

## Product Summary

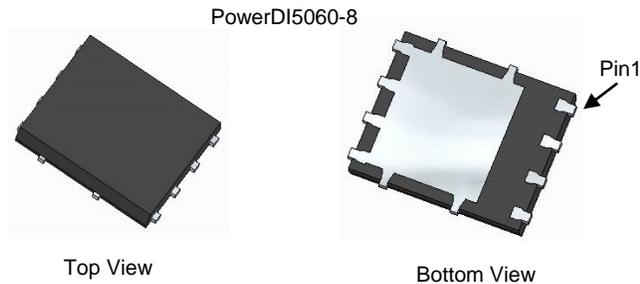
BV <sub>DSS</sub>	R <sub>DS(ON)</sub> Max	I <sub>D</sub> Max T <sub>C</sub> = +25°C
60V	23mΩ @ V <sub>GS</sub> = 10V	55A
	28mΩ @ V <sub>GS</sub> = 4.5V	48A

## Description

This MOSFET is designed to minimize the on-state resistance (R<sub>DS(ON)</sub>), yet maintain superior switching performance, making it ideal for high-efficiency power management applications.

## Applications

- Driving Solenoids
- Driving Relays
- Power Management Functions

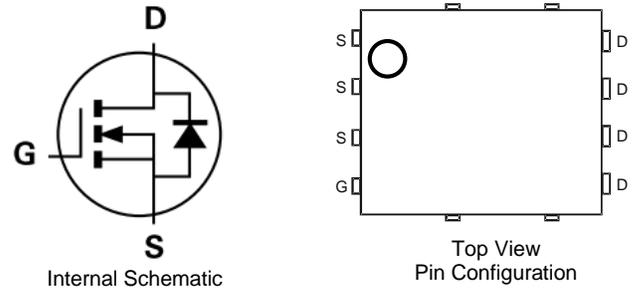


## Features

- Rated to +175°C – Ideal for High Ambient Temperature Environments
- 100% Unclamped Inductive Switching – Ensures More Reliable and Robust End Application
- High Conversion Efficiency
- Low R<sub>DS(ON)</sub> – Minimizes On-State Losses
- Low Input Capacitance
- Fast Switching Speed
- **Lead-Free Finish; RoHS Compliant (Notes 1 & 2)**
- **Halogen and Antimony Free. “Green” Device (Note 3)**
- **Qualified to AEC-Q101 Standards for High Reliability**
- **An Automotive-Compliant Part is Available Under Separate Data Sheet ([DMNH6021SPSQ](#))**

## Mechanical Data

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

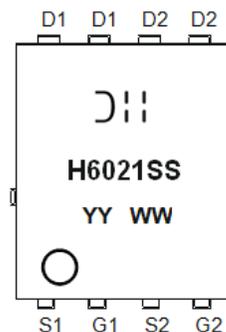


## Ordering Information (Note 4)

Part Number	Case	Packaging
DMNH6021SPS-13	PowerDI5060-8	2,500/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](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



⌋⌋⌋ = Manufacturer's Marking  
 H6021SS = Product Type Marking Code  
 YYWW = Date Code Marking  
 YY = Year (ex: 16 = 2016)  
 WW = Week (01 - 53)

**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, $V_{GS} = 10\text{V}$ (Note 7)	$I_D$	$T_C = +25^\circ\text{C}$	55
		$T_C = +100^\circ\text{C}$	39
Maximum Continuous Body Diode Forward Current (Note 7)	$I_S$	55	A
Pulsed Drain Current (10 $\mu\text{s}$ Pulse, Duty Cycle = 1%)	$I_{DM}$	88	A
Avalanche Current, $L = 0.1\text{mH}$ (Note 8)	$I_{AS}$	35	A
Avalanche Energy, $L = 0.1\text{mH}$ (Note 8)	$E_{AS}$	64	mJ

**Thermal Characteristics**

Characteristic	Symbol	Value	Units
Total Power Dissipation (Note 5)	$P_D$	1.6	W
Thermal Resistance, Junction to Ambient (Note 5)	$R_{\theta JA}$	96	$^\circ\text{C/W}$
Total Power Dissipation (Note 6)	$P_D$	3.0	W
Thermal Resistance, Junction to Ambient (Note 6)	$R_{\theta JA}$	50	$^\circ\text{C/W}$
Total Power Dissipation (Note 7)	$P_D$	53	W
Thermal Resistance, Junction to Case (Note 7)	$R_{\theta JC}$	1.5	$^\circ\text{C/W}$
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 9)						
Drain-Source Breakdown Voltage	$BV_{DSS}$	60	—	—	V	$V_{GS} = 0\text{V}, I_D = 250\mu\text{A}$
Zero Gate Voltage Drain Current	$I_{DSS}$	—	—	1	$\mu\text{A}$	$V_{DS} = 60\text{V}, V_{GS} = 0\text{V}$
Gate-Source Leakage	$I_{GSS}$	—	—	$\pm 100$	nA	$V_{GS} = \pm 20\text{V}, V_{DS} = 0\text{V}$
<b>ON CHARACTERISTICS</b> (Note 9)						
Gate Threshold Voltage	$V_{GS(TH)}$	1	—	3	V	$V_{DS} = V_{GS}, I_D = 250\mu\text{A}$
Static Drain-Source On-Resistance	$R_{DS(ON)}$	—	12	23	m $\Omega$	$V_{GS} = 10\text{V}, I_D = 12\text{A}$
		—	18	28		$V_{GS} = 4.5\text{V}, I_D = 12\text{A}$
Diode Forward Voltage	$V_{SD}$	—	0.75	1.2	V	$V_{GS} = 0\text{V}, I_S = 20\text{A}$
<b>DYNAMIC CHARACTERISTICS</b> (Note 10)						
Input Capacitance	$C_{ISS}$	—	1,016	—	pF	$V_{DS} = 30\text{V}, V_{GS} = 0\text{V}, f = 1\text{MHz}$
Output Capacitance	$C_{OSS}$	—	153	—		
Reverse Transfer Capacitance	$C_{RSS}$	—	76.8	—		
Gate Resistance	$R_G$	—	2.5	—	$\Omega$	$V_{DS} = 0\text{V}, V_{GS} = 0\text{V}, f = 1\text{MHz}$
Total Gate Charge ( $V_{GS} = 4.5\text{V}$ )	$Q_G$	—	9.5	—	nC	$V_{DS} = 30\text{V}, I_D = 20\text{A}$
Total Gate Charge ( $V_{GS} = 10\text{V}$ )	$Q_G$	—	19.7	—		
Gate-Source Charge	$Q_{GS}$	—	3.6	—		
Gate-Drain Charge	$Q_{GD}$	—	4.8	—		
Turn-On Delay Time	$t_{D(ON)}$	—	4.2	—	ns	$V_{DD} = 30\text{V}, V_{GS} = 10\text{V}, I_D = 10\text{A}, R_G = 4.7\Omega,$
Turn-On Rise Time	$t_R$	—	13	—		
Turn-Off Delay Time	$t_{D(OFF)}$	—	27.5	—		
Turn-Off Fall Time	$t_F$	—	15.3	—		
Body Diode Reverse Recovery Time	$t_{RR}$	—	20.8	—	ns	$I_F = 20\text{A}, di/dt = 100\text{A}/\mu\text{s}$
Body Diode Reverse Recovery Charge	$Q_{RR}$	—	13.9	—	nC	

- Notes:
- Device mounted on FR-4 PC board, with minimum recommended pad layout, single sided.
  - Device mounted on FR-4 substrate PC board, 2oz copper, with thermal bias to bottom layer 1-inch square copper plate.
  - Thermal resistance from junction to soldering point (on the exposed drain pad).
  - $I_{AS}$  and  $E_{AS}$  rating are based on low frequency and duty cycles to keep  $T_J = +25^\circ\text{C}$ .
  - Short duration pulse test used to minimize self-heating effect.
  - Guaranteed by design. Not subject to product testing.

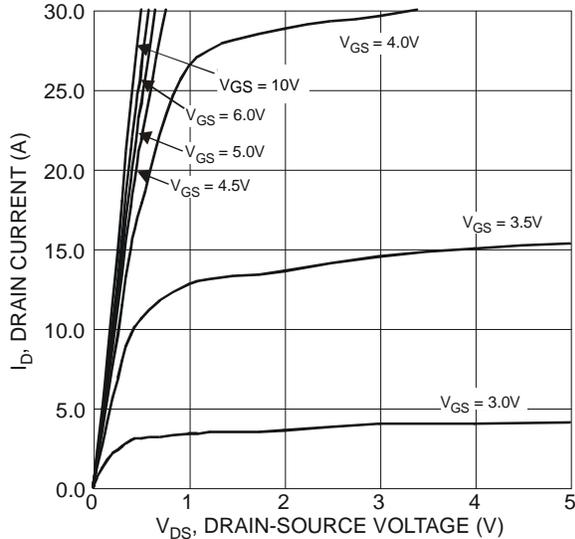


Figure 1 Typical Output Characteristics

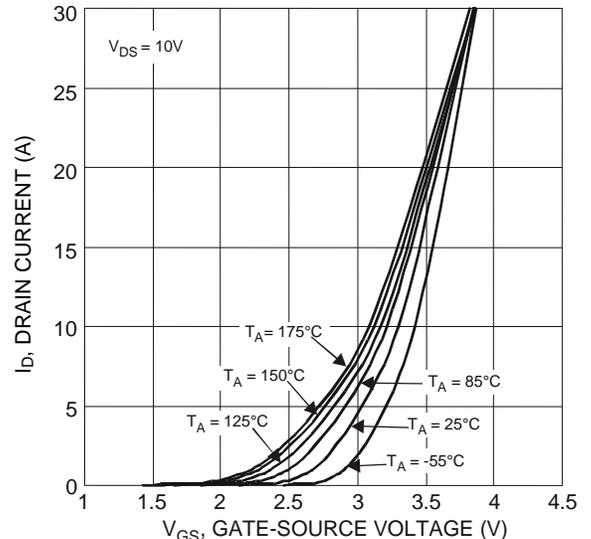


Figure 2 Typical Transfer Characteristics

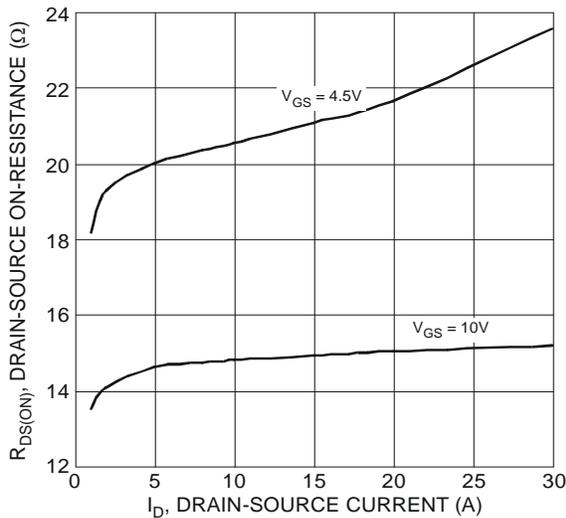


Figure 3 Typical On-Resistance vs. Drain Current and Gate Voltage

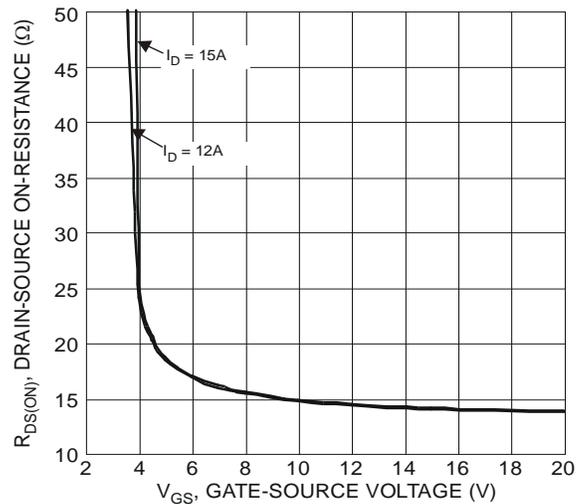


Figure 4 Typical Drain-Source On-Resistance vs. Gate-Source Voltage

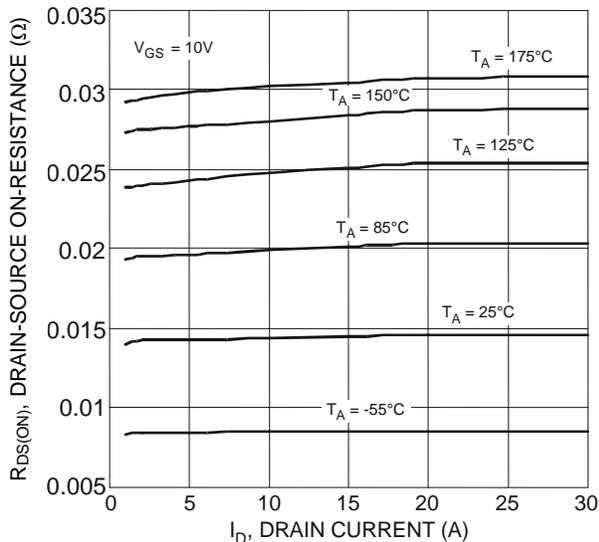


Figure 5 Typical On-Resistance vs. Drain Current and Temperature

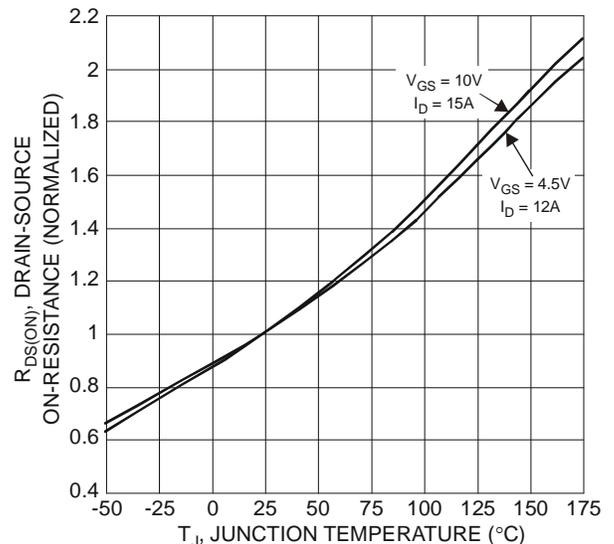


Figure 6 On-Resistance Variation with Temperature

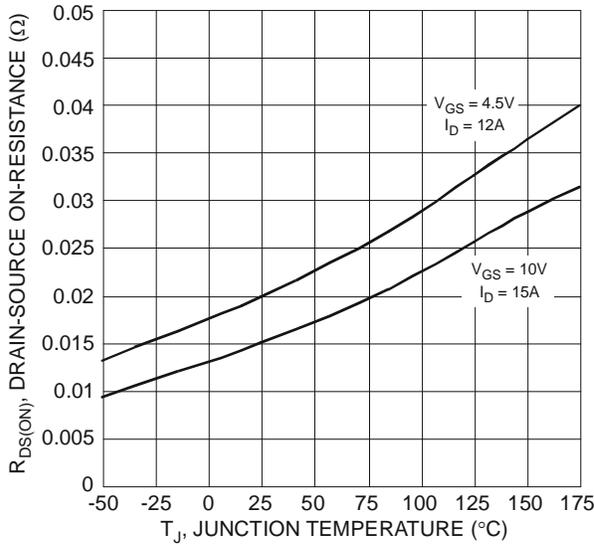


Figure 7 On-Resistance Variation with Temperature

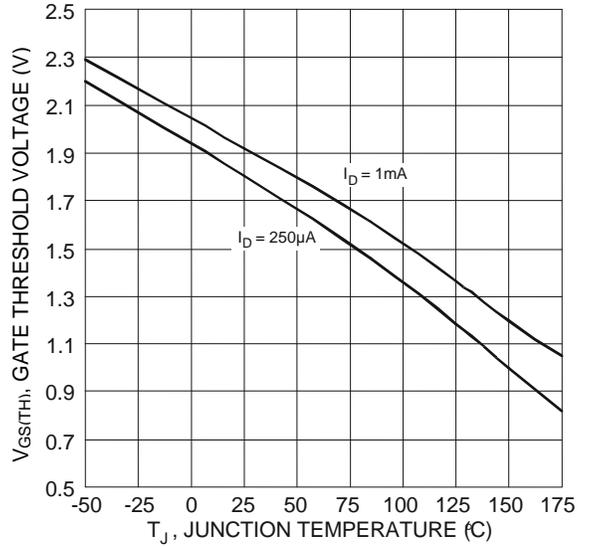


Figure 8 Gate Threshold Variation vs. Junction Temperature

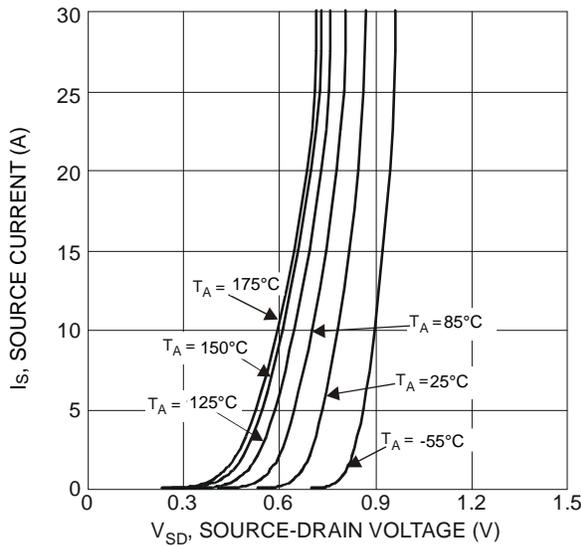


Figure 9 Diode Forward Voltage vs. Current

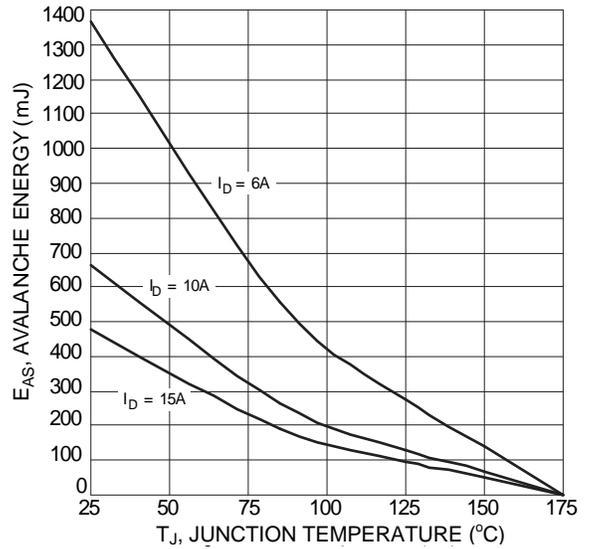


Figure 10 Avalanche Energy

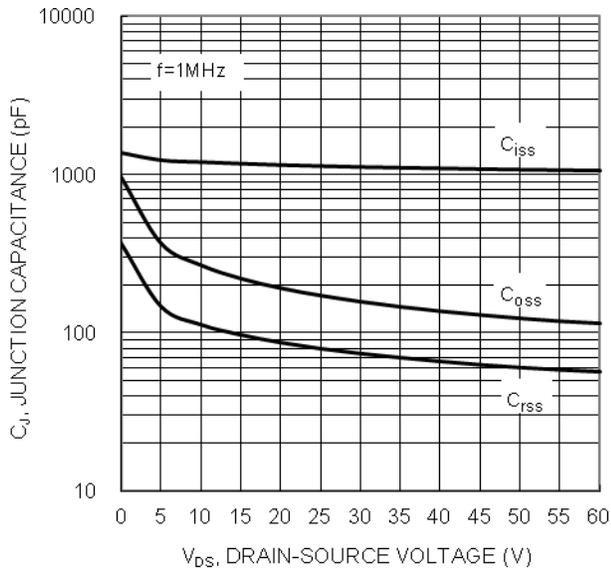


Figure 11 Typical Junction Capacitance

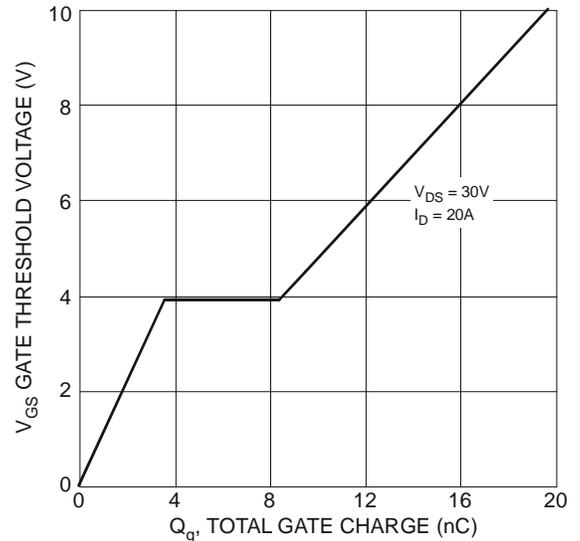


Figure 12 Gate Charge

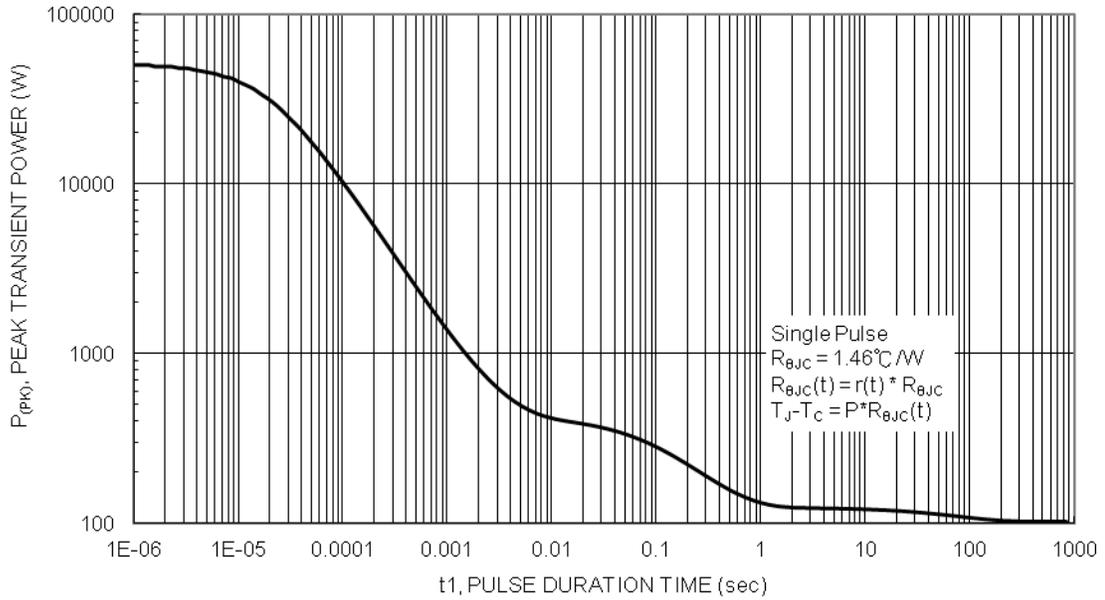


Figure 13 Single Pulse Maximum Power Dissipation

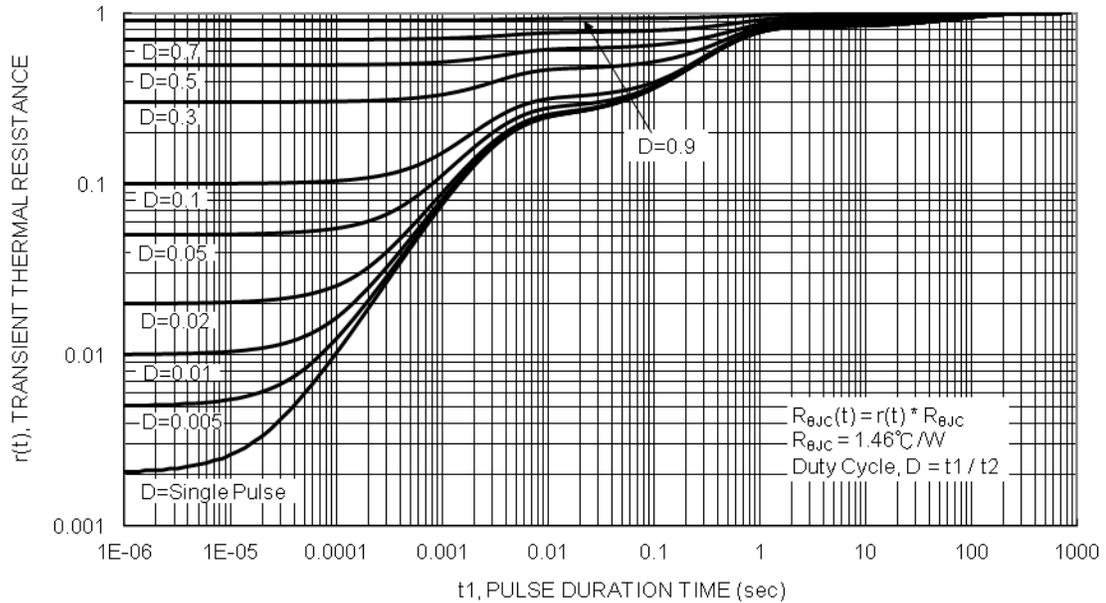
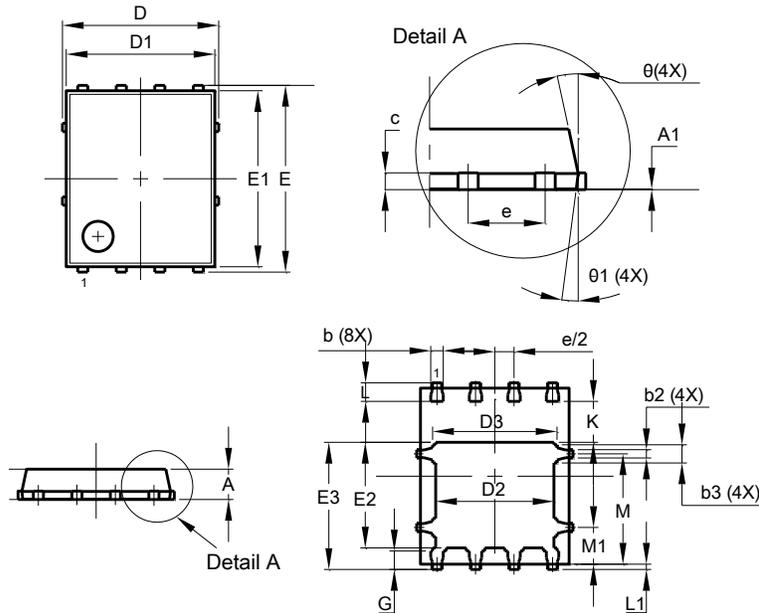


Figure 14 Transient Thermal Resistance

## Package Outline

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

**PowerDI5060-8**

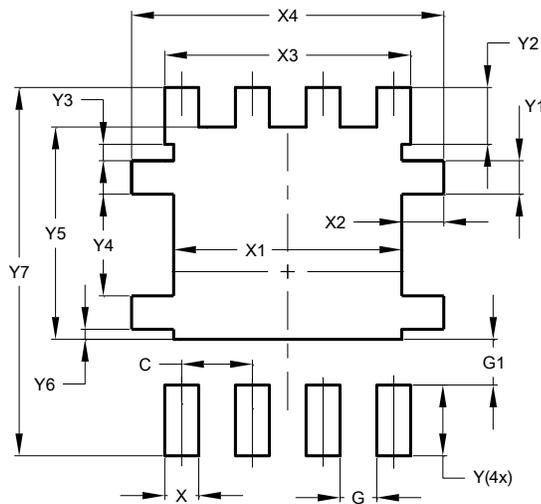


PowerDI5060-8			
Dim	Min	Max	Typ
A	0.90	1.10	1.00
A1	0.00	0.05	-
b	0.33	0.51	0.41
b2	0.200	0.350	0.273
b3	0.40	0.80	0.60
c	0.230	0.330	0.277
D	5.15 BSC		
D1	4.70	5.10	4.90
D2	3.70	4.10	3.90
D3	3.90	4.30	4.10
E	6.15 BSC		
E1	5.60	6.00	5.80
E2	3.28	3.68	3.48
E3	3.99	4.39	4.19
e	1.27 BSC		
G	0.51	0.71	0.61
K	0.51	-	-
L	0.51	0.71	0.61
L1	0.100	0.200	0.175
M	3.235	4.035	3.635
M1	1.00	1.40	1.21
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**



Dimensions	Value (in mm)
C	1.270
G	0.660
G1	0.820
X	0.610
X1	4.100
X2	0.755
X3	4.420
X4	5.610
Y	1.270
Y1	0.600
Y2	1.020
Y3	0.295
Y4	1.825
Y5	3.810
Y6	0.180
Y7	6.610

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