

## Product Summary

BV <sub>DSS</sub>	R <sub>DS(ON)</sub> max	I <sub>D</sub> T <sub>C</sub> = +25°C
-20V	2.5mΩ @ V <sub>GS</sub> = -10V	-60A
	3.5mΩ @ V <sub>GS</sub> = -4.5V	-60A

## Description

This new generation P-Channel Enhancement Mode MOSFET is designed to minimize R<sub>DS(ON)</sub> and yet maintain superior switching performance.

## Applications

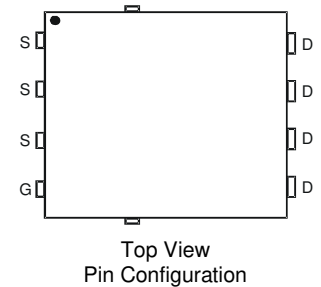
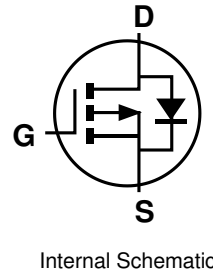
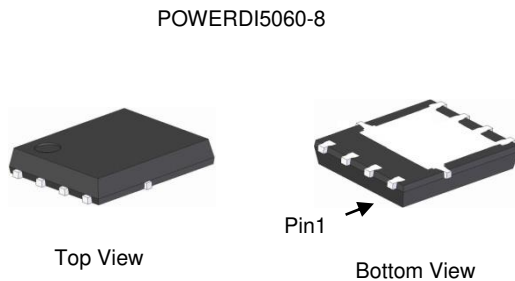
- Load Switch
- Notebook Battery Power Management

## Features

- Thermally Efficient Package – Cooler Running Applications
- High Conversion Efficiency
- Low R<sub>DS(ON)</sub> – Minimizes On State Losses
- <1.1mm Package Profile – Ideal for Thin Applications
- **Lead-Free Finish; RoHS Compliant (Notes 1 & 2)**
- **Halogen and Antimony Free. “Green” Device (Note 3)**

## 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 208③
- Weight: 0.097 grams (Approximate)

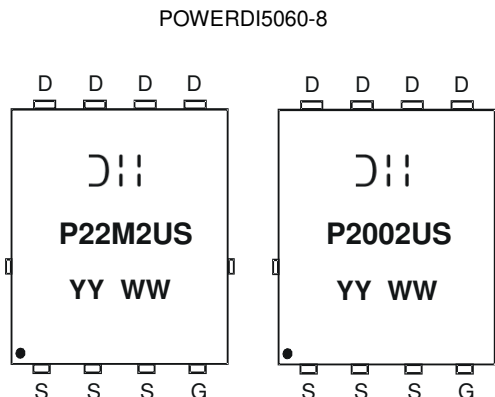


## Ordering Information (Note 4)

Part Number	Case	Packaging
DMP22M2UPS-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  
 P22M2US or P2002US = Product Type Marking Code  
 YYWW = Date Code Marking  
 YY = Last Digit of Year (ex: 14 = 2014)  
 WW = Week Code (01 to 53)

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

Characteristic			Symbol	Value	Units
Drain-Source Voltage			$V_{DSS}$	-20	V
Gate-Source Voltage			$V_{GSS}$	$\pm 12$	V
Continuous Drain Current, $V_{GS} = 10\text{V}$ (Note 5)	Steady State (Note 6)	$T_C = +25^\circ\text{C}$ $T_C = +70^\circ\text{C}$	$I_D$	-60 -60	A
	$t < 10\text{s}$	$T_A = +25^\circ\text{C}$ $T_A = +70^\circ\text{C}$		-42 -33.5	A
Pulsed Drain Current (10 $\mu\text{s}$ Pulse, Duty Cycle = 1%)			$I_{DM}$	-100	A
Continuous Body Diode Forward Current (Note 5)	Steady State (Note 6)	$T_C = +25^\circ\text{C}$	$I_S$	-60	A
	$t < 10\text{s}$	$T_A = +25^\circ\text{C}$		-5.6	A
Avalanche Current, $L = 0.1\text{mH}$			$I_{AS}$	-37	A
Avalanche Energy, $L = 0.1\text{mH}$			$E_{AS}$	69.8	mJ

**Thermal Characteristics**

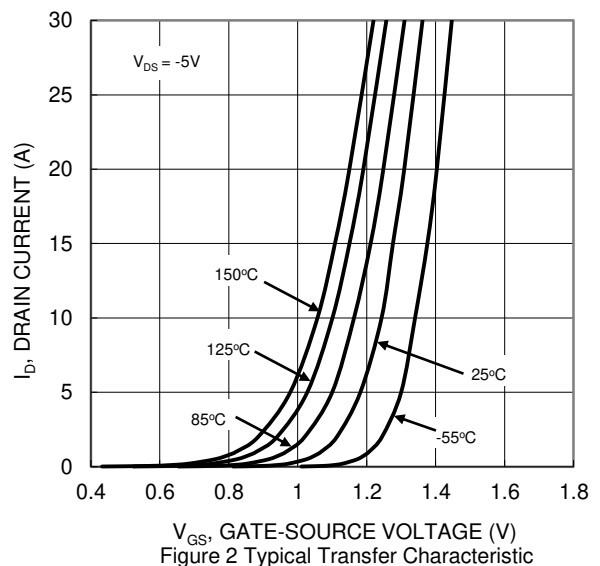
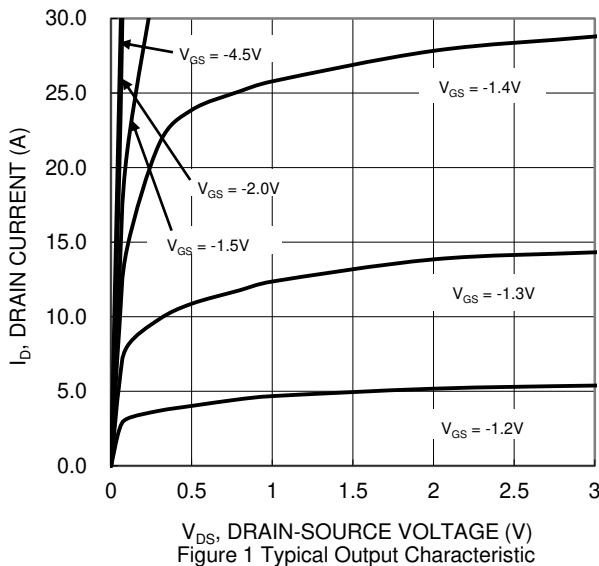
Characteristic		Symbol	Value	Units
Total Power Dissipation (Note 5)	Steady State	$P_D$	2.3	W
	$t < 10\text{s}$		6.25	
Thermal Resistance, Junction to Ambient (Note 5)	Steady State	$R_{\theta JA}$	55	$^\circ\text{C/W}$
	$t < 10\text{s}$		20	
Total Power Dissipation (Note 5)	Steady State	$P_D$	104	W
Thermal Resistance, Junction to Case (Note 5)		$R_{\theta JC}$	0.9	$^\circ\text{C/W}$
Operating and Storage Temperature Range		$T_J, T_{STG}$	-55 to +150	$^\circ\text{C}$

Note: 5. Device mounted on FR-4 substrate PC board, 2oz copper, with thermal bias to bottom layer 1-inch square copper plate.  
6. Package limited.

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

Characteristic	Symbol	Min	Typ	Max	Unit	Test Condition
<b>OFF CHARACTERISTICS (Note 7)</b>						
Drain-Source Breakdown Voltage	BV <sub>DSS</sub>	-20	—	—	V	V <sub>GS</sub> = 0V, I <sub>D</sub> = -250μA
Zero Gate Voltage Drain Current	I <sub>DSS</sub>	—	—	-10	μA	V <sub>DS</sub> = -20V, V <sub>GS</sub> = 0V
Gate-Source Leakage	I <sub>GSS</sub>	—	—	±100	nA	V <sub>GS</sub> = ±12V, V <sub>DS</sub> = 0V
<b>ON CHARACTERISTICS (Note 7)</b>						
Gate Threshold Voltage	V <sub>GS(TH)</sub>	-0.5	—	-1.4	V	V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = -250μA
Static Drain-Source On-Resistance	R <sub>DS(ON)</sub>	—	—	2.5	mΩ	V <sub>GS</sub> = -10V, I <sub>D</sub> = -25A
		—	—	3.5		V <sub>GS</sub> = -4.5V, I <sub>D</sub> = -20A
		—	—	5.0		V <sub>GS</sub> = -2.5V, I <sub>D</sub> = -15A
<b>DYNAMIC CHARACTERISTICS (Note 8)</b>						
Input Capacitance	C <sub>iss</sub>	—	12826	—	pF	V <sub>DS</sub> = -10V, V <sub>GS</sub> = 0V f = 1MHz
Output Capacitance	C <sub>oss</sub>	—	2547	—		
Reverse Transfer Capacitance	C <sub>rss</sub>	—	1924	—		
Gate Resistance	R <sub>G</sub>	—	4.2	—	Ω	V <sub>DS</sub> = 0V, V <sub>GS</sub> = 0V, f = 1MHz
Total Gate Charge (V <sub>GS</sub> = -10V)	Q <sub>g</sub>	—	476	—	nC	V <sub>DS</sub> = -10V, I <sub>D</sub> = -20A
Total Gate Charge (V <sub>GS</sub> = -4.5V)	Q <sub>g</sub>	—	228	—		
Gate-Source Charge	Q <sub>gs</sub>	—	24.8	—		
Gate-Drain Charge	Q <sub>gd</sub>	—	61.9	—		
Turn-On Delay Time	t <sub>D(ON)</sub>	—	14.2	—	ns	V <sub>DD</sub> = -10V, V <sub>GEN</sub> = -4.5V, R <sub>GEN</sub> = 1Ω, I <sub>D</sub> = -10A
Turn-On Rise Time	t <sub>R</sub>	—	35.4	—		
Turn-Off Delay Time	t <sub>D(OFF)</sub>	—	361	—		
Turn-Off Fall Time	t <sub>F</sub>	—	224	—		
<b>BODY DIODE CHARACTERISTICS</b>						
Diode Forward Voltage	V <sub>SD</sub>	—	-0.58	—	V	V <sub>GS</sub> = 0V, I <sub>S</sub> = -5A
Reverse Recovery Time (Note 8)	t <sub>RR</sub>	—	137	—	ns	I <sub>F</sub> = -10A, di/dt = 100A/μs
Reverse Recovery Charge (Note 8)	Q <sub>rr</sub>	—	221	—	nC	
Reverse Recovery Fall Time (Note 8)	t <sub>a</sub>	—	39	—	ns	
Reverse Recovery Raise Time (Note 8)	t <sub>b</sub>	—	98	—		

Notes: 7. Short duration pulse test used to minimize self-heating effect.  
8. Guaranteed by design. Not subject to product testing.



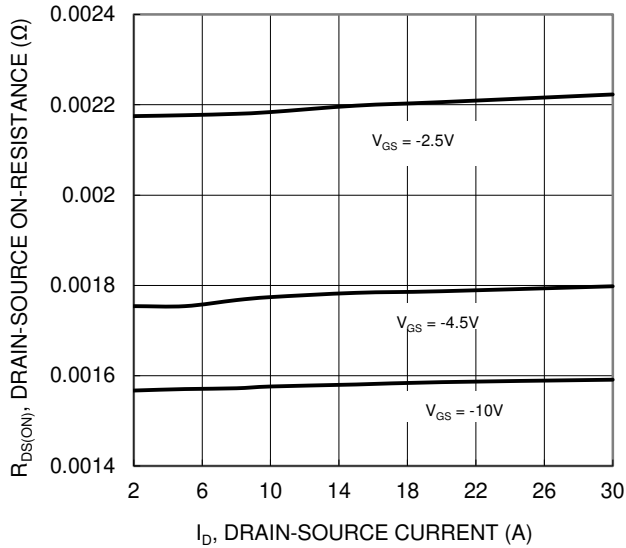


Figure 3 Typical On-Resistance vs. Drain Current and Gate Voltage

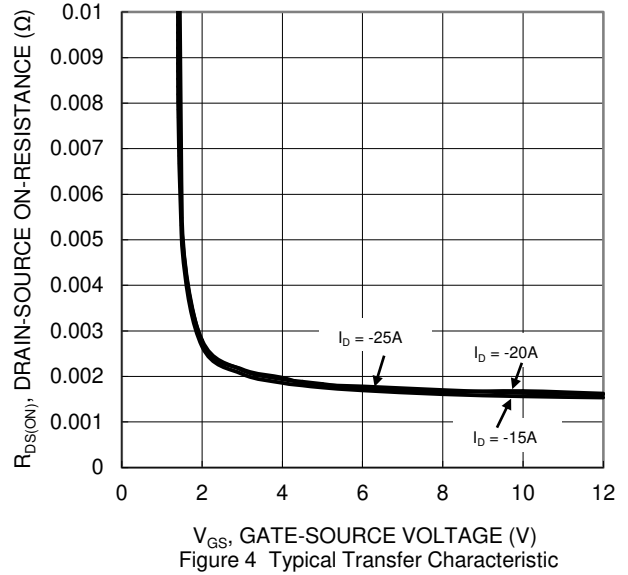


Figure 4 Typical Transfer Characteristic

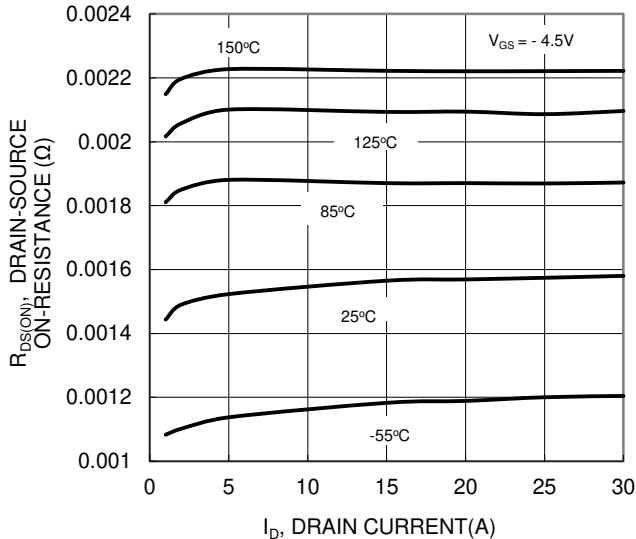


Figure 5 Typical On-Resistance vs. Drain Current and Temperature

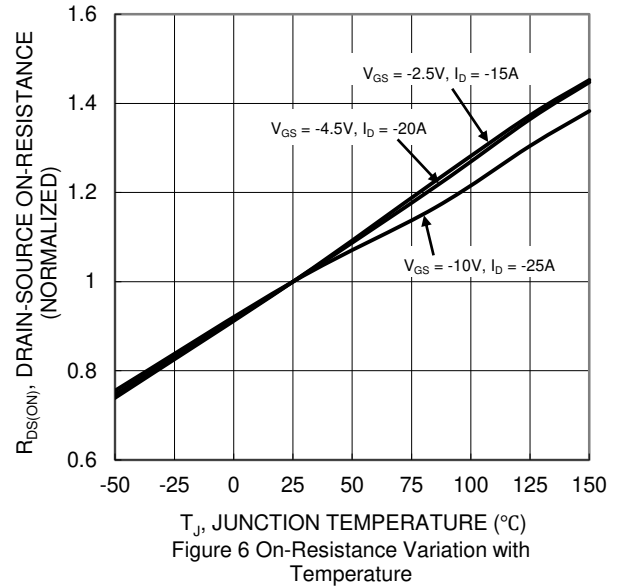


Figure 6 On-Resistance Variation with Temperature

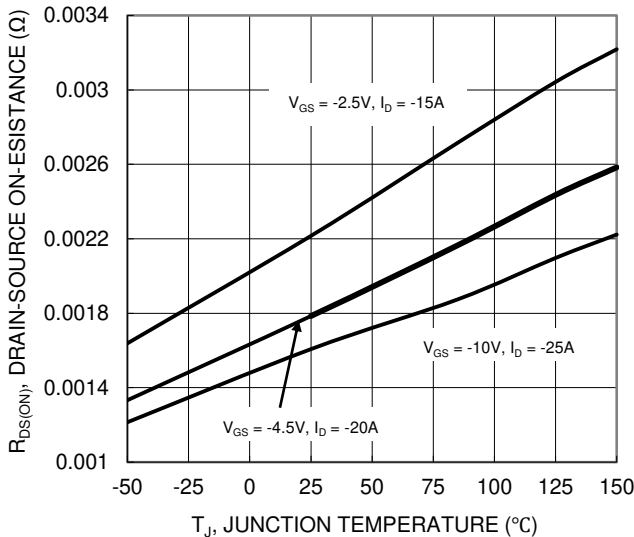


Figure 7 On-Resistance Variation with Temperature

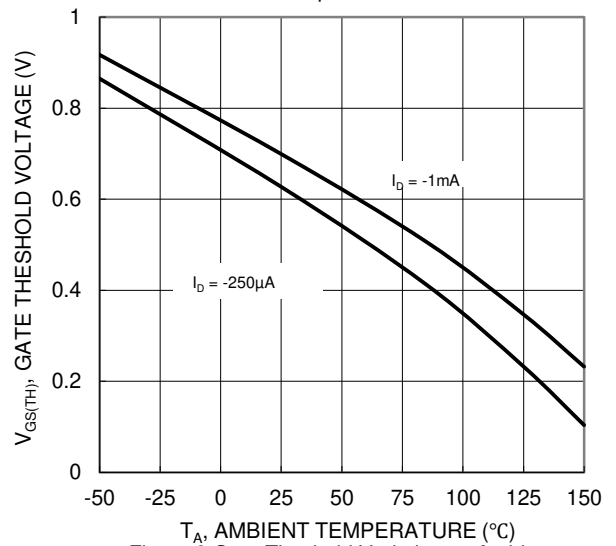


Figure 8 Gate Threshold Variation vs Ambient Temperature

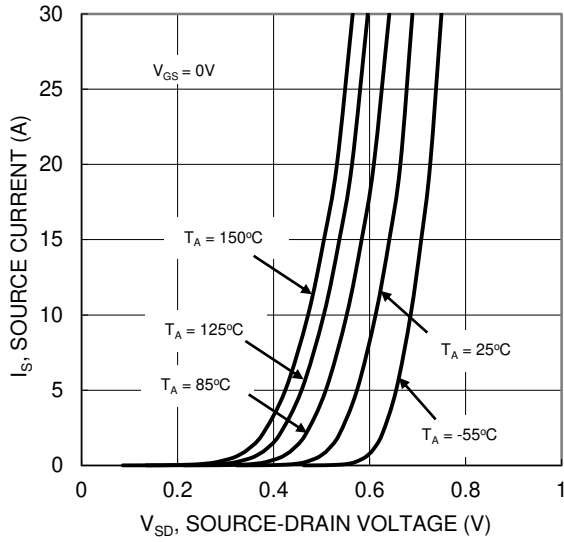


Figure 9 Diode Forward Voltage vs. Current

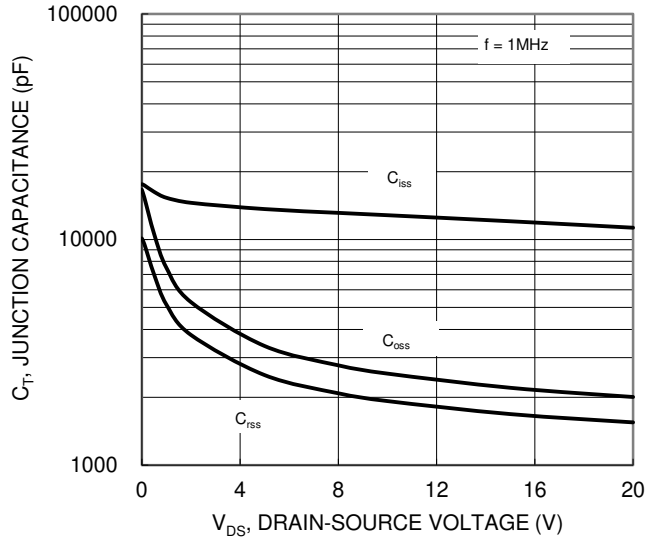


Figure 10 Typical Junction Capacitance

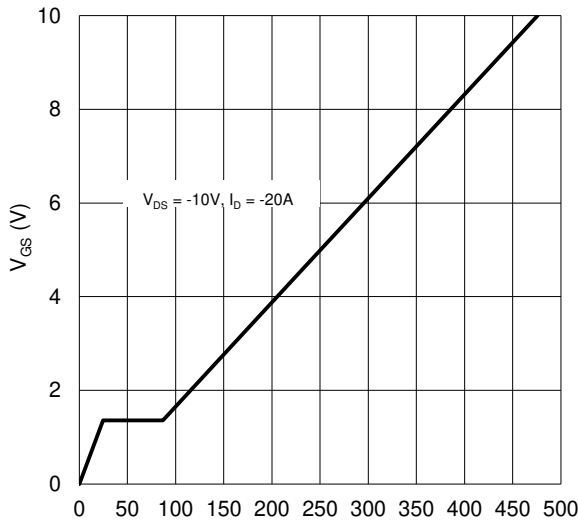


Figure 11 Gate Charge

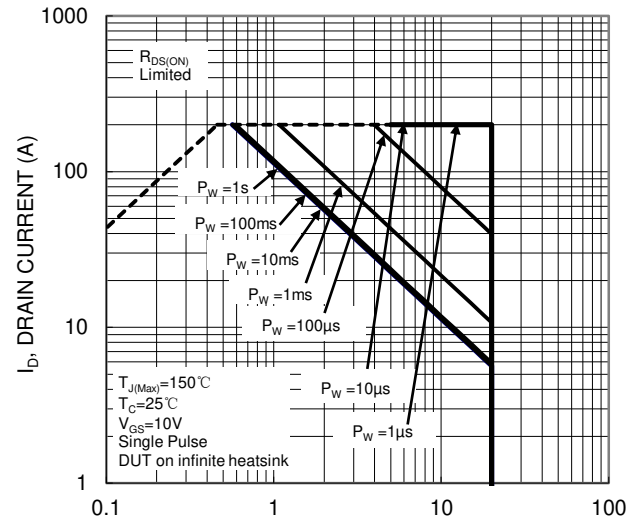


Figure 12 SOA, Safe Operation Area

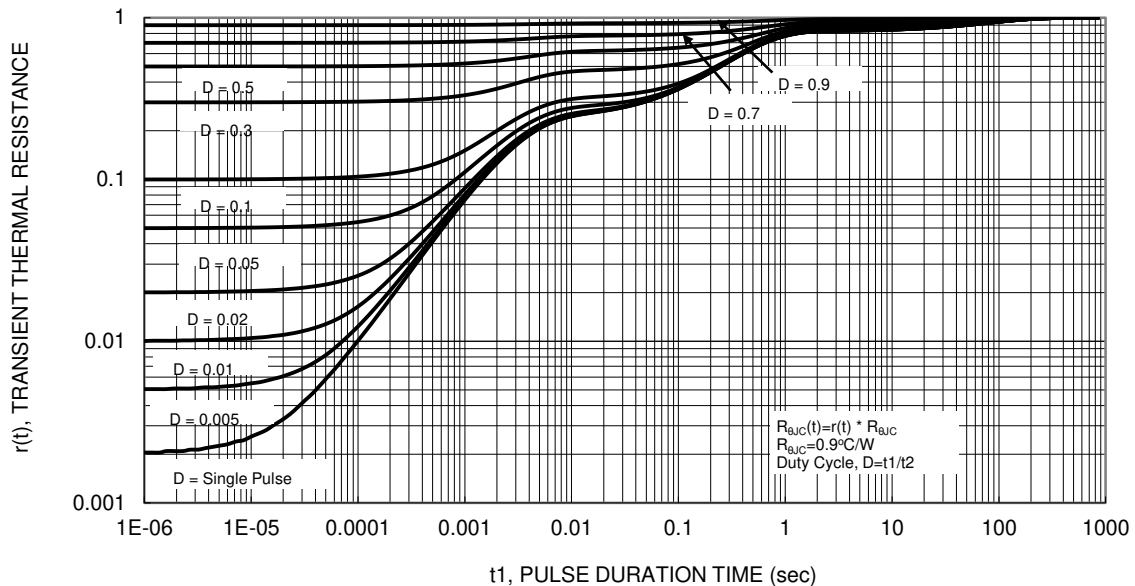
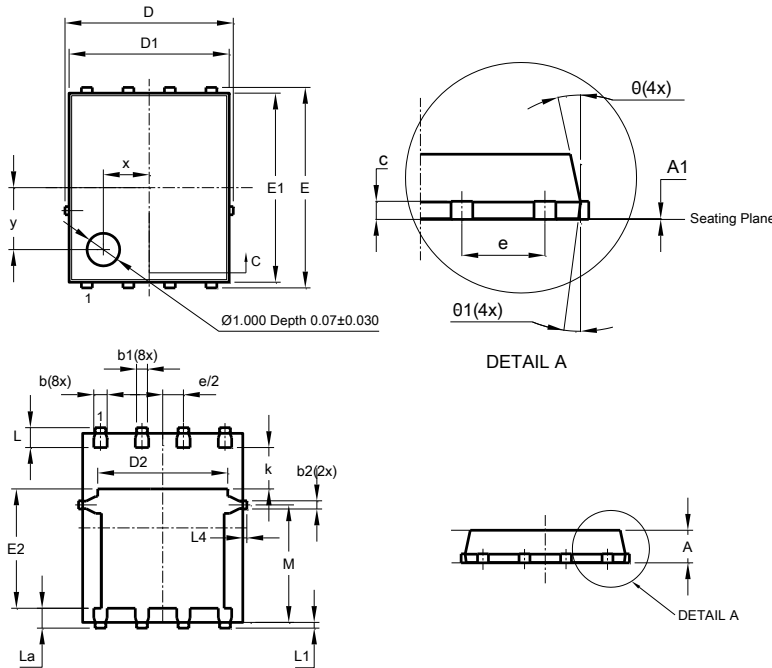


Figure 13 Transient Thermal Resistance

**Package Outline Dimensions**

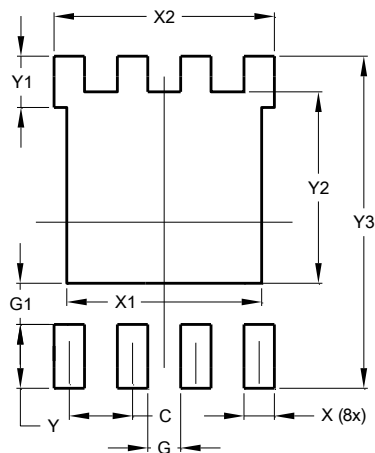
Please see AP02002 at <http://www.diodes.com/datasheets/ap02002.pdf> for latest version.



PowerDI5060-8 (Type K)			
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	-	-	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
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 AP02001 at <http://www.diodes.com/datasheets/ap02001.pdf> for the latest version.



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

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