Charge (V <sub>GS</sub> = -4.5V)	Q <sub>g</sub>	-	11.2	-	nC	V <sub>DS</sub> = -20V, I <sub>D</sub> = -4.9A
Total Gate Charge (V <sub>GS</sub> = -10V)	Q <sub>g</sub>	-	23.2	-	nC	
Gate-Source Charge	Q <sub>gs</sub>	-	3.3	-	nC	
Gate-Drain Charge	Q <sub>gd</sub>	-	3.9	-	nC	
Turn-On Delay Time	t <sub>D(ON)</sub>	-	18.5	-	ns	
Turn-On Rise Time	t <sub>r</sub>	-	28.2	-	ns	V <sub>DS</sub> = -20V, I <sub>D</sub> = -3.9A V <sub>GS</sub> = 4.5V, R <sub>G</sub> = 1Ω
Turn-Off Delay Time	t <sub>D(OFF)</sub>	-	38.8	-	ns	
Turn-Off Fall Time	t <sub>f</sub>	-	28.6	-	ns	
Body Diode Reverse Recovery Time	t <sub>RR</sub>	-	15.4	-	ns	I <sub>F</sub> = -3.9A, di/dt = 100A/µs
Body Diode Reverse Recovery Charge	Q <sub>RR</sub>	-	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<sub>AS</sub> and E<sub>AS</sub> ratings are based on low frequency and duty cycles to keep T<sub>J</sub> = +25°C.
  8. Short duration pulse test used to minimize self-heating effect.
  9. Guaranteed by design. Not subject to product testing.

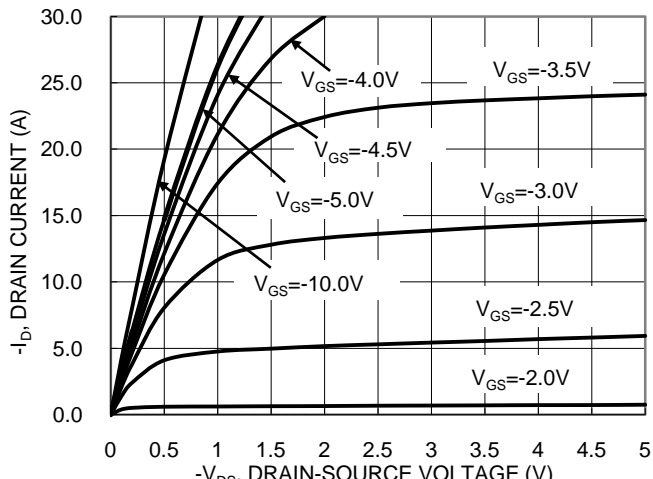


Figure 1. Typical Output Characteristic

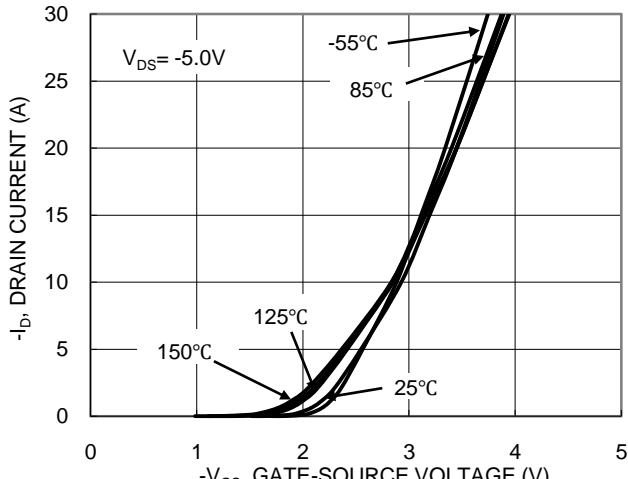


Figure 2. Typical Transfer Characteristic

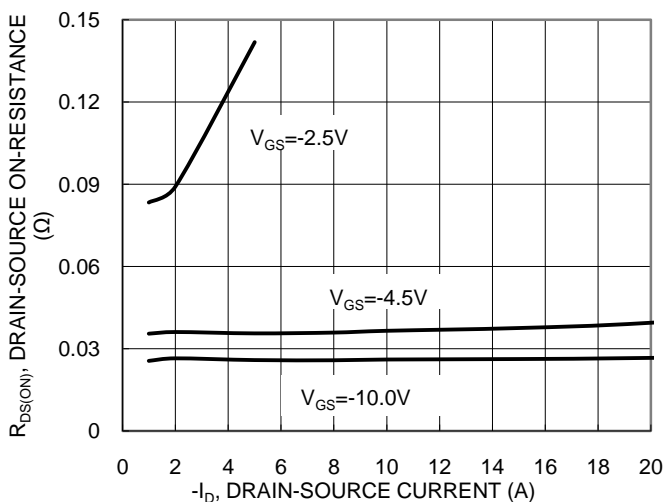


Figure 3. Typical On-Resistance vs. Drain Current and Gate Voltage

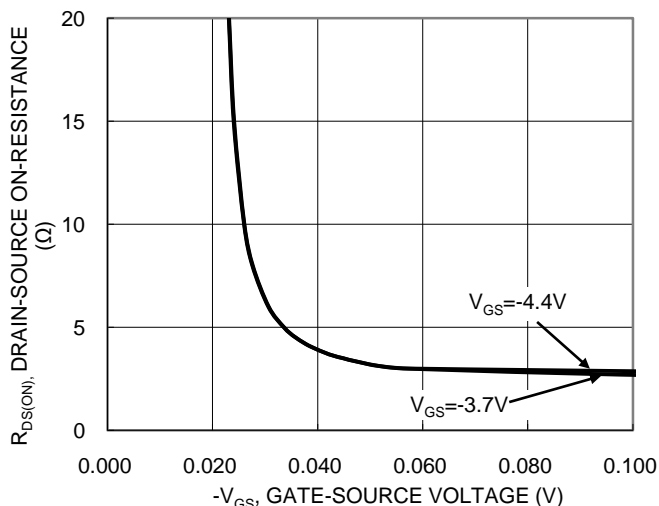


Figure 4. Typical On-Resistance vs. Gate Voltage

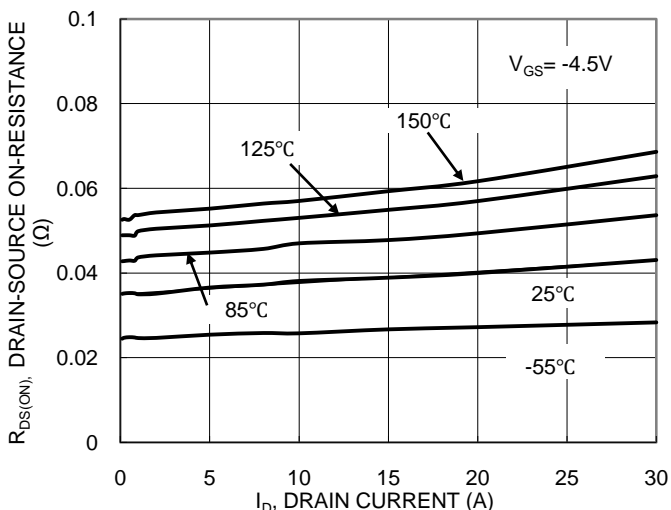


Figure 5. Typical On-Resistance vs. Drain Current and Temperature

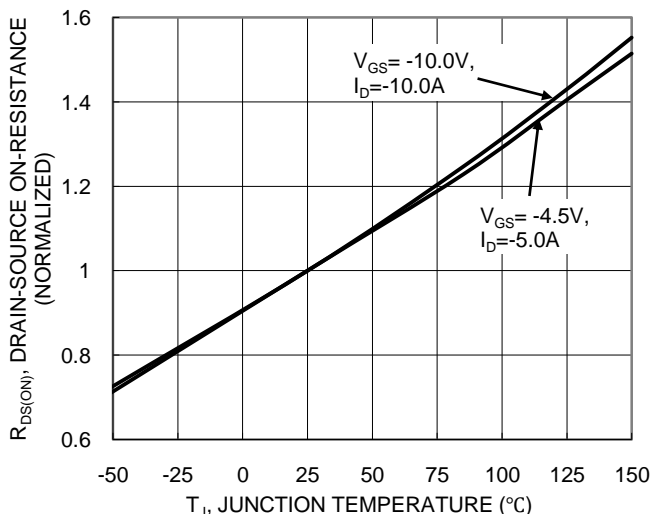


Figure 6. On-Resistance Variation with Temperature

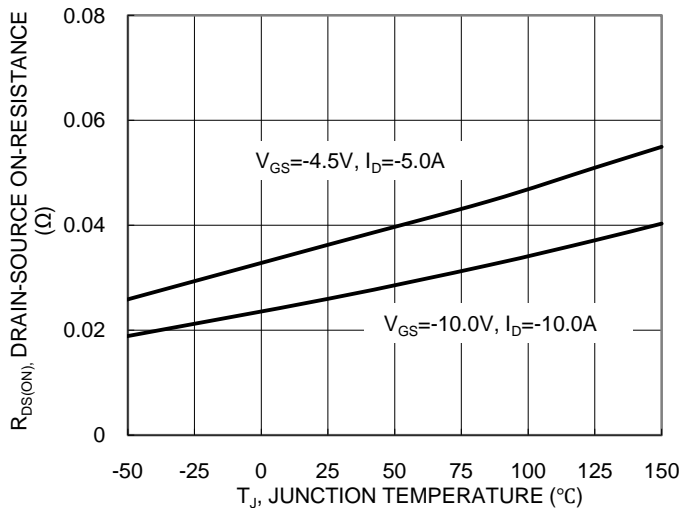


Figure 7. On-Resistance Variation with Temperature

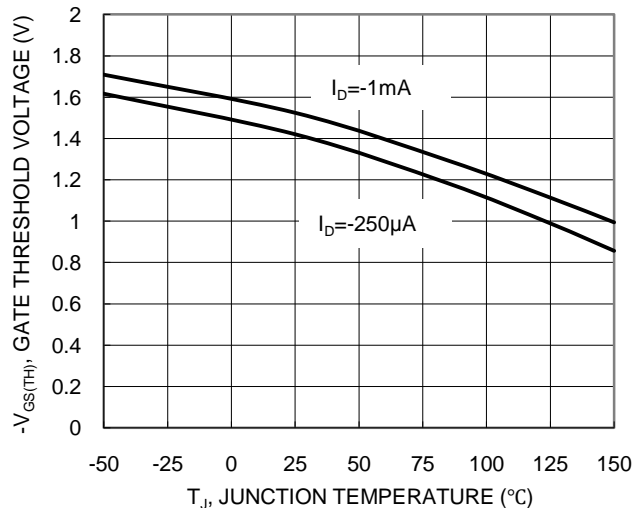


Figure 8. Gate Threshold Variation vs. Junction Temperature

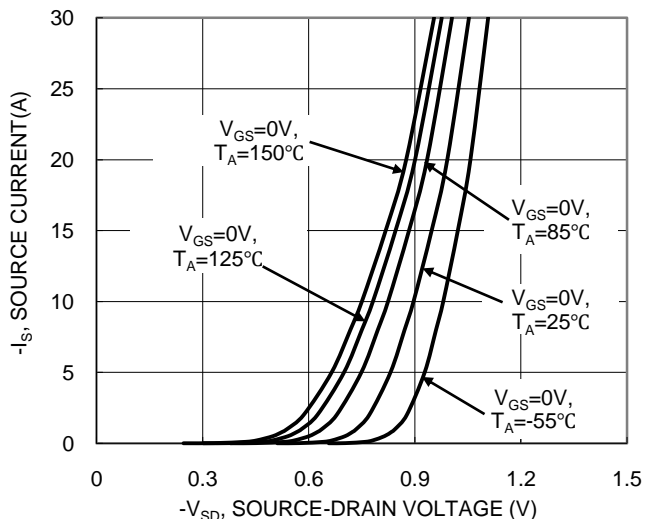


Figure 9. Diode Forward Voltage vs. Current

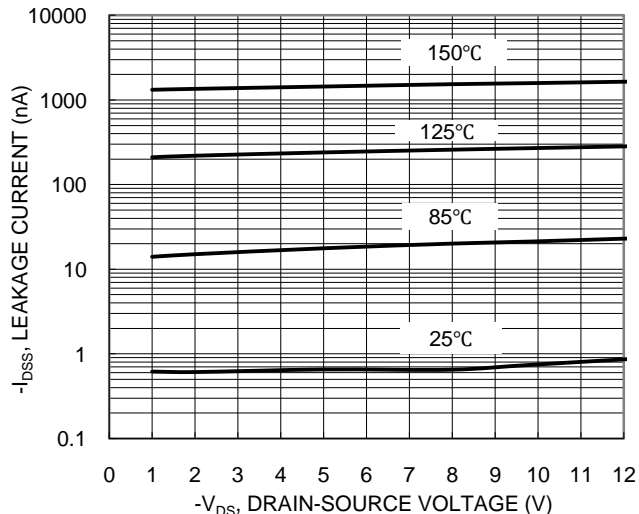


Figure 10. Typical Drain-Source Leakage Current vs. Voltage

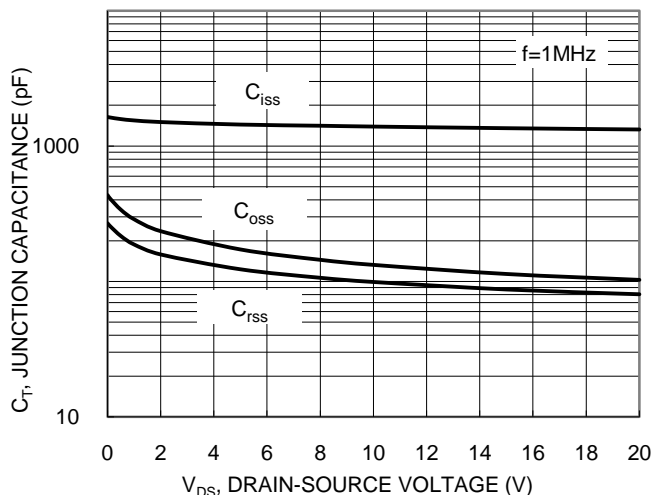


Figure 11. Typical Junction Capacitance

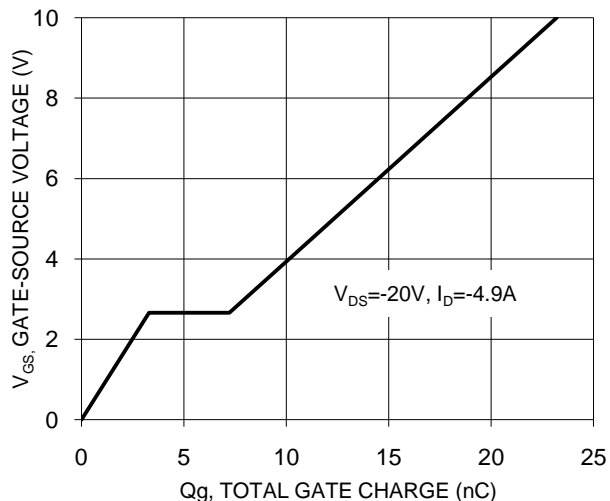
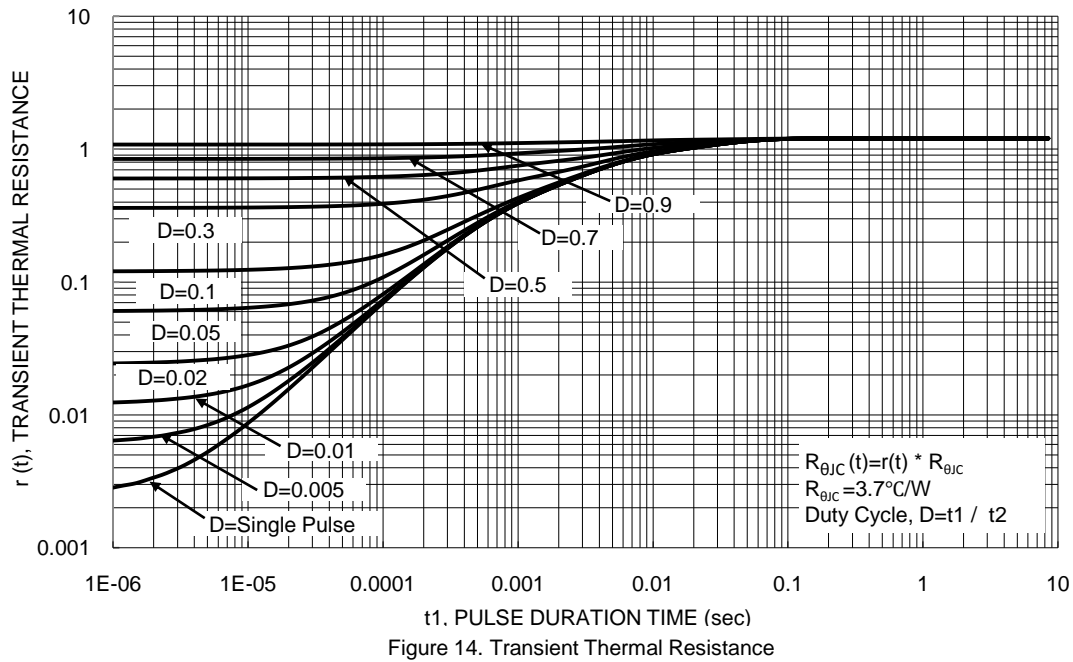
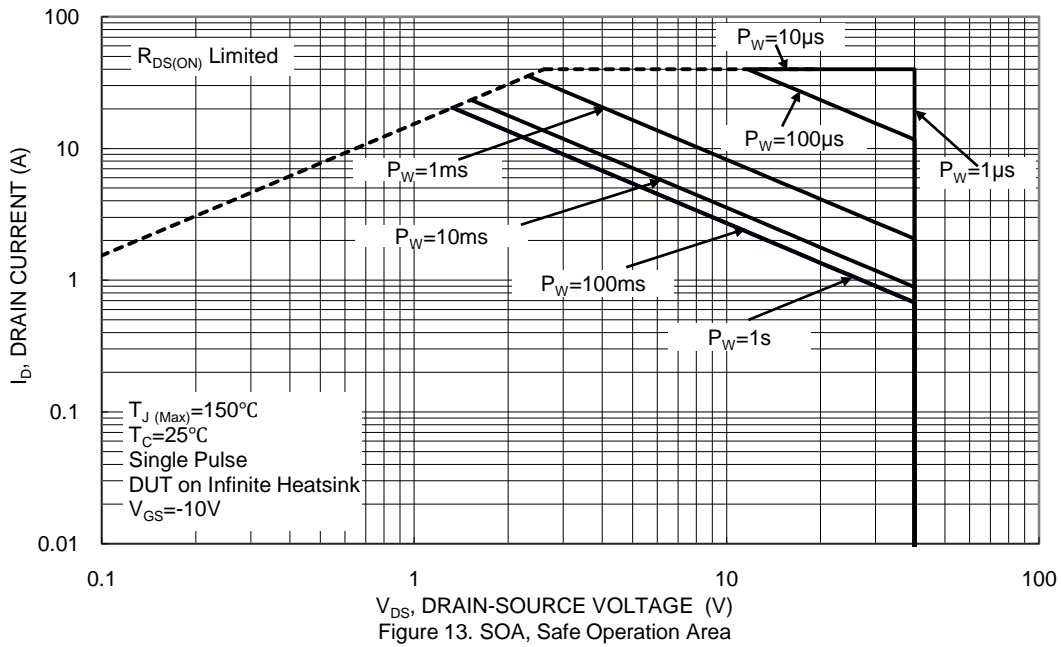
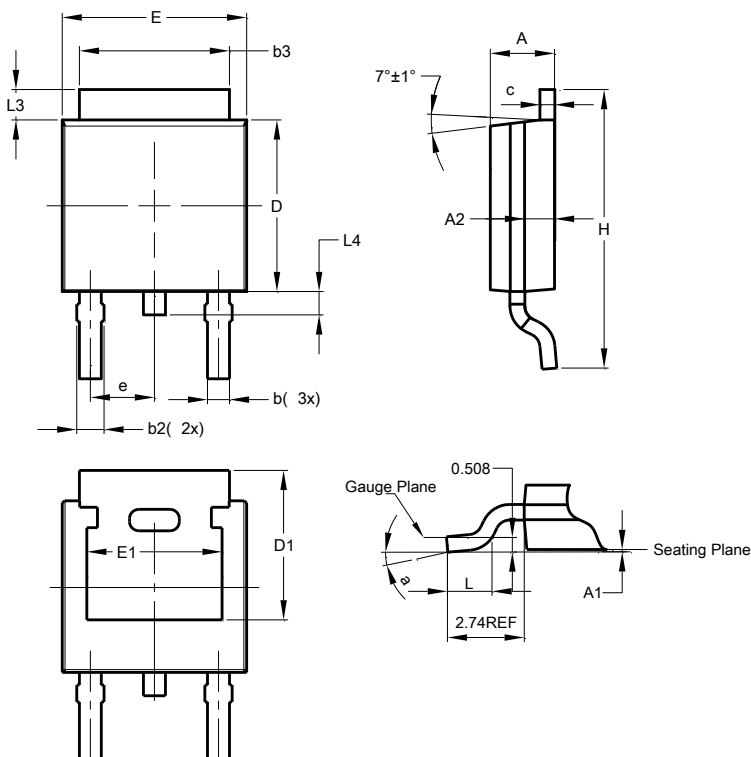


Figure 12. Gate Charge



**Package Outline Dimensions**

Please see AP02002 at <http://www.diodes.com/datasheets/ap02002.pdf> for the latest version.

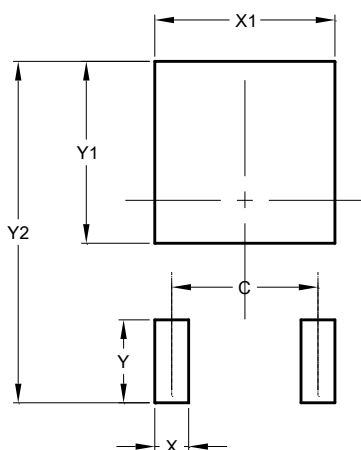


TO252 (DPAK)			
Dim	Min	Max	Typ
A	2.19	2.39	2.29
A1	0.00	0.13	0.08
A2	0.97	1.17	1.07
b	0.64	0.88	0.783
b2	0.76	1.14	0.95
b3	5.21	5.46	5.33
c	0.45	0.58	0.531
D	6.00	6.20	6.10
D1	5.21	-	-
e	-	-	2.286
E	6.45	6.70	6.58
E1	4.32	-	-
H	9.40	10.41	9.91
L	1.40	1.78	1.59
L3	0.88	1.27	1.08
L4	0.64	1.02	0.83
a	0°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

NEW PRODUCT

**Suggested Pad Layout**

Please see AP02001 at <http://www.diodes.com/datasheets/ap02001.pdf> for the latest version.



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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