

## Product Summary

BV <sub>DSS</sub>	R <sub>DS(ON)</sub> Max	I <sub>D</sub> Max T <sub>C</sub> = +25°C
60V	19mΩ @ V <sub>GS</sub> = 10V	33.2A
	28mΩ @ V <sub>GS</sub> = 4.5V	28A

## Features and Benefits

- Rated to +175°C – Ideal for High Ambient Temperature Environments
- 100% Unclamped Inductive Switching (UIS) Test in Production – Ensures More Reliable and Robust End Application
- High Conversion Efficiency
- Low Input Capacitance
- Fast Switching Speed
- **Totally Lead-Free & Fully 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)**

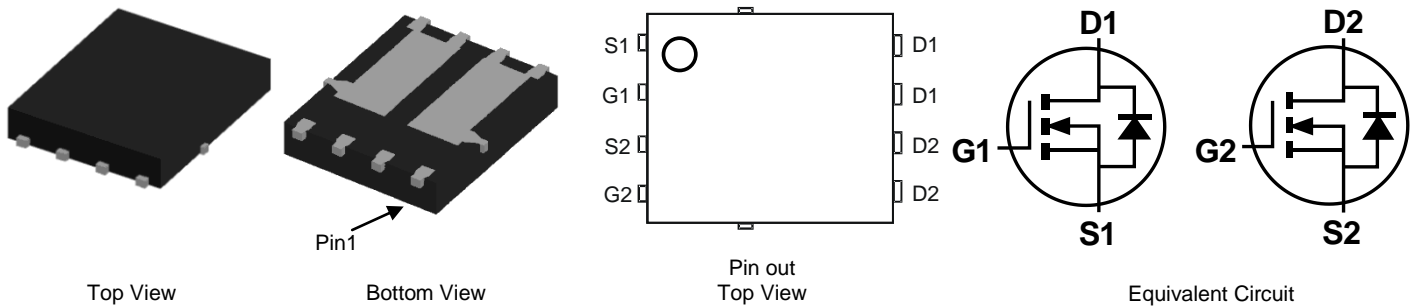
## Description and Applications

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

## Mechanical Data

- Case: PowerDI<sup>®</sup> 5060-8 (Type C)
- 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 <sup>(e3)</sup>
- Weight: 0.097 grams (Approximate)

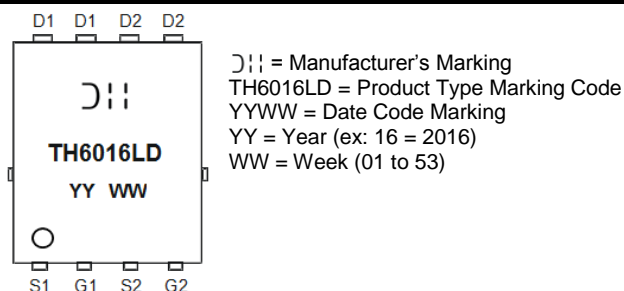


## Ordering Information (Note 5)

Part Number	Case	Packaging
DMTH6016LPDQ-13	PowerDI5060-8 (Type C)	2,500/Tape & Reel

- Notes:
1. No purposely added lead. Fully EU Directive 2002/95/EC (RoHS), 2011/65/EU (RoHS 2) & 2015/863/EU (RoHS 3).compliant.
  2. See <https://www.diodes.com/quality/lead-free/> 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](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



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

Characteristic	Symbol	Value	Units
Drain-Source Voltage	$V_{DSS}$	60	V
Gate-Source Voltage	$V_{GSS}$	$\pm 20$	V
Continuous Drain Current (Note 7)	$I_D$	$T_C = +25^\circ\text{C}$	33.2
		$T_C = +100^\circ\text{C}$	23.7
Continuous Drain Current (Note 6)	$I_D$	$T_A = +25^\circ\text{C}$	9.2
		$T_A = +100^\circ\text{C}$	6.5
Pulsed Drain Current (10 $\mu\text{s}$ Pulse, Duty Cycle = 1%)	$I_{DM}$	50	A
Maximum Continuous Body Diode Forward Current (Note 6)	$I_S$	31	A
Pulsed Body Diode Forward Current (Note 6)	$I_{SM}$	50	A
Avalanche Current, L = 0.1mH	$I_{AS}$	15.3	A
Avalanche Energy, L = 0.1mH	$E_{AS}$	11.7	mJ

**Thermal Characteristics**

Characteristic	Symbol	Value	Unit
Total Power Dissipation (Note 6)	$P_D$	2.5	W
Thermal Resistance, Junction to Ambient (Note 6)	$R_{\theta JA}$	58	$^\circ\text{C/W}$
Total Power Dissipation (Note 7)	$P_D$	37.5	W
Thermal Resistance, Junction to Case (Note 7)	$R_{\theta JC}$	4	$^\circ\text{C/W}$
Operating and Storage Temperature Range	$T_J, T_{STG}$	-55 to +175	$^\circ\text{C}$

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

Characteristic	Symbol	Min	Typ	Max	Unit	Test Condition
<b>OFF CHARACTERISTICS</b> (Note 8)						
Drain-Source Breakdown Voltage	$BV_{DSS}$	60	—	—	V	$V_{GS} = 0V, I_D = 250\mu\text{A}$
Zero Gate Voltage Drain Current	$I_{DSS}$	—	—	1	$\mu\text{A}$	$V_{DS} = 48V, V_{GS} = 0V$
Gate-Source Leakage	$I_{GSS}$	—	—	$\pm 100$	nA	$V_{GS} = \pm 20V, V_{DS} = 0V$
<b>ON CHARACTERISTICS</b> (Note 8)						
Gate Threshold Voltage	$V_{GS(TH)}$	1	—	2.5	V	$V_{DS} = V_{GS}, I_D = 250\mu\text{A}$
Static Drain-Source On-Resistance	$R_{DS(ON)}$	—	14.5	19	m $\Omega$	$V_{GS} = 10V, I_D = 10A$
		—	20.9	28		$V_{GS} = 4.5V, I_D = 6A$
Diode Forward Voltage	$V_{SD}$	—	0.7	1.2	V	$V_{GS} = 0V, I_S = 20A$
<b>DYNAMIC CHARACTERISTICS</b> (Note 9)						
Input Capacitance	$C_{ISS}$	—	864	—	pF	$V_{DS} = 30V, V_{GS} = 0V, f = 1\text{MHz}$
Output Capacitance	$C_{OSS}$	—	282	—	pF	
Reverse Transfer Capacitance	$C_{RSS}$	—	27	—	pF	
Gate Resistance	$R_G$	—	1.3	—	$\Omega$	$V_{DS} = 0V, V_{GS} = 0V, f = 1\text{MHz}$
Total Gate Charge ( $V_{GS} = 4.5V$ )	$Q_G$	—	8.4	—	nC	$V_{DS} = 30V, I_D = 10A$
Total Gate Charge ( $V_{GS} = 10V$ )	$Q_G$	—	17	—	nC	
Gate-Source Charge	$Q_{GS}$	—	3.1	—	nC	
Gate-Drain Charge	$Q_{GD}$	—	4.3	—	nC	
Turn-On Delay Time	$t_{D(ON)}$	—	3.4	—	ns	$V_{DD} = 30V, V_{GS} = 10V, I_D = 10A, R_G = 6\Omega$
Turn-On Rise Time	$t_R$	—	5.2	—	ns	
Turn-Off Delay Time	$t_{D(OFF)}$	—	13	—	ns	
Turn-Off Fall Time	$t_F$	—	7	—	ns	
Body Diode Reverse Recovery Time	$t_{RR}$	—	22	—	ns	$I_F = 10A, di/dt = 100A/\mu\text{s}$
Body Diode Reverse Recovery Charge	$Q_{RR}$	—	11	—	nC	

- Notes:
6. Device mounted on FR-4 substrate PC board, 2oz copper, with thermal bias to bottom layer 1 inch square copper plate.
  7. Thermal resistance from junction to soldering point (on the exposed drain pad).
  8. Short duration pulse test used to minimize self-heating effect.
  9. Guaranteed by design. Not subject to product testing.

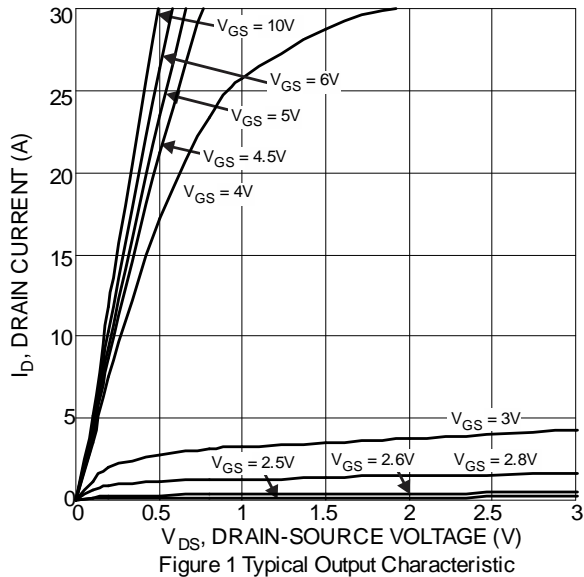


Figure 1 Typical Output Characteristic

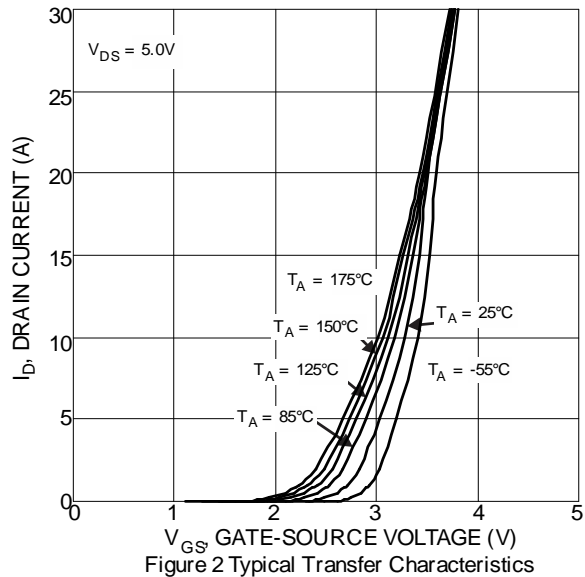


Figure 2 Typical Transfer Characteristics

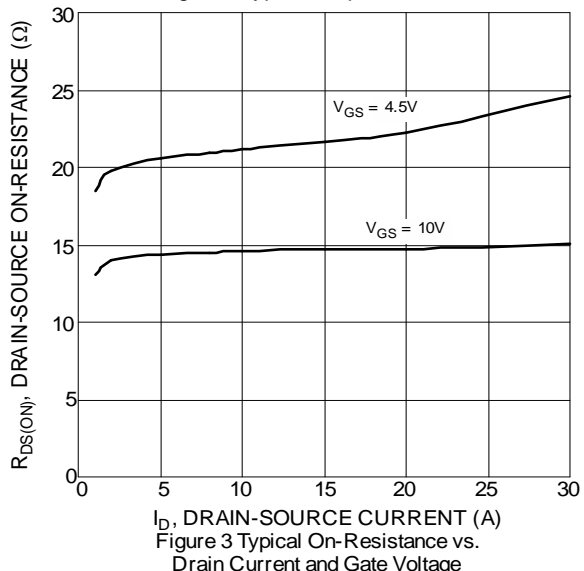


Figure 3 Typical On-Resistance vs. Drain Current and Gate Voltage

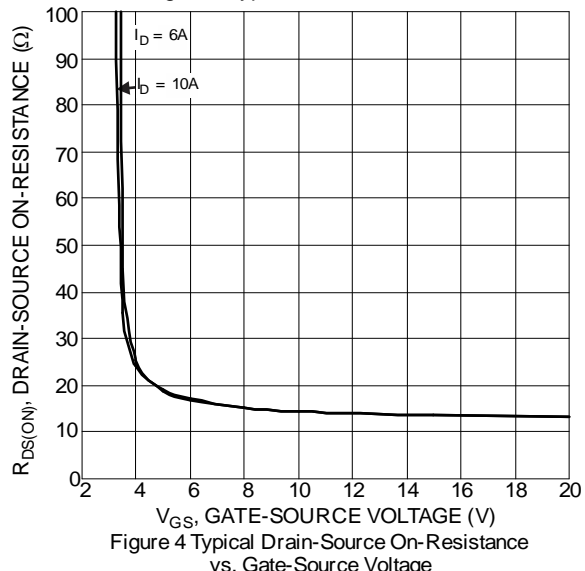


Figure 4 Typical Drain-Source On-Resistance vs. Gate-Source Voltage

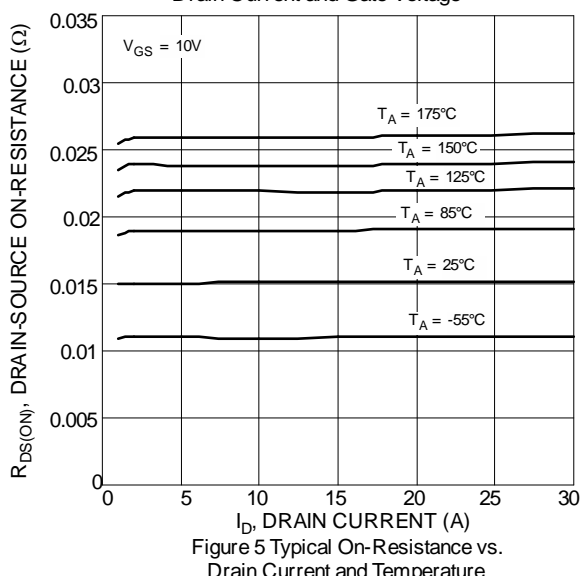


Figure 5 Typical On-Resistance vs. Drain Current and Temperature

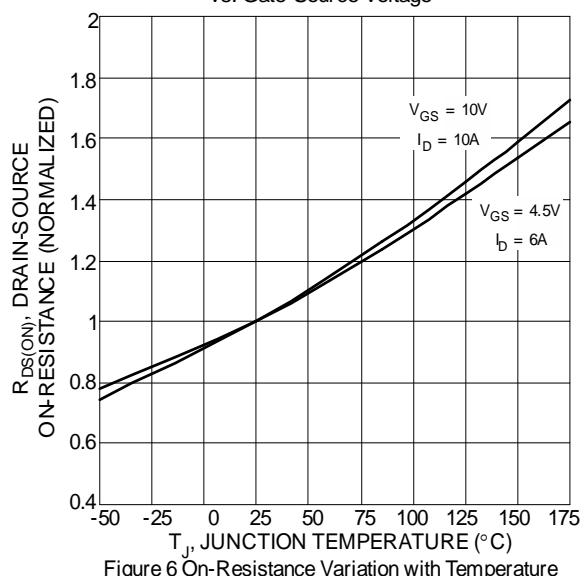


Figure 6 On-Resistance Variation with Temperature

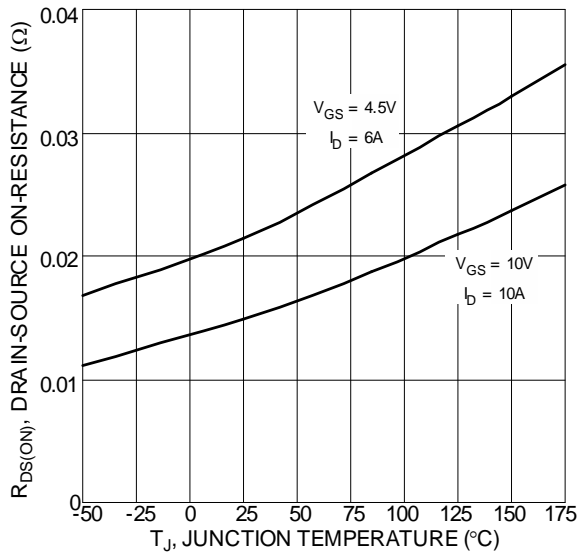


Figure 7 On-Resistance Variation with Temperature

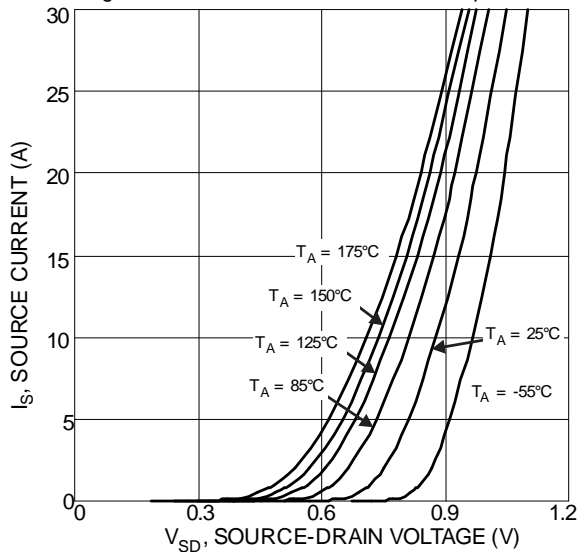


Figure 9 Diode Forward Voltage vs. Current

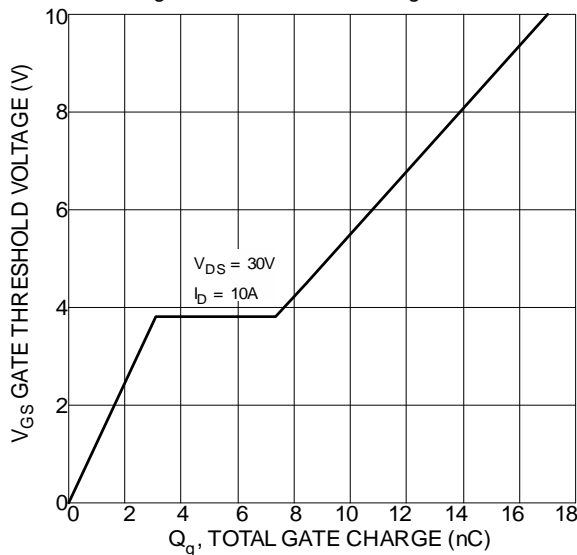


Figure 11 Gate Charge

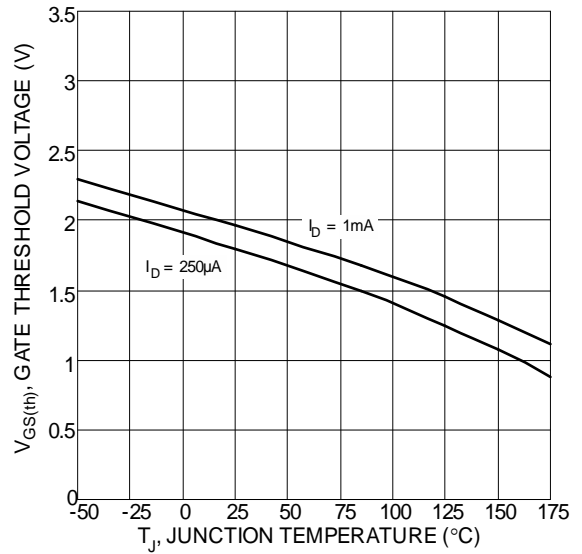


Figure 8 Gate Threshold Variation vs. Ambient Temperature

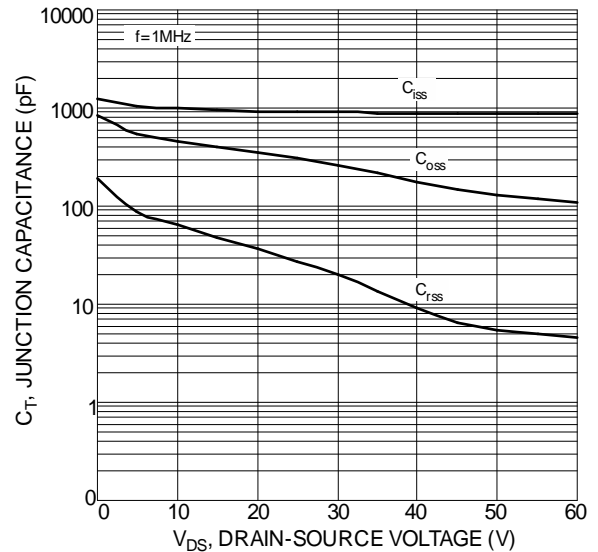


Figure 10 Typical Junction Capacitance

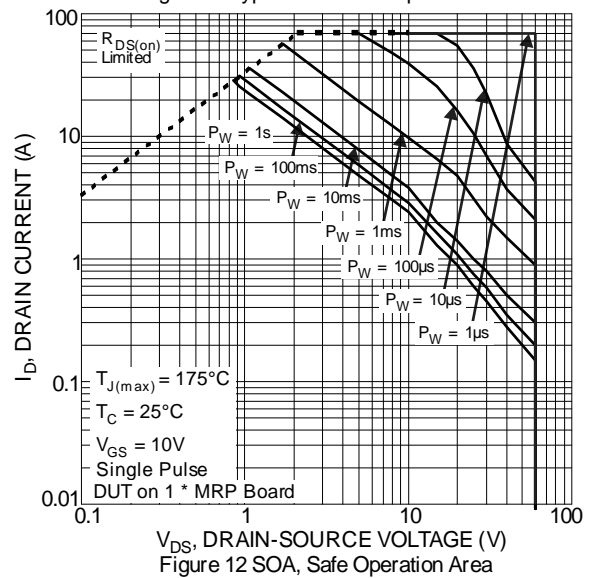
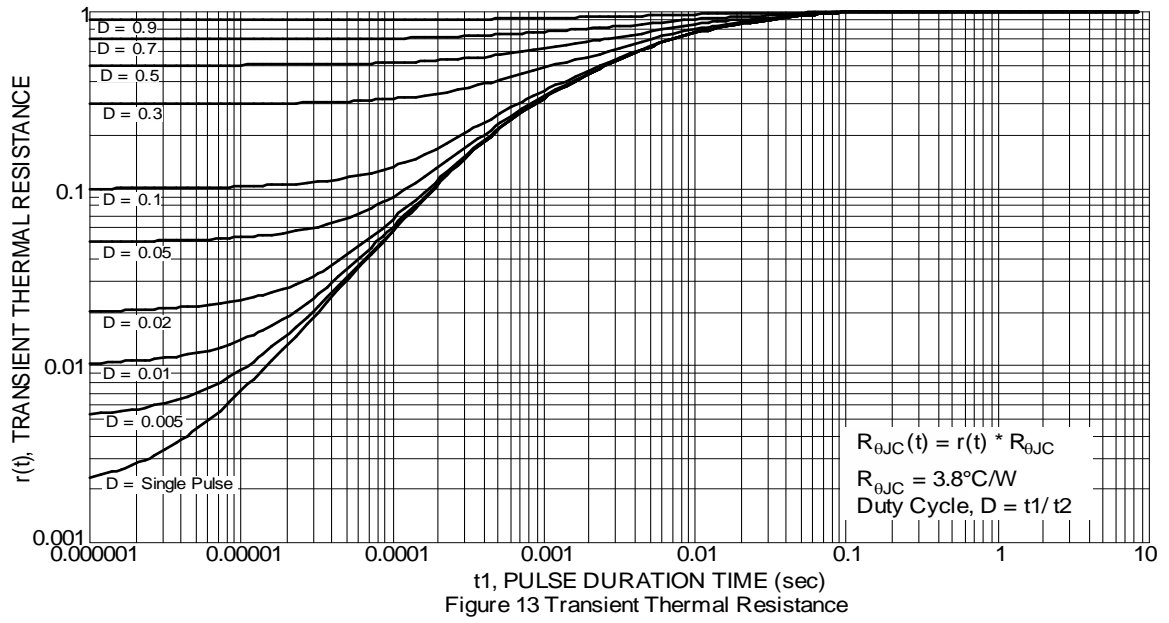


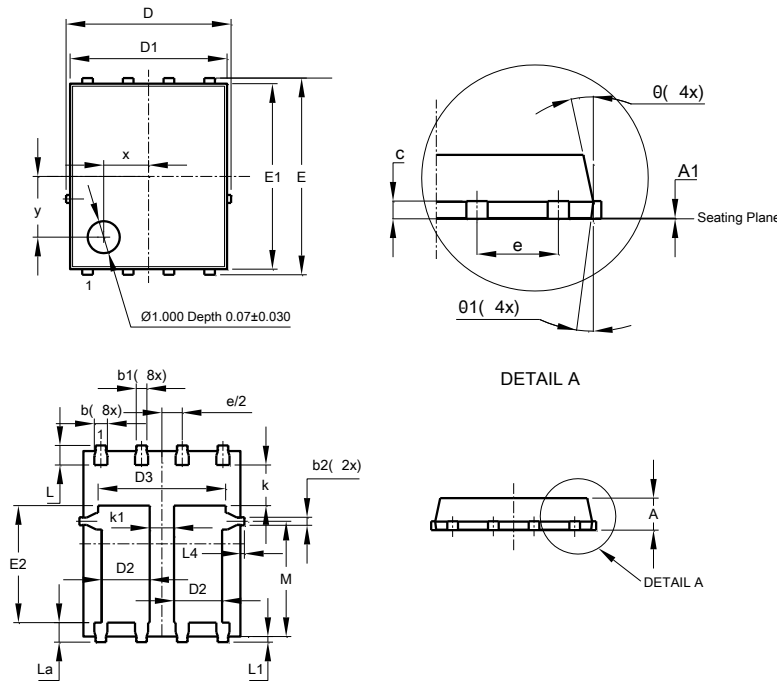
Figure 12 SOA, Safe Operation Area



## Package Outline Dimensions

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

### PowerDI5060-8 (Type C)

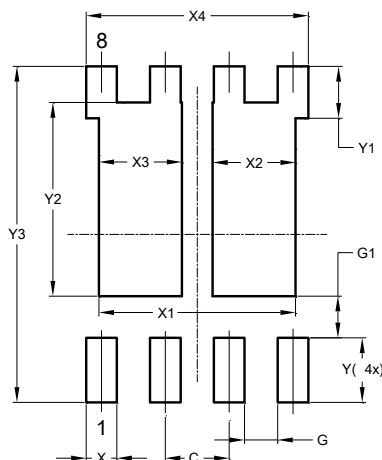


PowerDI5060-8 (Type C)			
Dim	Min	Max	Typ
A	0.90	1.10	1.00
A1	0	0.05	0.02
b	0.33	0.51	0.41
b1	0.300	0.366	0.333
b2	0.20	0.35	0.25
c	0.23	0.33	0.277
D	5.15 BSC		
D1	4.85	4.95	4.90
D2	1.40	1.60	1.50
D3	-	-	3.98
E	6.15 BSC		
E1	5.75	5.85	5.80
E2	3.56	3.76	3.66
e	1.27BSC		
k	-	-	1.27
k1	0.56	-	-
L	0.51	0.71	0.61
La	0.51	0.71	0.61
L1	0.05	0.20	0.175
L4	-	-	0.125
M	3.50	3.71	3.605
x	-	-	1.400
y	-	-	1.900
θ	10°	12°	11°
θ1	6°	8°	7°
All Dimensions in mm			

## Suggested Pad Layout

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

### PowerDI5060-8 (Type C)



Dimensions	Value (in mm)
C	1.270
G	0.660
G1	0.820
X	0.610
X1	3.910
X2	1.650
X3	1.650
X4	4.420
Y	1.270
Y1	1.020
Y2	3.810
Y3	6.610

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