DMNH4005SPSQ

40V N-CHANNEL 175°C MOSFET
PowerDI5060-8

Product Summary

BV_{DSS}	$R_{DS(ON)}$ MAX	I_D MAX T_C = +25°C
40V	4.0mΩ @ V_{GS} = 10V	80A

Description and Applications

This MOSFET is designed to meet the stringent requirements of Automotive applications. It is qualified to AECQ101, supported by a PPAP and is ideal for use in:

- Engine Management Systems
- Body Control Electronics
- DC-DC Converters

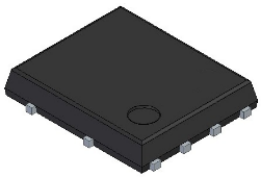
Features

- Rated to +175°C – Ideal for High Ambient Temperature Environments
- 100% Unclamped Inductive Switching – Ensures More Reliable and Robust End Application
- Low $R_{DS(ON)}$ – Minimises Power Losses
- Low Q_g – Minimises Switching 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)**
- **Qualified to AEC-Q101 Standards for High Reliability**
- **PPAP Capable (Note 4)**

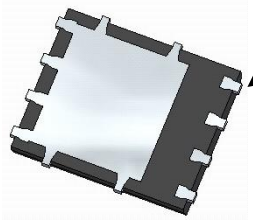
Mechanical Data

- 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 Connections: See Diagram Below
- Terminals: Finish – Matte Tin Annealed over Copper Leadframe Solderable per MIL-STD-202, Method 208 e3
- Weight: 0.097 grams (Approximate)

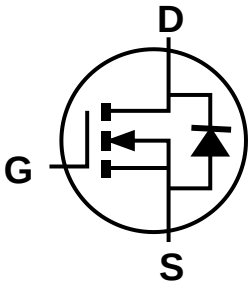
PowerDI5060-8



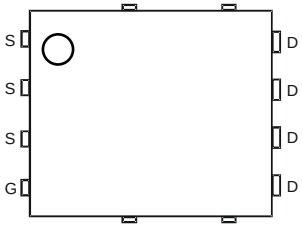
Top View



Bottom View



Internal Schematic



Top View
Pin Configuration

Ordering Information (Note 5)

Part Number	Case	Packaging
DMNH4005SPSQ-13	PowerDI5060-8	2,500 / Tape & Reel

Notes:
1. EU Directive 2002/95/EC (RoHS), 2011/65/EU (RoHS 2) & 2015/863/EU (RoHS 3) compliant. All applicable RoHS exemptions applied.
2. See http://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 https://www.diodes.com/quality/.
5. For packaging details, go to our website at https://www.diodes.com/design/support/packaging/diodes-packaging/.

Marking Information

= Manufacturer's Marking
NH4005SS = Product Type Marking Code
YYWW = Date Code Marking
YY = Last Digit of Year (ex: 18 = 2018)
WW = Week Code (01 to 53)

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

Characteristic			Symbol	Value	Unit
Drain-Source Voltage			V_{DSS}	40	V
Gate-Source Voltage			V_{GSS}	20	V
Continuous Drain Current (Note 7) V_{GS} = 10V	Steady State	T_C = +25°C T_C = +100°C	I_D	80 60	A
Pulsed Drain Current (10µs Pulse, Duty Cycle = 1%)			I_{DM}	90	A
Maximum Continuous Body Diode Forward Current (Note 6)			I_S	80	A
Avalanche Current (Note 8) L=1mH			I_{AS}	30	A
Avalanche Energy (Note 8) L=1mH			E_{AS}	445	mJ

Thermal Characteristics

Characteristic		Symbol	Value	Unit
Total Power Dissipation (Note 6)		P_D	1.6	W
Thermal Resistance, Junction to Ambient (Note 6)	Steady State	$R_{\theta JA}$	98	°C/W
	t<10s		54	
Total Power Dissipation (Note 7)		P_D	2.8	W
Thermal Resistance, Junction to Ambient (Note 7)	Steady State	$R_{\theta JA}$	53	°C/W
	t<10s		29	
Thermal Resistance, Junction to Case		$R_{\theta JC}$	0.9	
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 9)						
Drain-Source Breakdown Voltage	BV_{DSS}	40	—	—	V	V_{GS} = 0V, I_D = 250µA
Zero Gate Voltage Drain Current	I_{DSS}	—	—	1	µA	V_{DS} = 32V, V_{GS} = 0V
Gate-Source Leakage	I_{GSS}	—	—	±100	nA	V_{GS} = ±16V, V_{DS} = 0V
ON CHARACTERISTICS (Note 9)						
Gate Threshold Voltage	$V_{GS(TH)}$	1	—	3	V	V_{DS} = V_{GS}, I_D = 250µA
Static Drain-Source On-Resistance	$R_{DS(ON)}$	—	3.2	4.0	mΩ	V_{GS} = 10V, I_D = 20A
Diode Forward Voltage	V_{SD}	—	—	1.2	V	V_{GS} = 0V, I_S = 1A
DYNAMIC CHARACTERISTICS (Note 10)						
Input Capacitance	C_{iss}	—	2847	—	pF	V_{DS} = 20V, V_{GS} = 0V f = 1.0MHz
Output Capacitance	C_{oss}	—	743	—		
Reverse Transfer Capacitance	C_{rss}	—	243	—		
Gate Resistance	R_g	—	2.0	—	Ω	V_{DS} = 0V, V_{GS} = 0V, f = 1.0MHz
Total Gate Charge (V_{GS} = 10V)	Q_g	—	48	—	nC	V_{DD} = 20V, I_D = 20A
Total Gate Charge (V_{GS} = 4.5V)	Q_g	—	23	—		
Gate-Source Charge	Q_{gs}	—	9.5	—		
Gate-Drain Charge	Q_{gd}	—	11.5	—		
Turn-On Delay Time	$t_{D(ON)}$	—	6.6	—	ns	V_{DD} = 20V, V_{GS} = 10V, R_g = 1Ω, I_D = 20A
Turn-On Rise Time	t_R	—	12.1	—		
Turn-Off Delay Time	$t_{D(OFF)}$	—	18.3	—		
Turn-Off Fall Time	t_F	—	4.9	—		
Reverse Recovery Time	t_{RR}	—	29	—	ns	I_F = 15A, di/dt = 100A/µs
Reverse Recovery Charge	Q_{RR}	—	24	—	nC	

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 1inch square copper plate.
8. I_{AS} and E_{AS} ratings are based on low frequency and duty cycles to keep T_J = +25°C.
9. Short duration pulse test used to minimize self-heating effect.
10. Guaranteed by design. Not subject to product testing.

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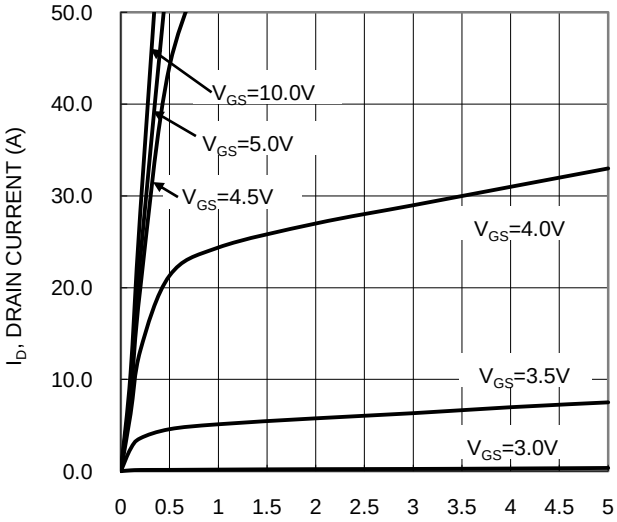

Figure 1. Typical Output Characteristic

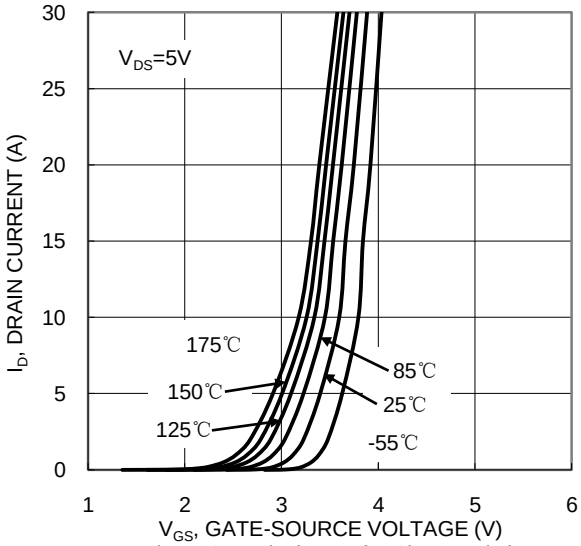

Figure 2. Typical Transfer Characteristic

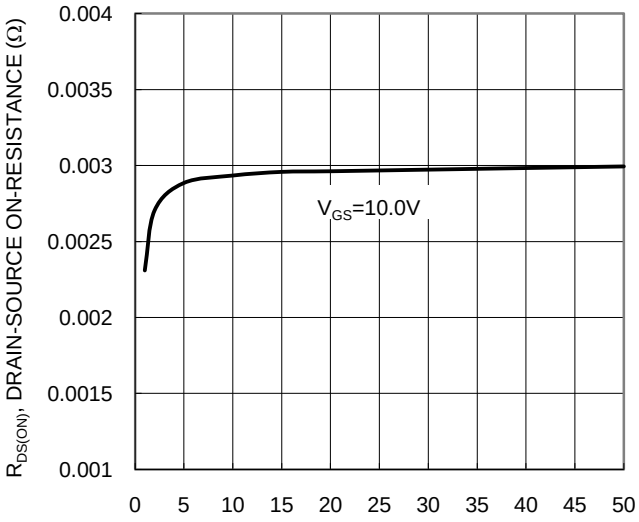

Figure 3. Typical On-Resistance vs. Drain Current and Gate Voltage

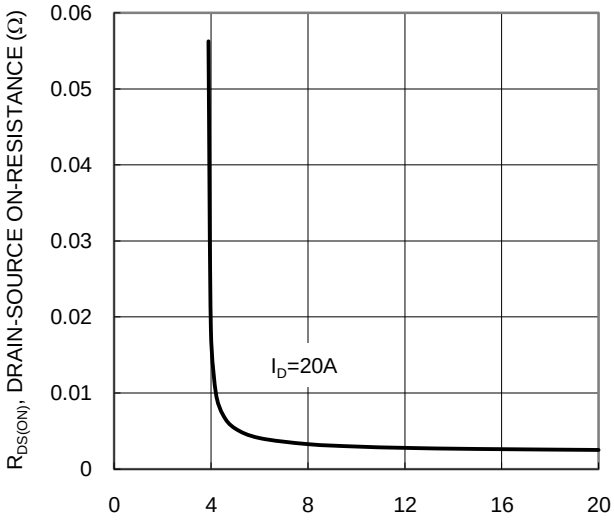

Figure 4. Typical Transfer Characteristic

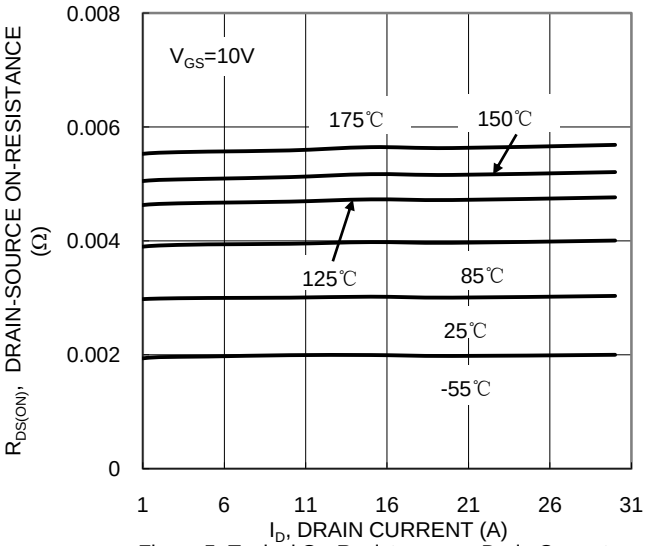

Figure 5. Typical On-Resistance vs. Drain Current and Junction Temperature

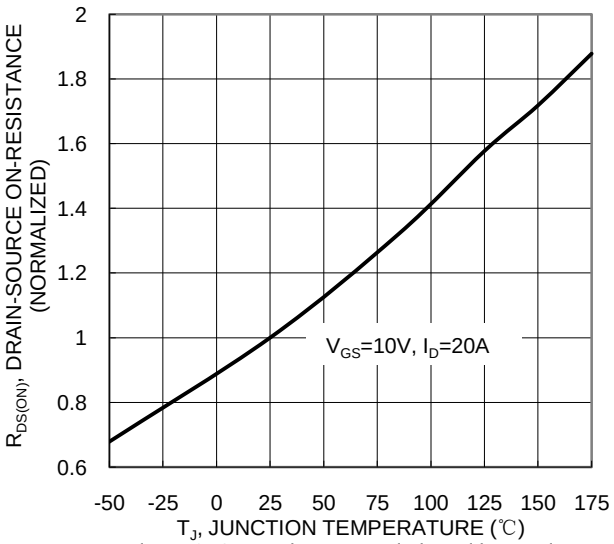

Figure 6. On-Resistance Variation with Junction Temperature

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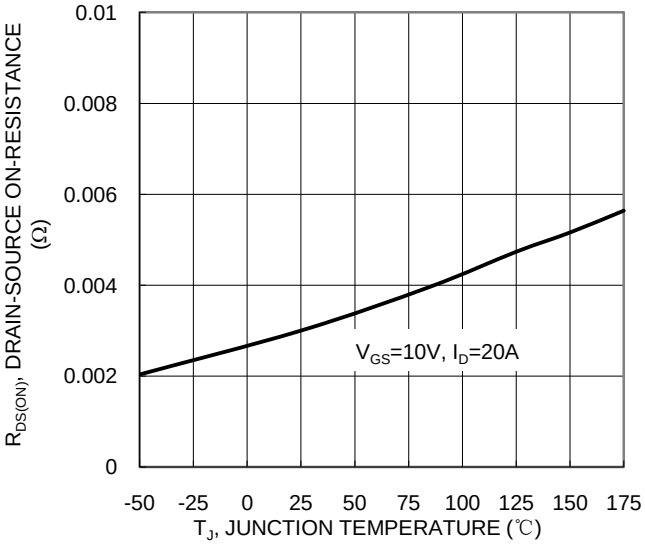

Figure 7. On-Resistance Variation with Junction Temperature

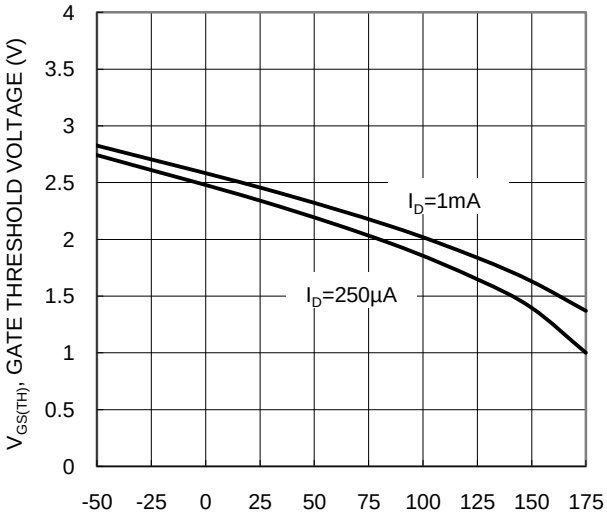

Figure 8. Gate Threshold Variation vs. Junction Temperature

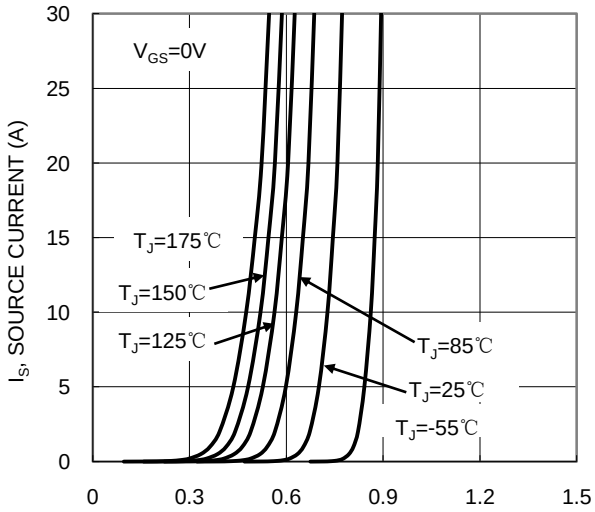

Figure 9. Diode Forward Voltage vs. Current

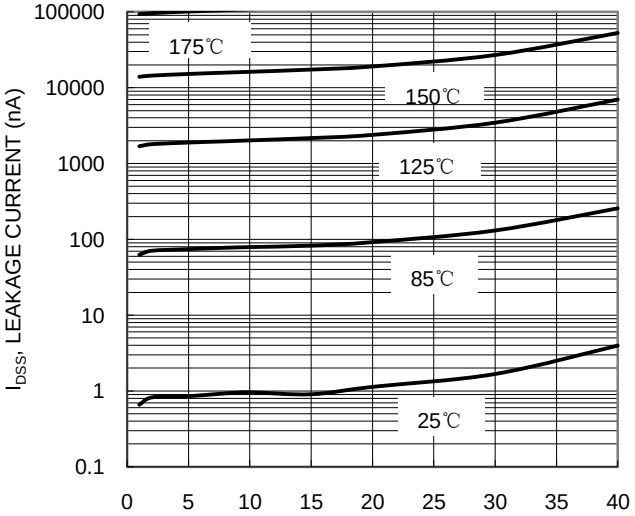

Figure 10. Typical Drain-Source Leakge Current vs Voltage

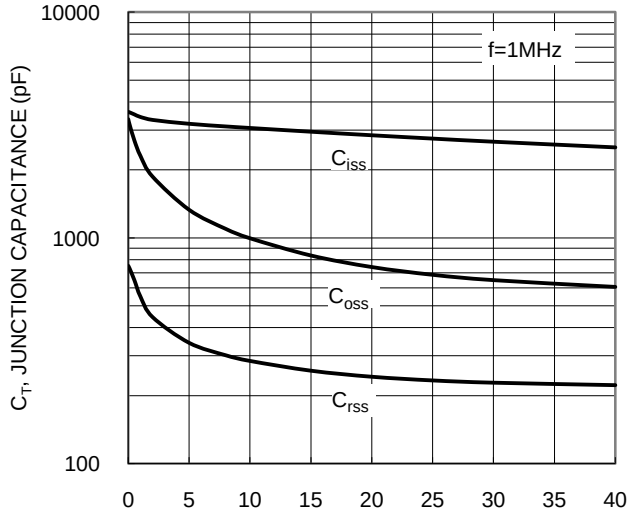

Figure 11. Typical Junction Capacitance

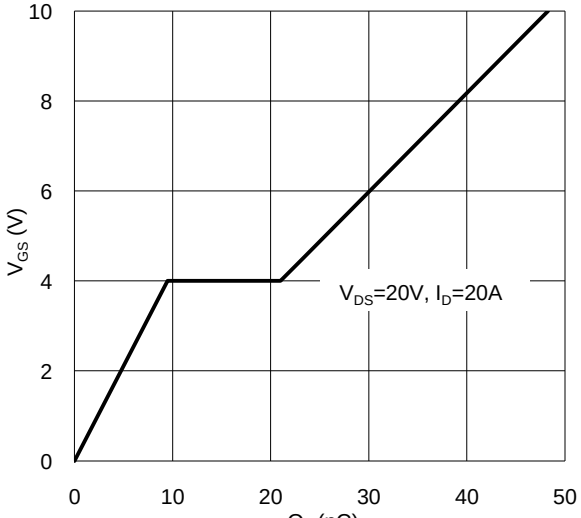

Figure 12. Gate Charge

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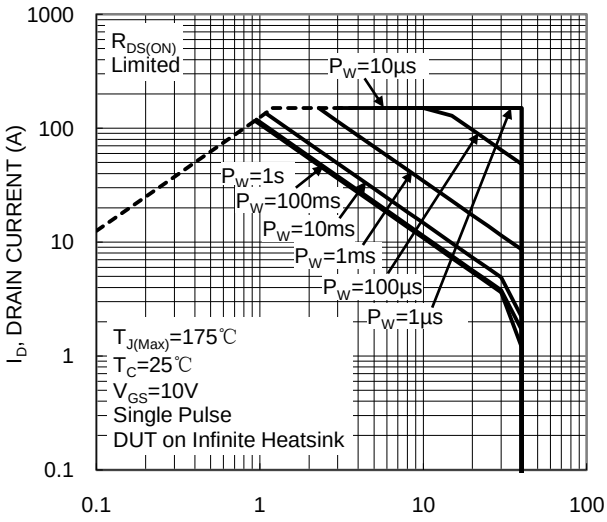

Figure 13. SOA, Safe Operation Area

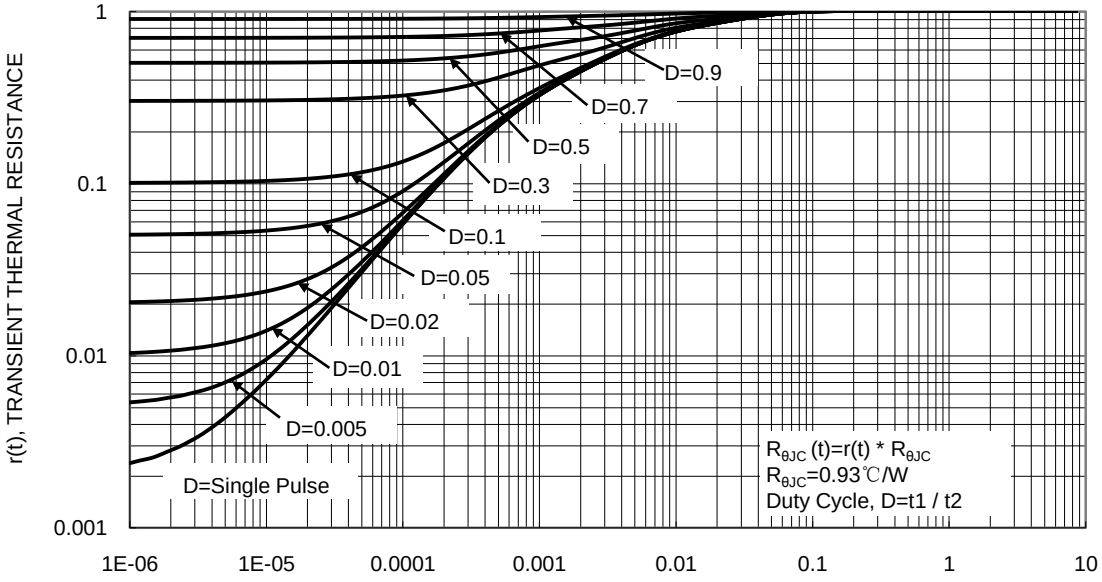

Figure 14. Transient Thermal Resistance

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Package Outline Dimensions

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

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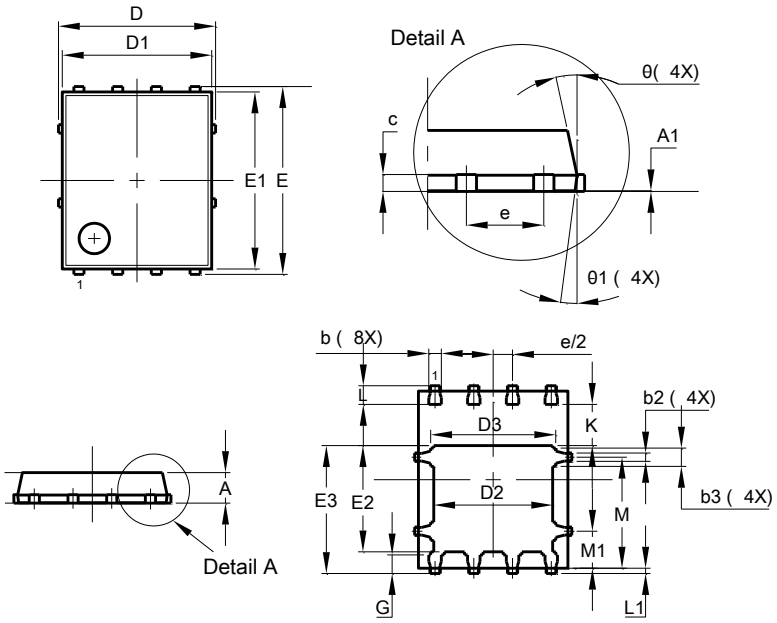
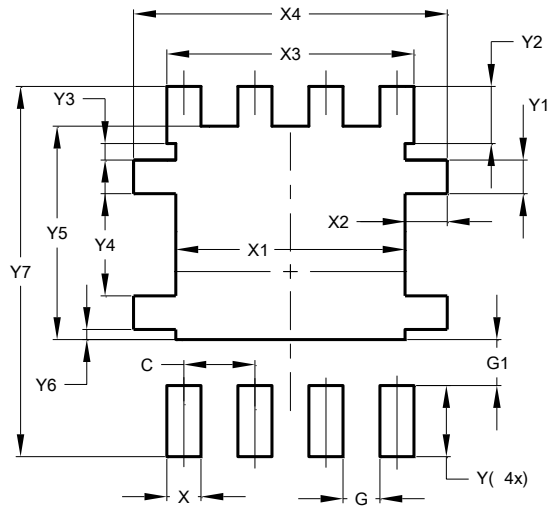


PowerDI5060-8			
Dim	**Min**	**Max**	**Typ**
A	0.90	1.10	1.00
A1	0.00	0.05	-
b	0.33	0.51	0.41
b2	0.200	0.350	0.273
b3	0.40	0.80	0.60
c	0.230	0.330	0.277
D	5.15 BSC		
D1	4.70	5.10	4.90
D2	3.70	4.10	3.90
D3	3.90	4.30	4.10
E	6.15 BSC		
E1	5.60	6.00	5.80
E2	3.28	3.68	3.48
E3	3.99	4.39	4.19
e	1.27 BSC		
G	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	10º	12º	11º
Θ1	6º	8º	7º
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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