

## Product Summary

$BV_{DSS}$	$R_{DS(ON)}$	$I_D$ $T_A = +25^\circ C$
-12V	6m $\Omega$ @ $V_{GS} = -4.5V$	-80A
	8m $\Omega$ @ $V_{GS} = -2.5V$	-70A

## 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:

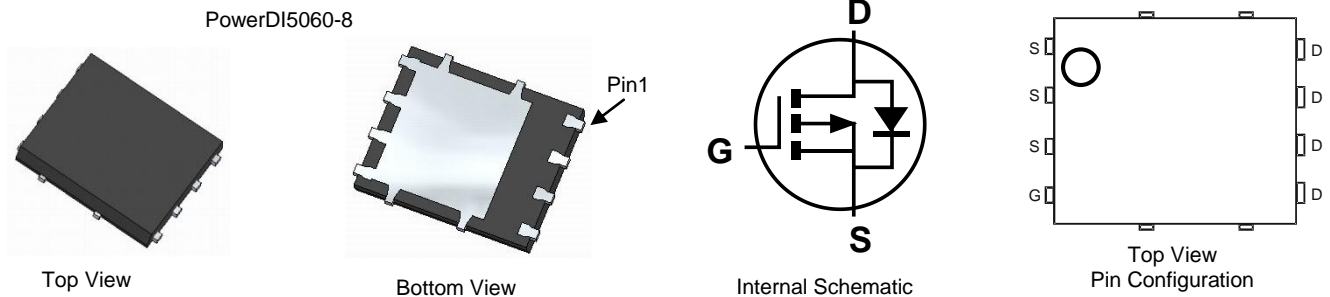
- Notebook Battery Power Management
- DC-DC Converters
- Load Switch

## 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  $R_{DS(ON)}$  – 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**
- **PPAP Capable (Note 4)**

## Mechanical Data

- Case: PowerDI5060-8
- 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 (63)
- Weight: 0.097 grams (Approximate)

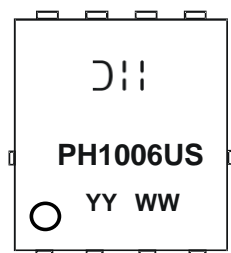


## Ordering Information (Note 5)

Part Number	Case	Packaging
DMPH1006UPSQ-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. 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



☺|| = Manufacturer's Marking  
 PH1006US = Product Type Marking Code  
 YYWW = Date Code Marking  
 YY = Year (ex: 16 = 2016)  
 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>	-12	V	
Gate-Source Voltage	V <sub>GSS</sub>	±8	V	
Continuous Drain Current (Note 8) V <sub>GS</sub> = -4.5V	I <sub>D</sub>	T <sub>C</sub> = +25°C	-80	A
		T <sub>C</sub> = +100°C	-60	A
Pulsed Drain Current (10µs Pulse, Duty Cycle = 1%)	I <sub>DM</sub>	-140	A	
Maximum Continuous Body Diode Forward Current (Note 7)	I <sub>S</sub>	-3.6	A	
Avalanche Current, L=0.1mH (Note 9)	I <sub>AS</sub>	-18	A	
Avalanche Energy, L=0.1mH (Note 9)	E <sub>AS</sub>	-17	mJ	

**Thermal Characteristics**

Characteristic	Symbol	Value	Unit	
Total Power Dissipation (Note 6)	P <sub>D</sub>	1.8	W	
Thermal Resistance, Junction to Ambient (Note 6)	R <sub>θJA</sub>	Steady State	86	°C/W
		t<10s	74	
Total Power Dissipation (Note 7)	P <sub>D</sub>	3.2	W	
Thermal Resistance, Junction to Ambient (Note 7)	R <sub>θJA</sub>	Steady State	47	°C/W
		t<10s	40	
Thermal Resistance, Junction to Case (Note 8)	R <sub>θJC</sub>	1.0		
Operating and Storage Temperature Range	T <sub>J</sub> , T <sub>STG</sub>	-55 to +175	°C	

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

Characteristic	Symbol	Min	Typ	Max	Unit	Test Condition
<b>OFF CHARACTERISTICS (Note 10)</b>						
Drain-Source Breakdown Voltage	BV <sub>DSS</sub>	-12	—	—	V	V <sub>GS</sub> = 0V, I <sub>D</sub> = -250µA
Zero Gate Voltage Drain Current	I <sub>DSS</sub>	—	—	-1	µA	V <sub>DS</sub> = -12V, V <sub>GS</sub> = 0V
Gate-Source Leakage	I <sub>GSS</sub>	—	—	±100	nA	V <sub>GS</sub> = ±8V, V <sub>DS</sub> = 0V
<b>ON CHARACTERISTICS (Note 10)</b>						
Gate Threshold Voltage	V <sub>GS(TH)</sub>	-0.4	—	-1	V	V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = -250µA
Static Drain-Source On-Resistance	R <sub>DS(ON)</sub>	—	4	6	mΩ	V <sub>GS</sub> = -4.5V, I <sub>D</sub> = -15A
		—	5	8		V <sub>GS</sub> = -2.5V, I <sub>D</sub> = -10A
Diode Forward Voltage	V <sub>SD</sub>	—	-0.7	-1.1	V	V <sub>GS</sub> = 0V, I <sub>S</sub> = -1A
<b>DYNAMIC CHARACTERISTICS (Note 11)</b>						
Input Capacitance	C <sub>ISS</sub>	—	6,334	—	pF	V <sub>DS</sub> = -10V, V <sub>GS</sub> = 0V f = 1MHz
Output Capacitance	C <sub>OSS</sub>	—	1094	—		
Reverse Transfer Capacitance	C <sub>RSS</sub>	—	895	—		
Gate Resistance	R <sub>g</sub>	—	3.5	—	Ω	V <sub>DS</sub> = 0V, V <sub>GS</sub> = 0V, f = 1MHz
Total Gate Charge (V <sub>GS</sub> = -8V)	Q <sub>g</sub>	—	124	—	nC	V <sub>DD</sub> = -10V, I <sub>D</sub> = -20A
Total Gate Charge (V <sub>GS</sub> = -4.5V)	Q <sub>g</sub>	—	72	—		
Gate-Source Charge	Q <sub>gs</sub>	—	9	—		
Gate-Drain Charge	Q <sub>gd</sub>	—	17	—		
Turn-On Delay Time	t <sub>D(ON)</sub>	—	11	—	ns	V <sub>GS</sub> = -4.5V, V <sub>DD</sub> = -10V, R <sub>g</sub> = 1Ω, I <sub>D</sub> = -10A
Turn-On Rise Time	t <sub>R</sub>	—	21	—		
Turn-Off Delay Time	t <sub>D(OFF)</sub>	—	105	—		
Turn-Off Fall Time	t <sub>F</sub>	—	94	—		
Reverse Recovery Time	t <sub>RR</sub>	—	27	—	ns	I <sub>F</sub> = -10A, di/dt = -100A/µs
Reverse Recovery Charge	Q <sub>RR</sub>	—	10	—	nC	I <sub>F</sub> = -10A, di/dt = -100A/µs

- Notes:
6. Device mounted on FR-4 PC board, with minimum recommended pad layout, single sided.
  7. Device mounted on FR-4 substrate PC board, 2oz copper, with thermal bias to bottom layer 1 inch square copper plate.
  8. Thermal resistance from junction to soldering point (on the exposed drain pad).
  9. I<sub>AS</sub> and E<sub>AS</sub> rating are based on low frequency and duty cycles to keep T<sub>J</sub> = +25°C.
  10. Short duration pulse test used to minimize self-heating effect.
  11. Guaranteed by design. Not subject to product testing.

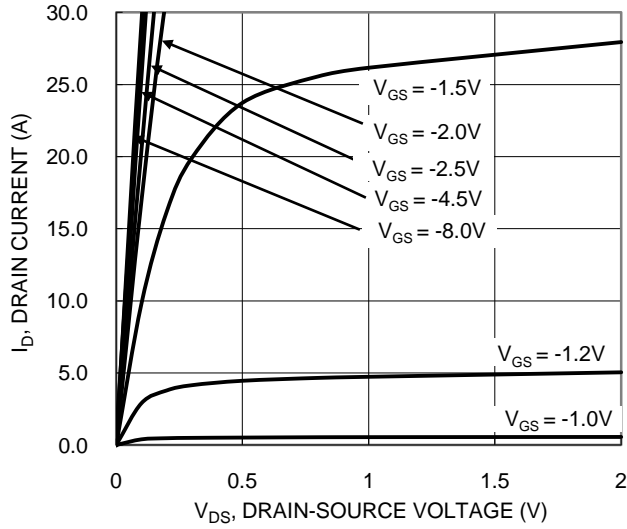


Figure 1. Typical Output Characteristic

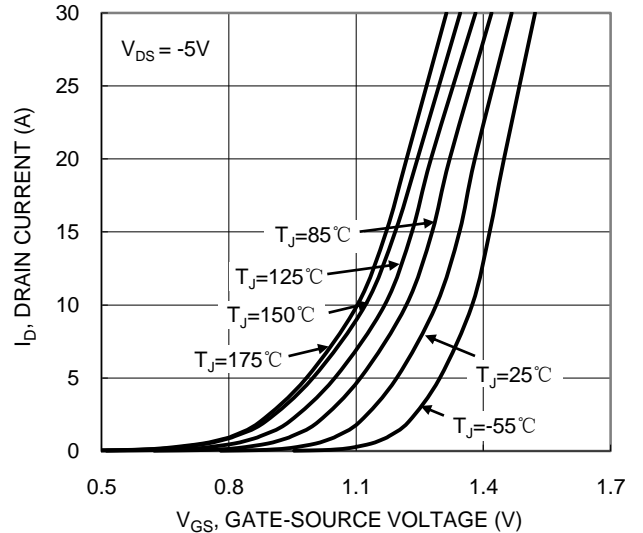


Figure 2. Typical Transfer Characteristic

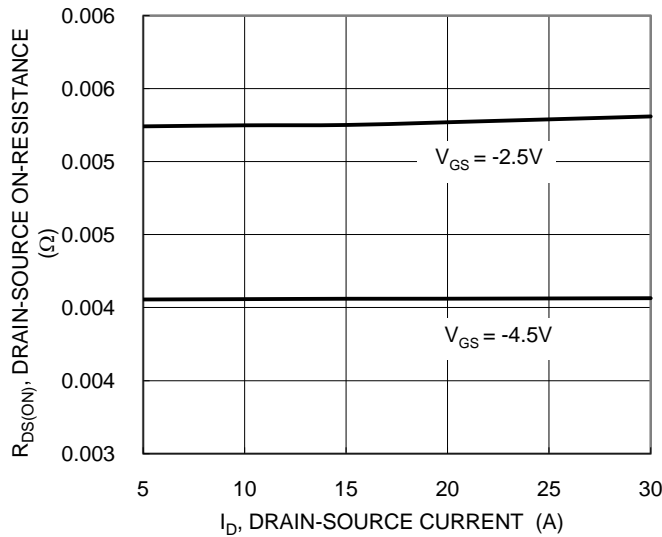


Figure 3. Typical On-Resistance vs. Drain Current and Gate Voltage

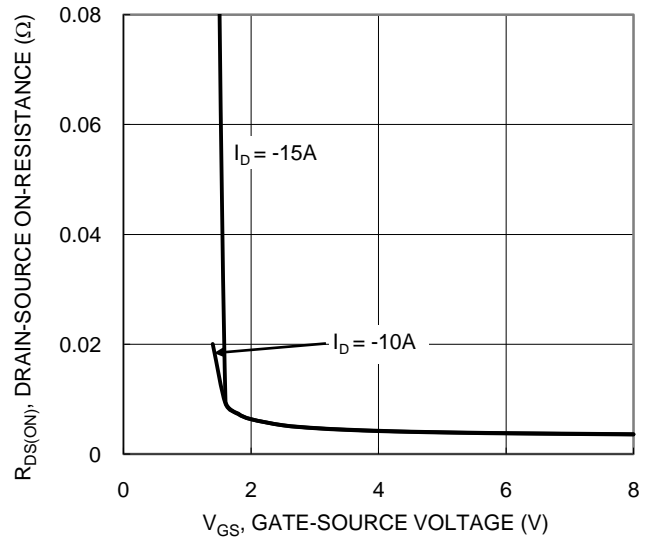


Figure 4. Typical Transfer Characteristic

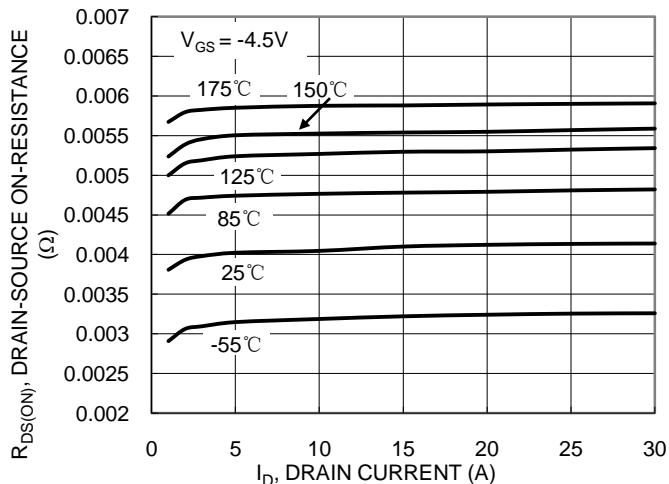


Figure 5. Typical On-Resistance vs. Drain Current and Temperature

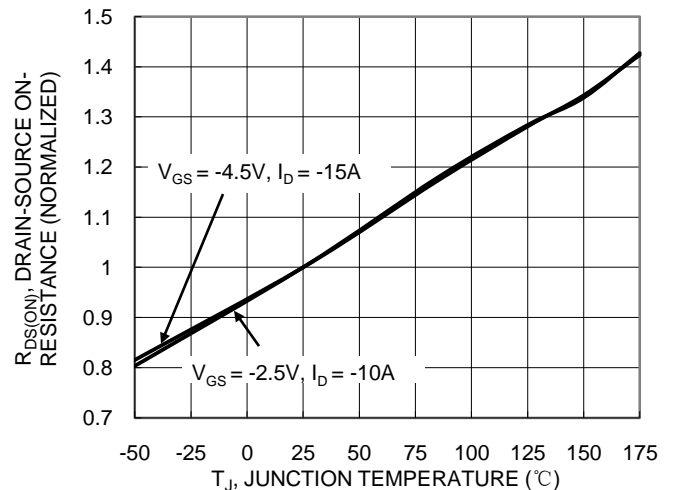


Figure 6. On-Resistance Variation with Temperature

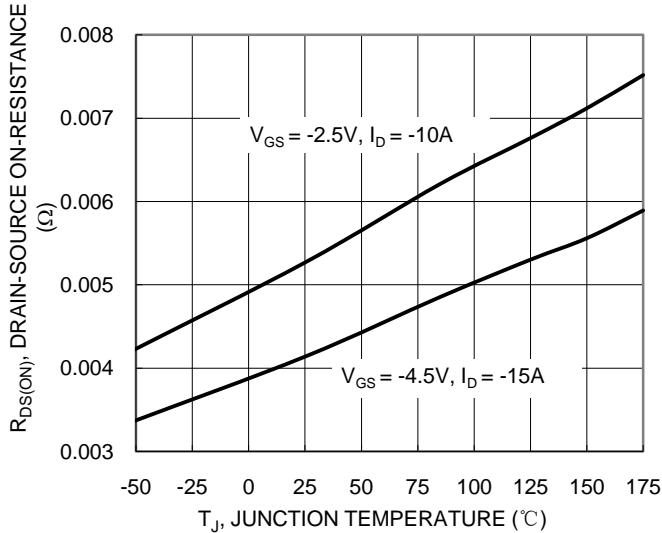


Figure 7. On-Resistance Variation with Temperature

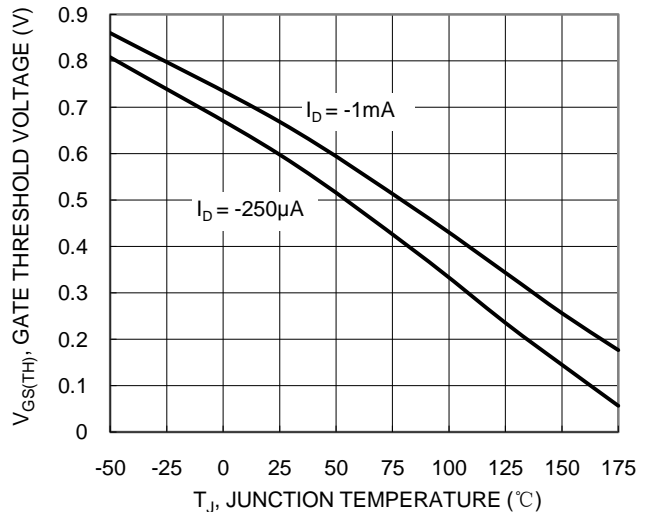


Figure 8. Gate Threshold Variation vs. Junction Temperature

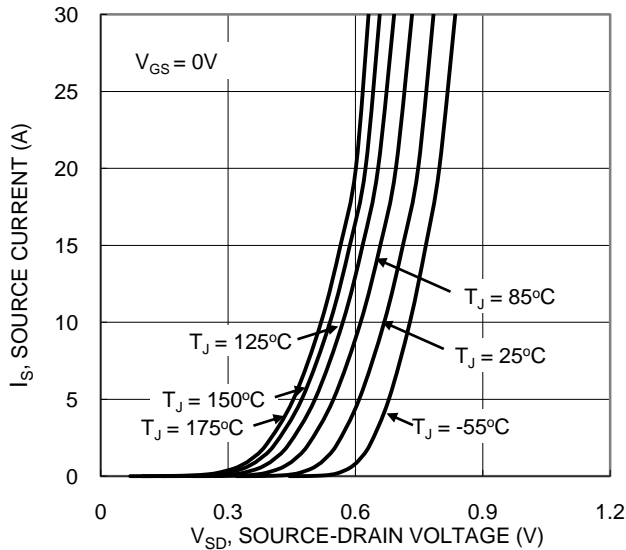


Figure 9. Diode Forward Voltage vs. Current

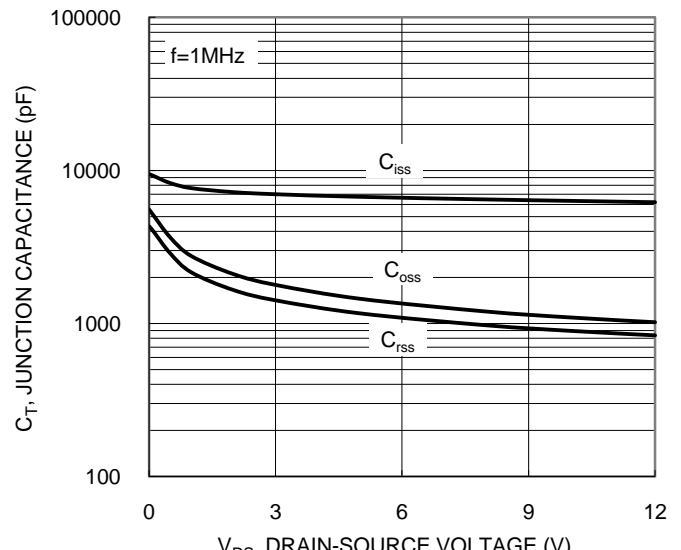


Figure 10. Typical Junction Capacitance

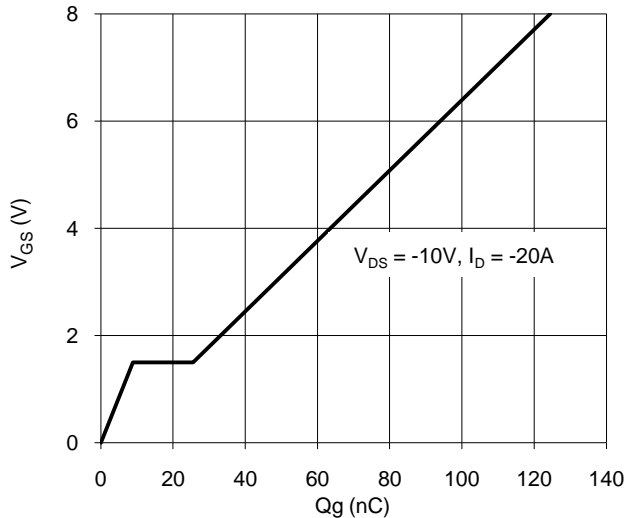


Figure 11. Gate Charge

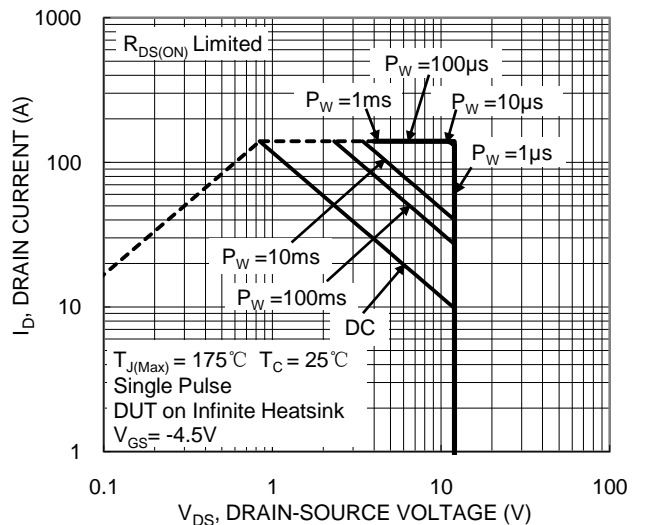


Figure 12. SOA, Safe Operation Area

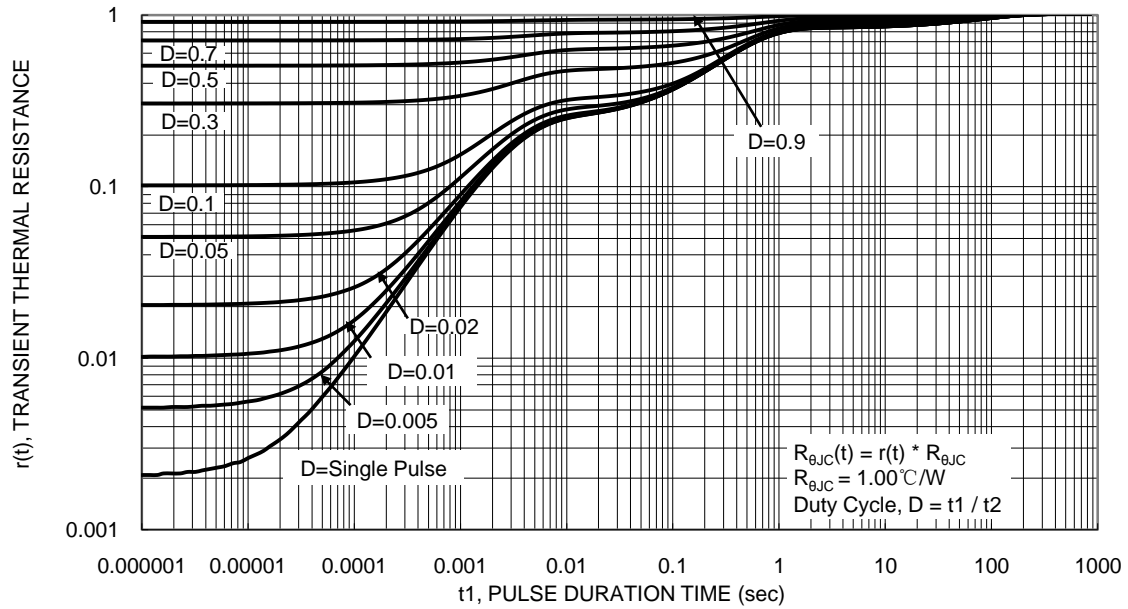
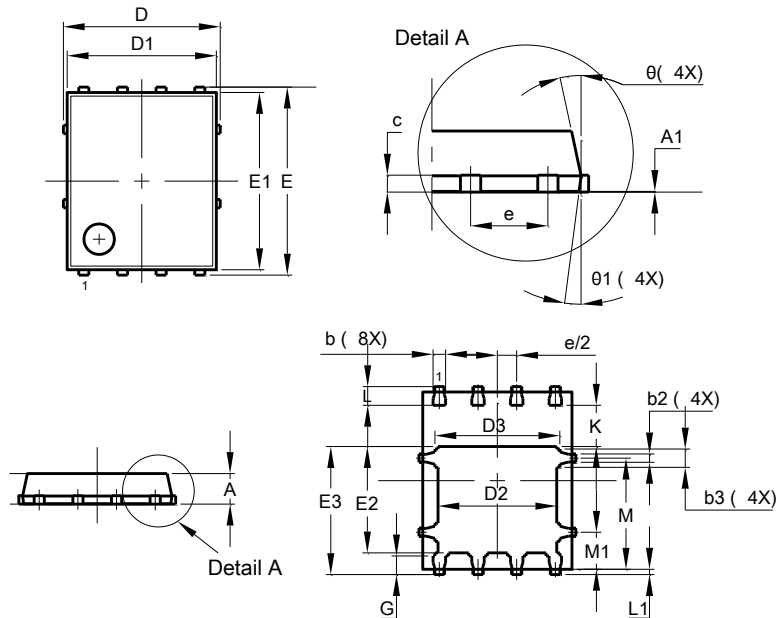


Figure 13. Transient Thermal Resistance

## Package Outline Dimensions

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

**PowerDI5060-8**



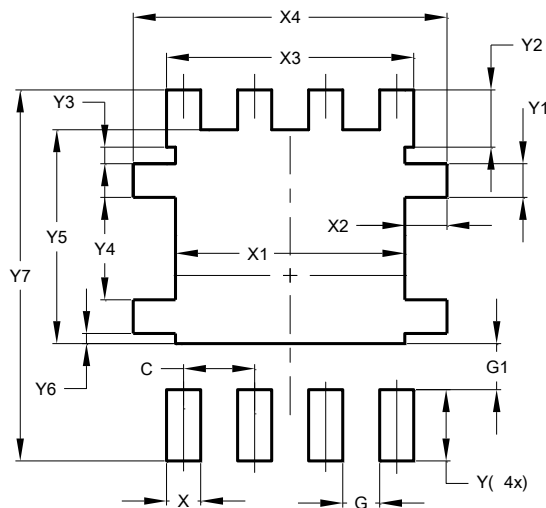
PowerDI5060-8			
Dim	Min	Max	Typ
A	0.90	1.10	1.00
A1	0.00	0.05	-
b	0.33	0.51	0.41
b2	0.200	0.350	0.273
b3	0.40	0.80	0.60
c	0.230	0.330	0.277
D	5.15 BSC		
D1	4.70	5.10	4.90
D2	3.70	4.10	3.90
D3	3.90	4.30	4.10
E	6.15 BSC		
E1	5.60	6.00	5.80
E2	3.28	3.68	3.48
E3	3.99	4.39	4.19
e	1.27 BSC		
G	0.51	0.71	0.61
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
$\Theta$	10°	12°	11°
$\Theta_1$	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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Телефон: 8 (812) 309-75-97 (многоканальный)

Факс: 8 (812) 320-03-32

Электронная почта: [ocean@oceanchips.ru](mailto:ocean@oceanchips.ru)

Web: <http://oceanchips.ru/>

Адрес: 198099, г. Санкт-Петербург, ул. Калинина, д. 2, корп. 4, лит. А