

Product Summary

BV_{DSS}	$R_{DS(ON)}$ Max	I_D $T_C = +25^\circ C$
40V	7.0mΩ @ $V_{GS} = 10V$	110A

Features and Benefits

- Rated to +175°C – Ideal for High Ambient Temperature Environments
- 100% Unclamped Inductive Switching – Ensures More Reliable and Robust End Application
- Low $R_{DS(ON)}$ – Minimizes Power Losses
- Low Q_G – Minimizes 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)**

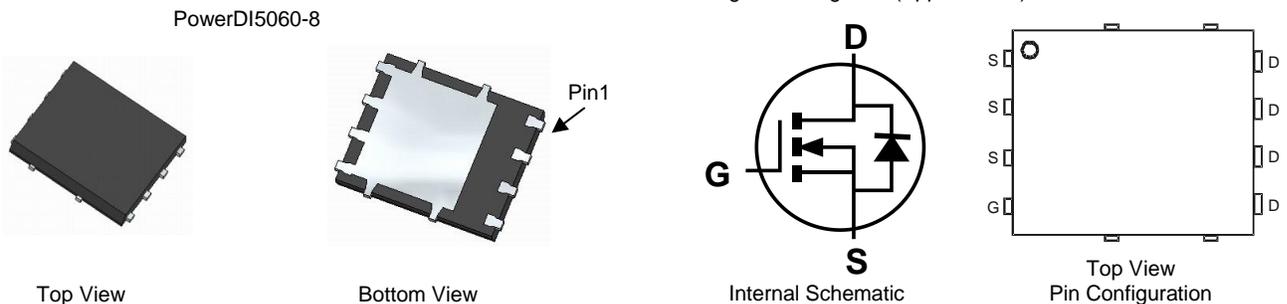
Description and Applications

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:

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

Mechanical Data

- Case: PowerDI[®]5060-8
- 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 (3)
- Weight: 0.097 grams (Approximate)

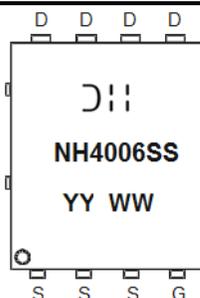


Ordering Information (Note 5)

Part Number	Case	Packaging
DMNH4006SPSQ-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 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
 5. For packaging details, go to our website at <http://www.diodes.com/products/packages.html>.

Marking Information



☺☺☺ = Manufacturer’s Marking
 NH4006SS = Product Type Marking Code
 YYWW = Date Code Marking
 YY = Last Two Digits of Year (ex: 16 = 2016)
 WW = Week Code (01 to 53)

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	110 80	A
Pulsed Drain Current (10μs Pulse, Duty Cycle = 1%)			I _{DM}	180	A
Maximum Continuous Body Diode Forward Current			I _S	100	A
Avalanche Current (Note 8) L=1mH			I _{AS}	64	A
Avalanche Energy (Note 8) L=1mH			E _{AS}	208	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 _{θJA}	93	°C/W
Total Power Dissipation (Note 7)			P _D	3.0	W
Thermal Resistance, Junction to Ambient (Note 7)	Steady State		R _{θJA}	50	°C/W
Thermal Resistance, Junction to Case			R _{θJC}	1.1	
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, T _J = +25°C	I _{DSS}	—	—	1	μA	V _{DS} = 40V, V _{GS} = 0V
Gate-Source Leakage	I _{GSS}	—	—	±100	nA	V _{DS} = ±20V, V _{GS} = 0V
ON CHARACTERISTICS (Note 9)						
Gate Threshold Voltage	V _{GS(TH)}	2	2.4	4	V	V _{DS} = V _{GS} , I _D = 250μA
Static Drain-Source On-Resistance	R _{DS(ON)}	—	4.5	7	mΩ	V _{GS} = 10V, I _D = 50A
Diode Forward Voltage	V _{SD}	—	0.7	1.2	V	V _{GS} = 0V, I _S = 1.0A
DYNAMIC CHARACTERISTICS (Note 10)						
Input Capacitance	C _{ISS}	—	2,280	—	pF	V _{DS} = 25V, V _{GS} = 0V, f = 1MHz
Output Capacitance	C _{OSS}	—	557	—	pF	
Reverse Transfer Capacitance	C _{RSS}	—	283	—	pF	
Gate Resistance	R _G	—	1.7	—	Ω	V _{DS} = 0V, V _{GS} = 0V, f = 1MHz
Total Gate Charge (V _{GS} = 10V)	Q _G	—	50.9	—	nC	
Gate-Source Charge	Q _{GS}	—	9.6	—	nC	V _{DS} = 32V, I _D = 86A
Gate-Drain Charge	Q _{GD}	—	20.4	—	nC	
Turn-On Delay Time	t _{D(ON)}	—	7.7	—	ns	V _{GS} = 10V, V _{DS} = 20V, R _G = 3.5Ω, I _D = 86A
Turn-On Rise Time	t _R	—	9.3	—	ns	
Turn-Off Delay Time	t _{D(OFF)}	—	18.1	—	ns	
Turn-Off Fall Time	t _F	—	8.1	—	ns	
Body Diode Reverse Recovery Time	t _{RR}	—	31.6	—	ns	I _F = 50A, di/dt = 100A/μs
Body Diode Reverse Recovery Charge	Q _{RR}	—	27.6	—	nC	I _F = 50A, 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. I_{AS} and E_{AS} rating 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.

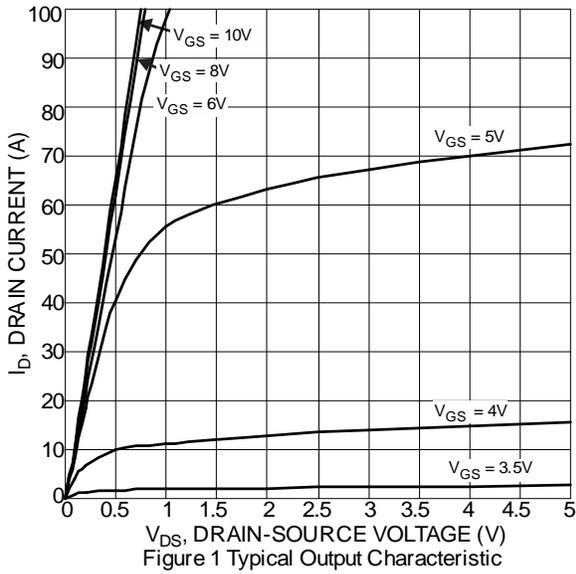


Figure 1 Typical Output Characteristic

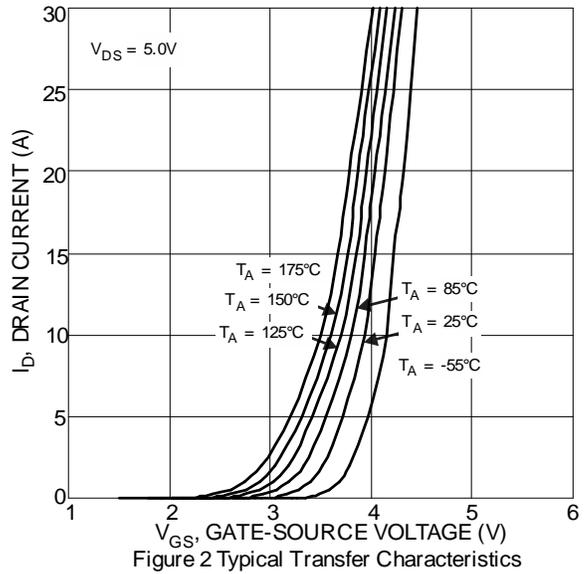


Figure 2 Typical Transfer Characteristics

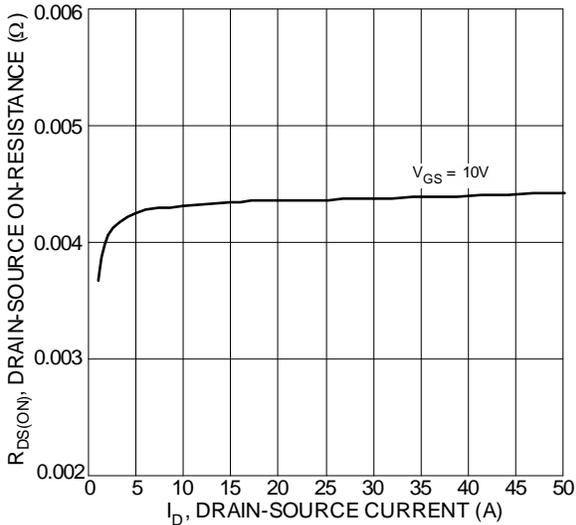


Figure 3 Typical On-Resistance vs. Drain Current and Gate Voltage

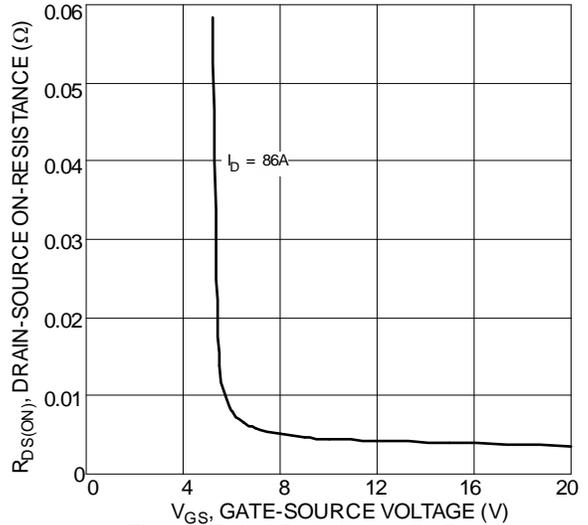


Figure 4 Typical Drain-Source On-Resistance vs. Gate-Source Voltage

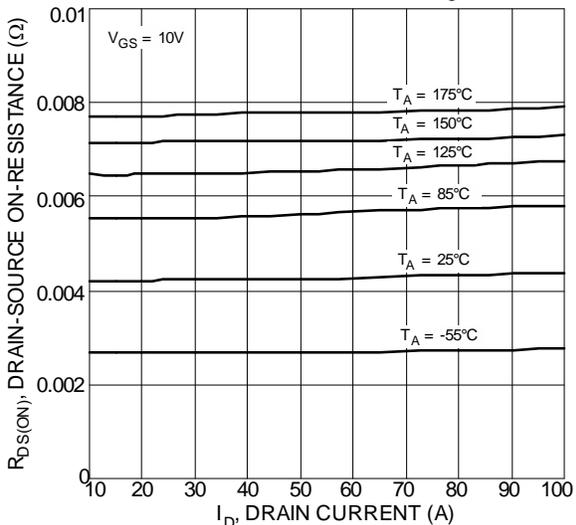


Figure 5 Typical On-Resistance vs. Drain Current and Temperature

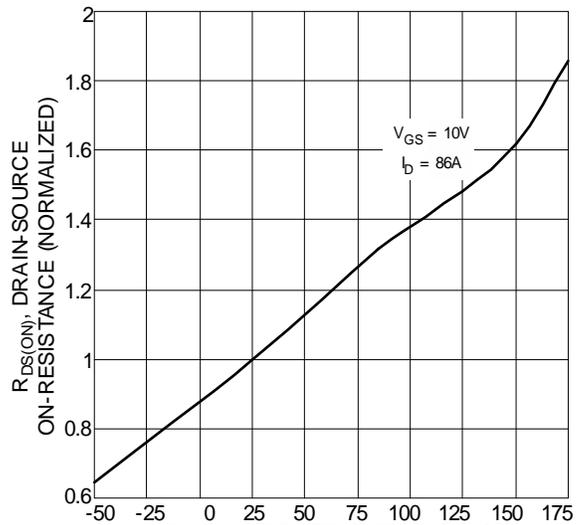


Figure 6 On-Resistance Variation with Temperature

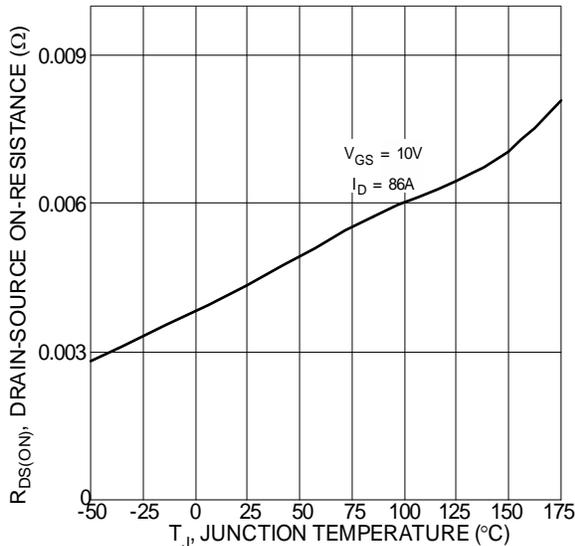


Figure 7 On-Resistance Variation with Temperature

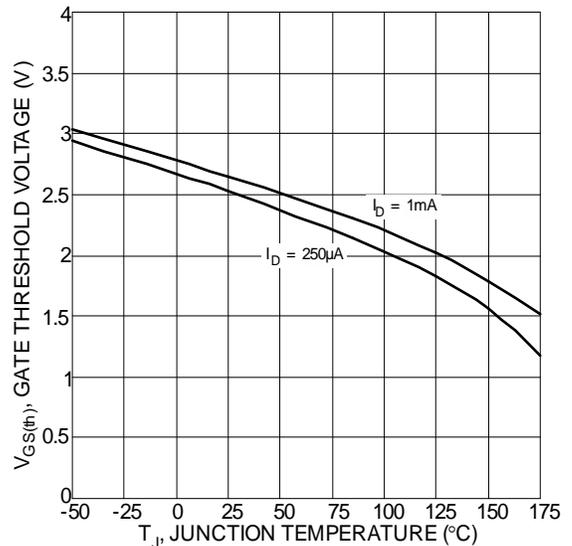


Figure 8 Gate Threshold Variation vs. Ambient Temperature

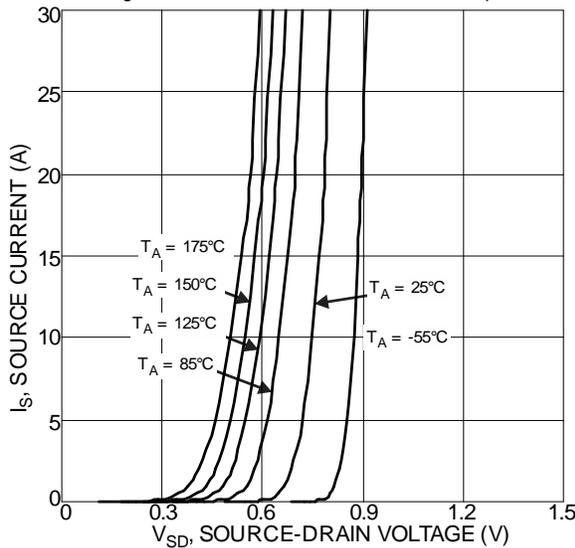


Figure 9 Diode Forward Voltage vs. Current

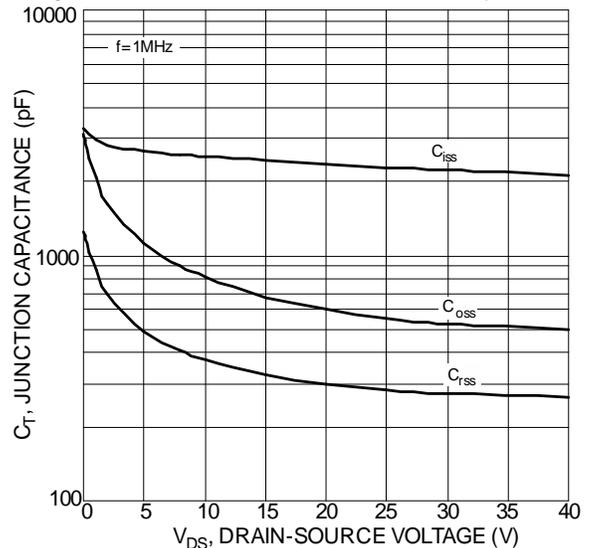


Figure 10 Typical Junction Capacitance

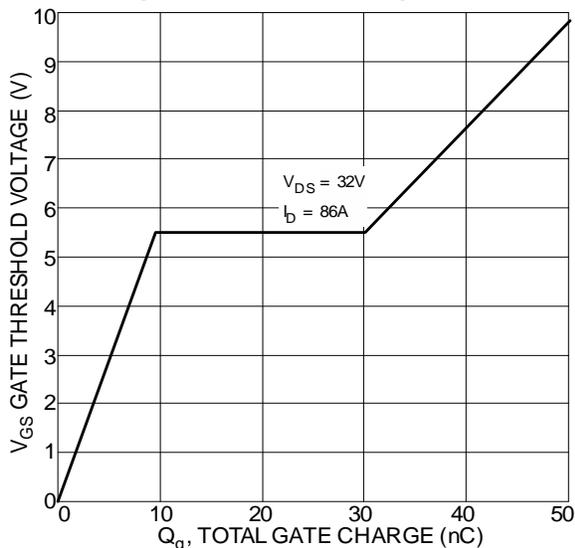


Figure 11 Gate Charge

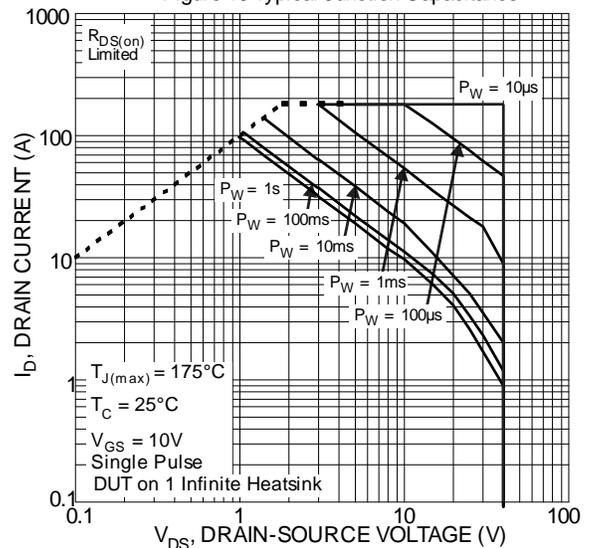
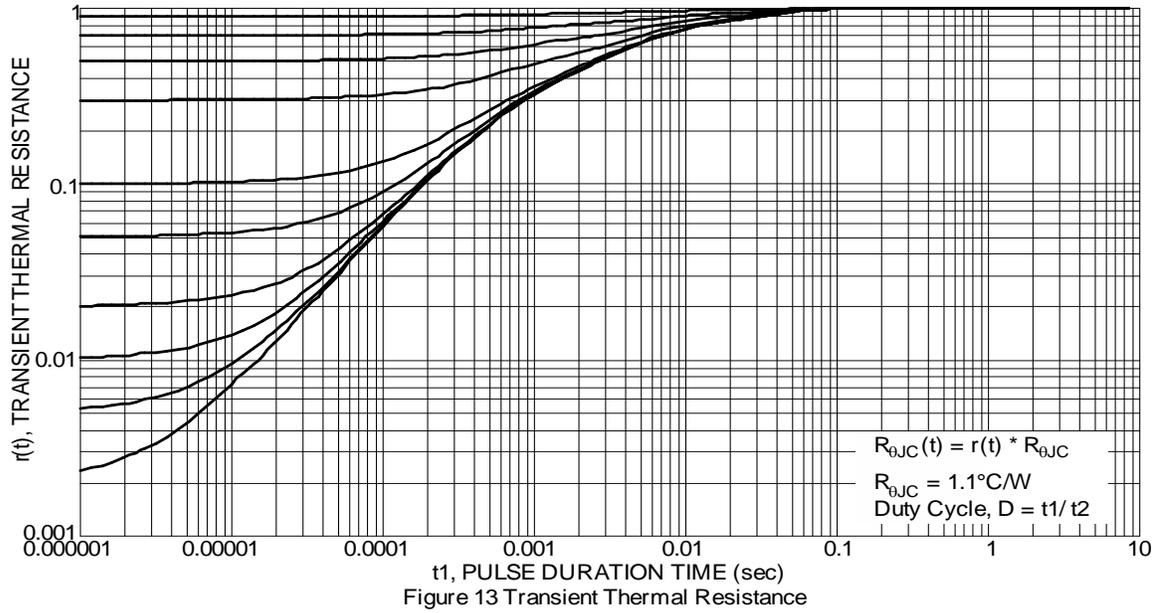


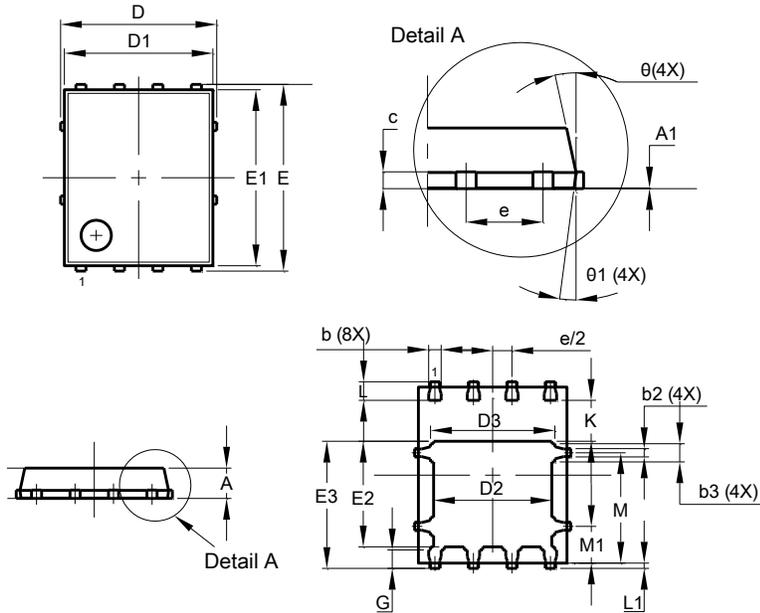
Figure 12 SOA, Safe Operation Area



Package Outline Dimensions

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

PowerDI5060-8

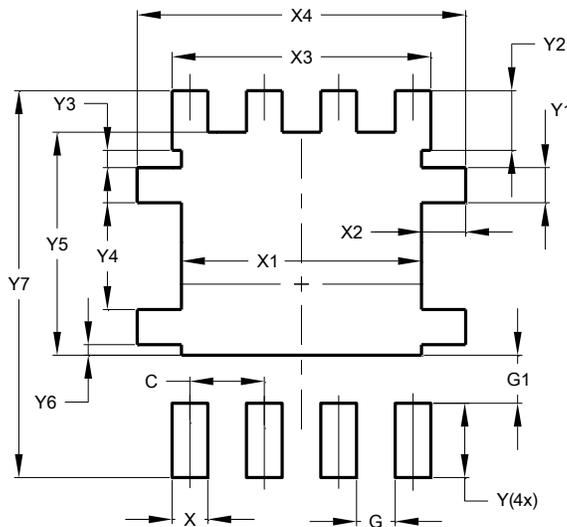


PowerDI5060-8			
Dim	Min	Max	Typ
A	0.90	1.10	1.00
A1	0.00	0.05	—
b	0.33	0.51	0.41
b2	0.200	0.350	0.273
b3	0.40	0.80	0.60
c	0.230	0.330	0.277
D	5.15 BSC		
D1	4.70	5.10	4.90
D2	3.70	4.10	3.90
D3	3.90	4.30	4.10
E	6.15 BSC		
E1	5.60	6.00	5.80
E2	3.28	3.68	3.48
E3	3.99	4.39	4.19
e	1.27 BSC		
G	0.51	0.71	0.61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