40V 175°C DUAL N-CHANNEL ENHANCEMENT MODE MOSFET

Product Summary

BV_{DSS}	$R_{DS(ON)}$ max	I_D max T_C = +25°C (Note 9)
40V	8.6mΩ @ V_{GS} = 10V	45A

Features and Benefits

- Rated to +175°C – Ideal for High Ambient Temperature Environments
- High Conversion Efficiency
- Low $R_{DS(ON)}$ – Minimizes On State Losses
- 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**

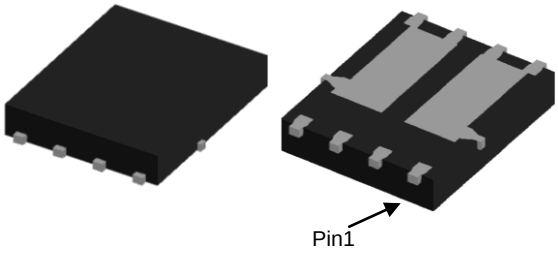
Description and Applications

This MOSFET is 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.

- Backlighting
- Power Management Functions
- DC-DC Converters

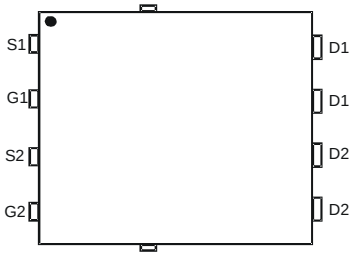
Mechanical Data

- Case: PowerDI5060-8
- Case Material: Molded Plastic, "Green" Molding Compound. UL Flammability Classification Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminals: Finish — Matte Tin Annealed over Copper Leadframe. Solderable per MIL-STD-202, Method 208 e3
- Weight: 0.097 grams (Approximate)

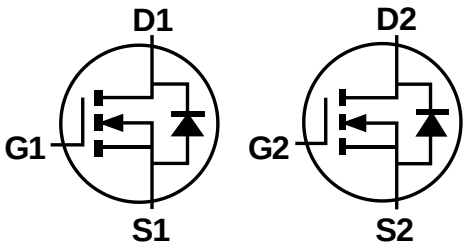


Top View

Bottom View



Pin Out
Top View



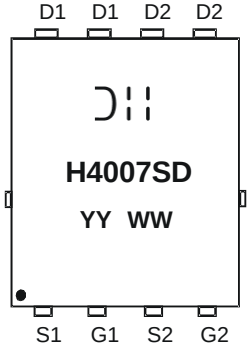
Equivalent Circuit

Ordering Information (Note 4)

Part Number	Case	Packaging
DMTH4007SPD-13	PowerDI5060-8	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 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
H4007SD = Product Type Marking Code
YYWW = Date Code Marking
YY = Year (ex: 14 = 2014)
WW = Week (01 - 53)

Maximum Ratings (@T_A = +25°C, unless otherwise specified.)

Characteristic		Symbol	Value	Units
Drain-Source Voltage		V_{DSS}	40	V
Gate-Source Voltage		V_{GSS}	±20	V
Continuous Drain Current (Note 6)	T_C = +25°C (Note 9) T_C = +100°C	I_D	45 38.1	A
Continuous Drain Current (Note 5)	T_A = +25°C T_A = +70°C	I_D	14.2 11.9	A
Pulsed Drain Current (10µs pulse, duty cycle = 1%)		I_{DM}	90	A
Maximum Continuous Body Diode Forward Current (Note 6)		I_S	34	A
Avalanche Current, L = 0.1mH		I_{AS}	20	A
Avalanche Energy, L = 0.1mH		E_{AS}	89	mJ

Thermal Characteristics

Characteristic		Symbol	Value	Unit
Total Power Dissipation (Note 5)	T_A = +25°C	P_D	2.6	W
Thermal Resistance, Junction to Ambient (Note 5)		$R_{\theta JA}$	57	°C/W
Total Power Dissipation (Note 6)	T_C = +25°C	P_D	37.5	W
Thermal Resistance, Junction to Case (Note 6)		$R_{\theta JC}$	4	°C/W
Operating and Storage Temperature Range		T_J, T_{STG}	-55 to +175	°C

Electrical Characteristics (@T_A = +25°C, unless otherwise specified.)

Characteristic	Symbol	Min	Typ	Max	Unit	Test Condition
OFF CHARACTERISTICS (Note 6)						
Drain-Source Breakdown Voltage	BV_{DSS}	40	—	—	V	V_{GS} = 0V, I_D = 1mA
Zero Gate Voltage Drain Current	I_{DSS}	—	—	1	µA	V_{DS} = 32V, V_{GS} = 0V
Gate-Source Leakage	I_{GSS}	—	—	±100	nA	V_{GS} = ±20V, V_{DS} = 0V
ON CHARACTERISTICS (Note 6)						
Gate Threshold Voltage	$V_{GS(th)}$	2	—	4	V	V_{DS} = V_{GS}, I_D = 250µA
Static Drain-Source On-Resistance	$R_{DS(ON)}$	—	7.5	8.6	mΩ	V_{GS} = 10V, I_D = 17A
Diode Forward Voltage	V_{SD}	—	0.85	—	V	V_{GS} = 0V, I_S = 17A
DYNAMIC CHARACTERISTICS (Note 7)						
Input Capacitance	C_{iss}	—	2,026	—	pF	V_{DS} = 30V, V_{GS} = 0V, f = 1MHz
Output Capacitance	C_{oss}	—	702	—	pF	
Reverse Transfer Capacitance	C_{rss}	—	84.8	—	pF	
Gate Resistance	R_g	—	0.46	—	Ω	V_{DS} = 0V, V_{GS} = 0V, f = 1MHz
Total Gate Charge	Q_g	—	41.9	—	nC	V_{DS} = 30V, I_D = 20A, V_{GS} = 10V
Gate-Source Charge	Q_{gs}	—	10	—	nC	
Gate-Drain Charge	Q_{gd}	—	11.5	—	nC	
Turn-On Delay Time	$t_{D(on)}$	—	7	—	ns	V_{DD} = 30V, V_{GS} = 10V, I_D = 20A, R_G = 3Ω
Turn-On Rise Time	t_r	—	11.5	—	ns	
Turn-Off Delay Time	$t_{D(off)}$	—	15.6	—	ns	
Turn-Off Fall Time	t_f	—	8.8	—	ns	
Body Diode Reverse Recovery Time	t_{rr}	—	29.9	—	nS	I_F = 20A, di/dt = 100A/µs
Body Diode Reverse Recovery Charge	Q_{rr}	—	23	—	nC	

Notes: 5. Device mounted on FR-4 substrate PC board, 2oz. copper, with thermal bias to bottom layer 1inch square copper plate.
6. Thermal resistance from junction to soldering point (on the exposed drain pad).
7. Short duration pulse test used to minimize self-heating effect.
8. Guaranteed by design. Not subject to product testing.
9. Package limited.

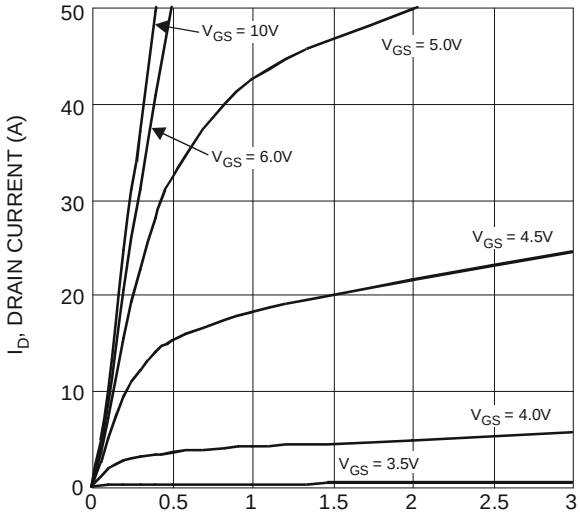


Figure 1 Typical Output Characteristics

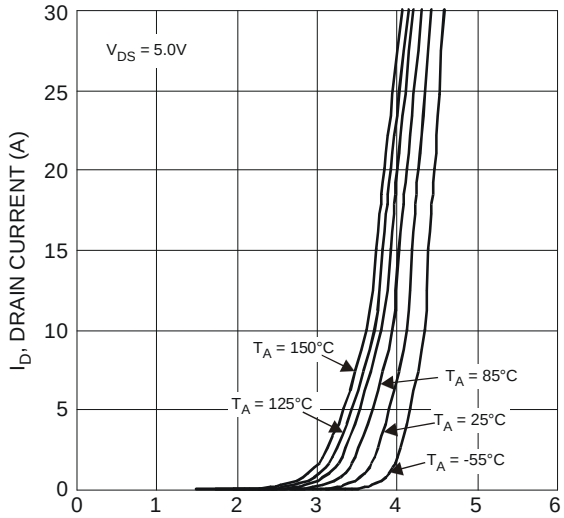


Figure 2 Typical Transfer Characteristics

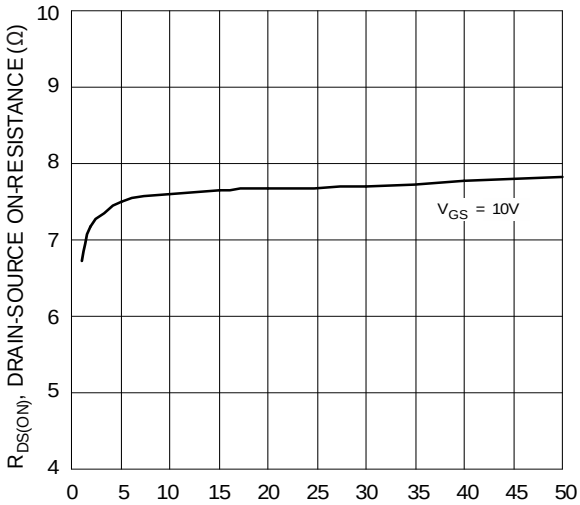


Figure 3 Typical On-Resistance vs. Drain Current and Gate Voltage

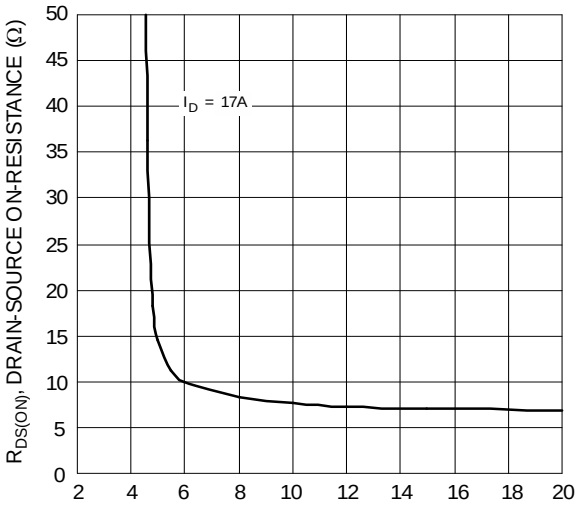


Figure 4 Typical Drain-Source On-Resistance vs. Gate-Source Voltage

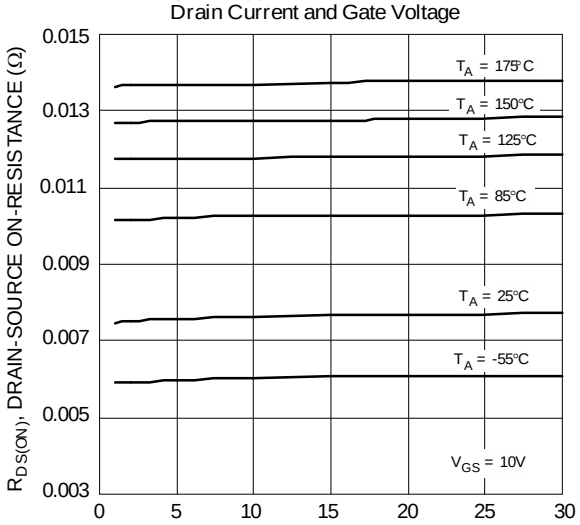


Figure 5 Typical On-Resistance vs. Drain Current and Temperature

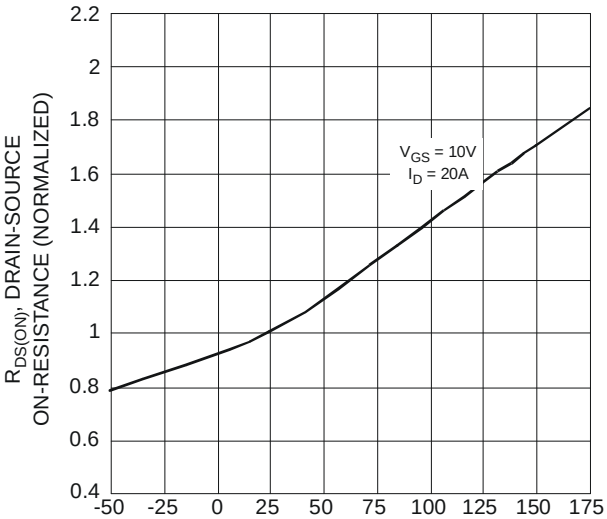


Figure 6 On-Resistance Variation with Temperature

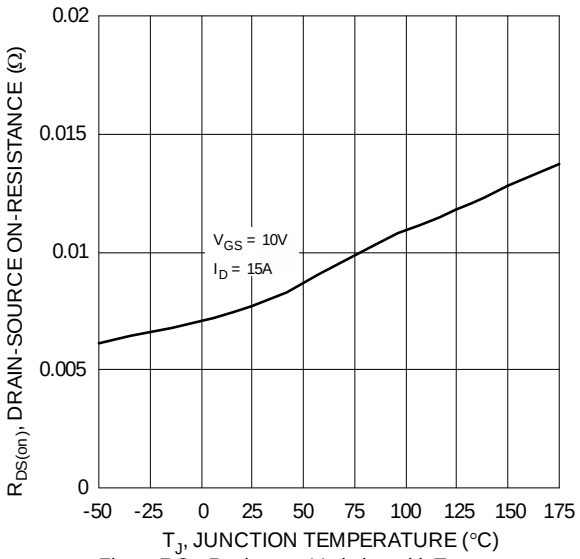


Figure 7 On-Resistance Variation with Temperature

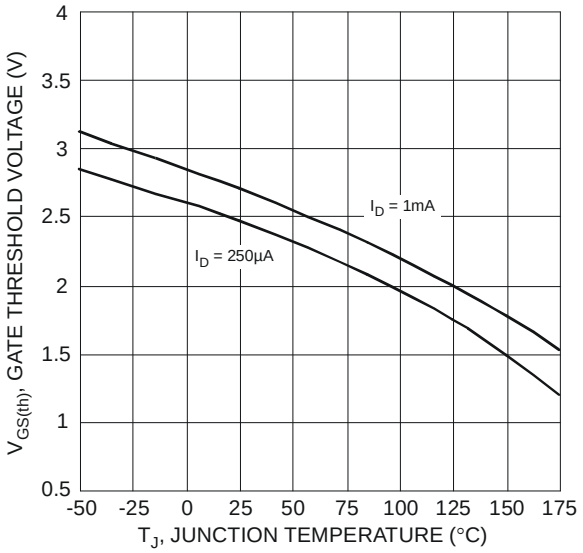


Figure 8 Gate Threshold Variation vs. Ambient Temperature

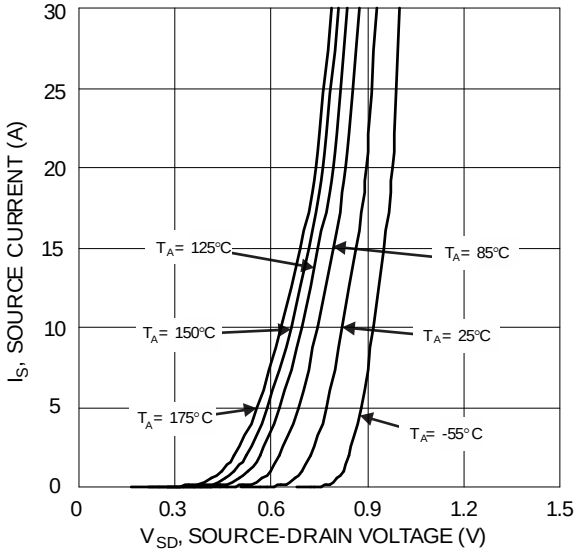


Figure 9 Diode Forward Voltage vs. Current

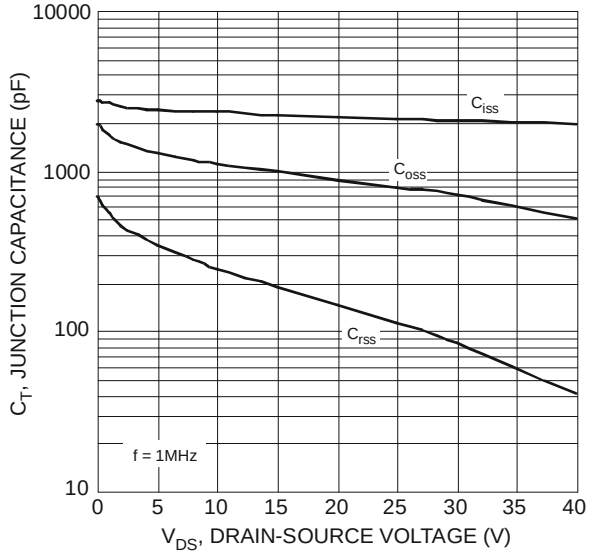


Figure 10 Typical Junction Capacitance

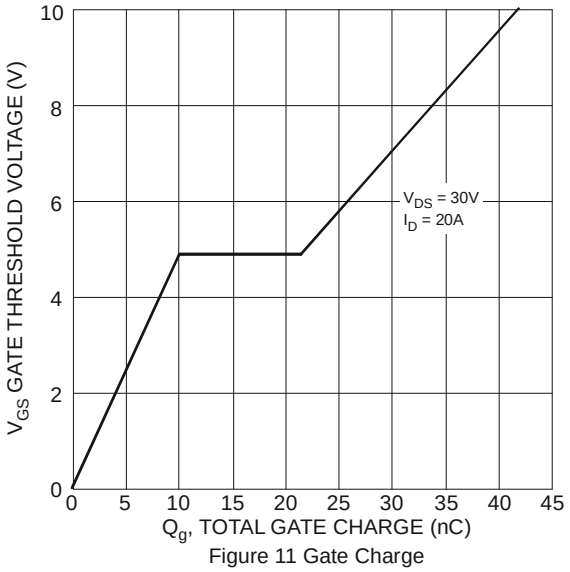


Figure 11 Gate Charge

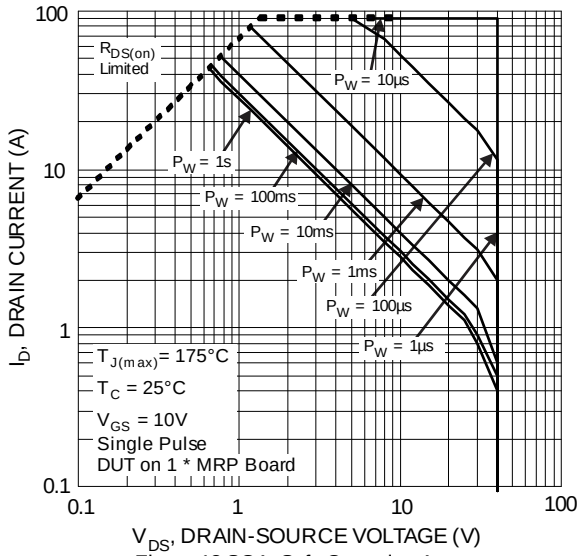


Figure 12 SOA, Safe Operation Area

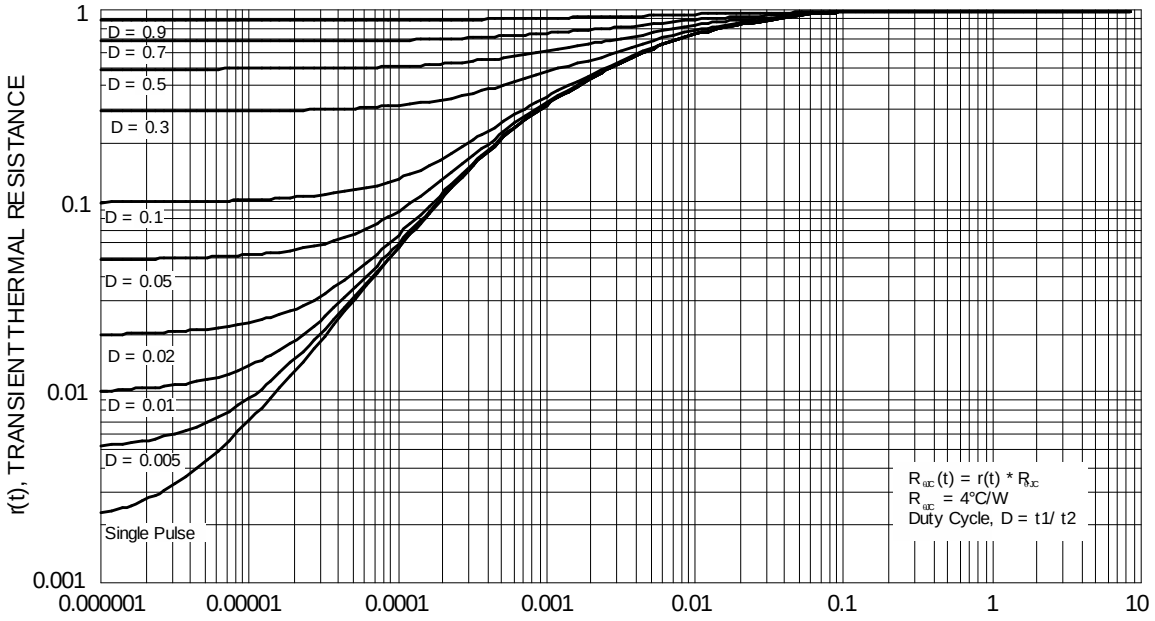
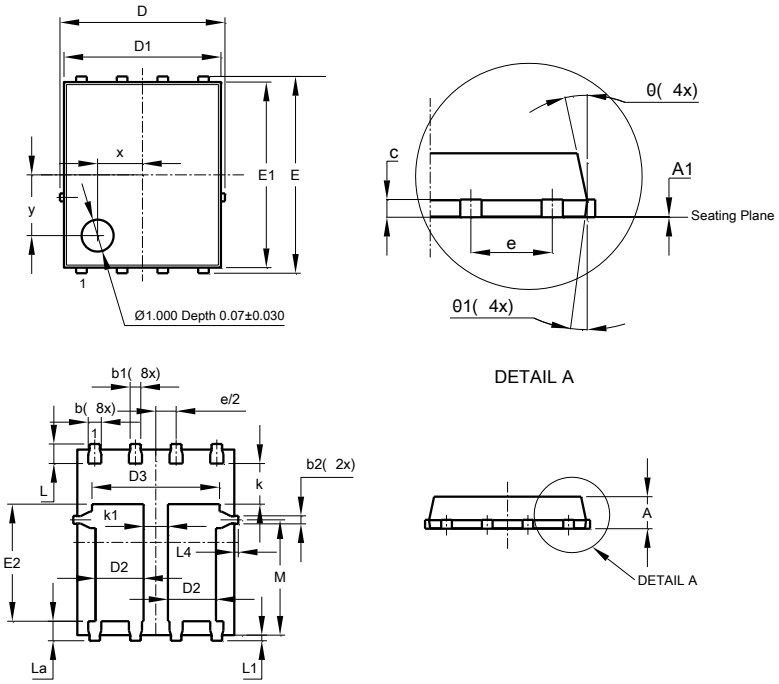


Figure 13 Transient Thermal Resistance

Package Outline Dimensions

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

PowerDI5060-8 (Type C)

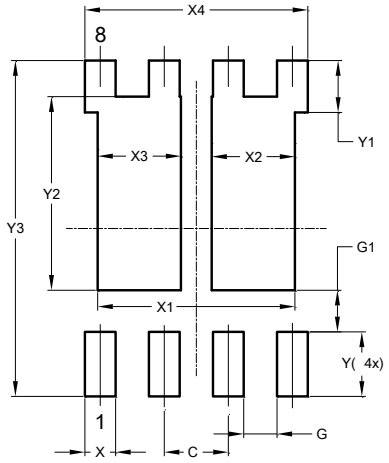


PowerDI5060-8 (Type C)			
Dim	**Min**	**Max**	**Typ**
A	0.90	1.10	1.00
A1	0	0.05	0.02
b	0.33	0.51	0.41
b1	0.300	0.366	0.333
b2	0.20	0.35	0.25
c	0.23	0.33	0.277
D	5.15 BSC		
D1	4.85	4.95	4.90
D2	1.40	1.60	1.50
D3	-	-	3.98
E	6.15 BSC		
E1	5.75	5.85	5.80
E2	3.56	3.76	3.66
e	1.27BSC		
k	-	-	1.27
k1	0.56	-	-
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 AP02001 at http://www.diodes.com/datasheets/ap02001.pdf 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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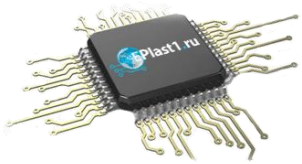

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