

Product Summary

BV _{DSS}	R _{DS(ON)} Max	I _D T _C = +25°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)**
- **An automotive-compliant part is available under separate datasheet ([DMNH4006SPSWQ](#))**

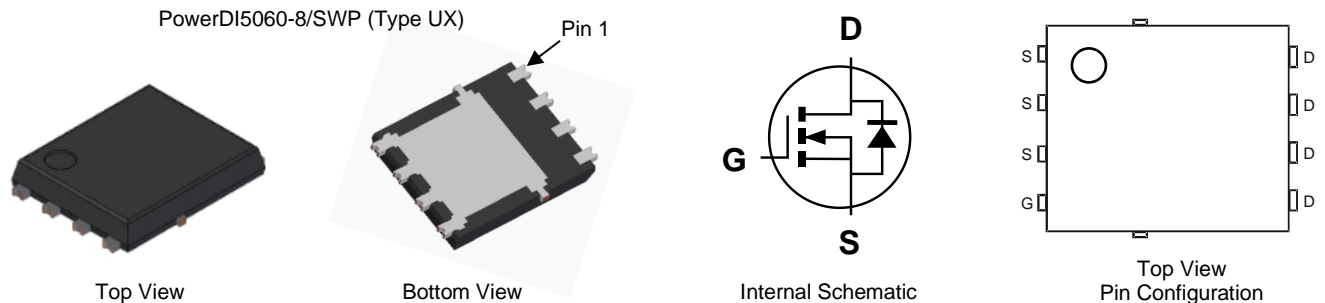
Description and Applications

This MOSFET is designed to minimize the on-state resistance (R_{DS(ON)}) yet maintain superior switching performance, making it ideal for high-efficiency power-management applications.

- Engine-management systems
- Body control electronics
- DC-DC converters

Mechanical Data

- Package: PowerDI[®]5060-8
- Package 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)

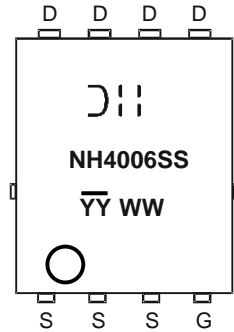


Ordering Information (Note 4)

Orderable Part Number	Package	Packing	
		Qty.	Carrier
DMNH4006SPSW-13	PowerDI5060-8/SWP (Type UX)	2,500	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 <https://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. For packaging details, go to our website at <https://www.diodes.com/design/support/packaging/diodes-packaging/>.

Marking Information



= Manufacturer's Marking
 NH4006SS = Product Type Marking Code
 = Date Code Marking
 YY = Last Two Digits of Year (ex: 24 = 2024)
 WW = Week Code (01 to 53)

Maximum Ratings (@ $T_A = +25^\circ\text{C}$, 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 5) $V_{GS} = 10\text{V}$	Steady State	I_D	110	A
			$T_C = +100^\circ\text{C}$	
Pulsed Drain Current (10 μs Pulse, Duty Cycle = 1%)		I_{DM}	440	A
Maximum Continuous Body Diode Forward Current		I_S	100	A
Pulsed Source Current (10 μs Pulse, Duty Cycle = 1%)		I_{SM}	440	A
Avalanche Current (Note 6) $L = 1\text{mH}$		I_{AS}	64	A
Avalanche Energy (Note 6) $L = 1\text{mH}$		E_{AS}	208	mJ

Thermal Characteristics

Characteristic		Symbol	Value	Unit
Total Power Dissipation (Note 7)		P_D	1.6	W
Thermal Resistance, Junction to Ambient (Note 7)	Steady State	$R_{\theta JA}$	93	$^\circ\text{C}/\text{W}$
Total Power Dissipation (Note 5)		P_D	3.0	W
Thermal Resistance, Junction to Ambient (Note 5)	Steady State	$R_{\theta JA}$	50	$^\circ\text{C}/\text{W}$
Thermal Resistance, Junction to Case		$R_{\theta JC}$	1.1	
Operating and Storage Temperature Range		T_J, T_{STG}	-55 to +175	$^\circ\text{C}$

Notes: 5. Device mounted on FR-4 substrate PC board, 2oz copper, with thermal bias to bottom layer 1inch square copper plate.
 6. I_{AS} and E_{AS} ratings are based on low frequency and duty cycles to keep $T_J = +25^\circ\text{C}$.
 7. Device mounted on FR-4 PC board, with minimum recommended pad layout, single sided.

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

Characteristic	Symbol	Min	Typ	Max	Unit	Test Condition
OFF CHARACTERISTICS (Note 8)						
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 _{GS} = ±20V, V _{DS} = 0V
ON CHARACTERISTICS (Note 8)						
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 9)						
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	V _{DS} = 32V, I _D = 86A
Gate-Source Charge	Q _{gs}	—	9.6	—	nC	
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	
Body Diode Reverse-Recovery Charge	Q _{RR}	—	27.6	—	nC	I _F = 50A, di/dt = 100A/μs

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

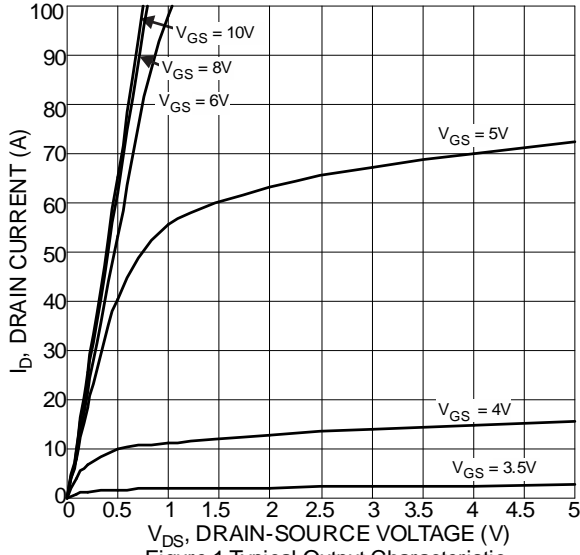


Figure 1 Typical Output Characteristic

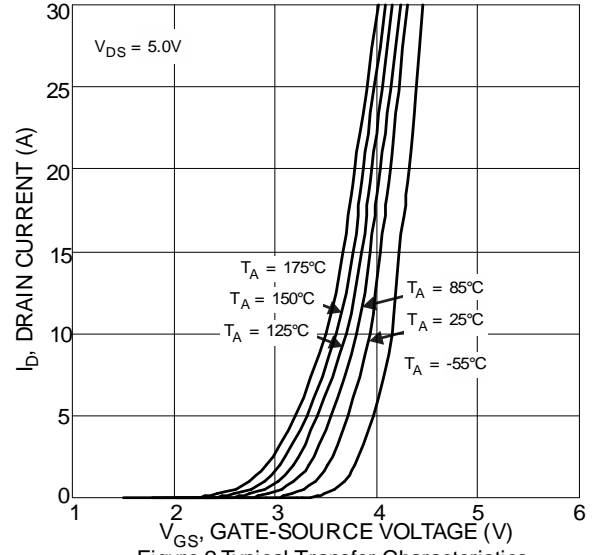


Figure 2 Typical Transfer Characteristics

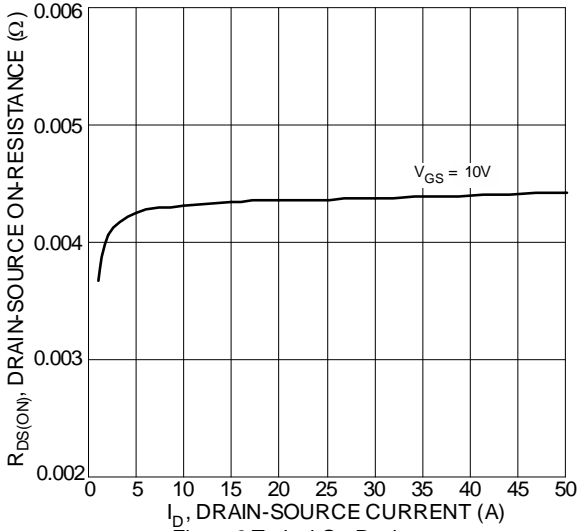


Figure 3 Typical On-Resistance vs. Drain Current and Gate Voltage

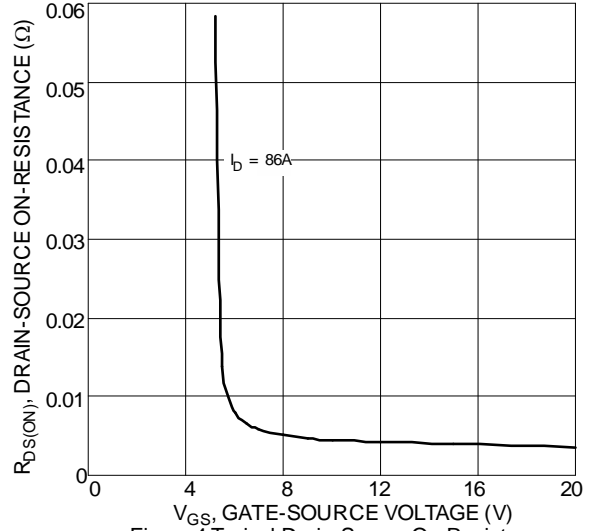


Figure 4 Typical Drain-Source On-Resistance vs. Gate-Source Voltage

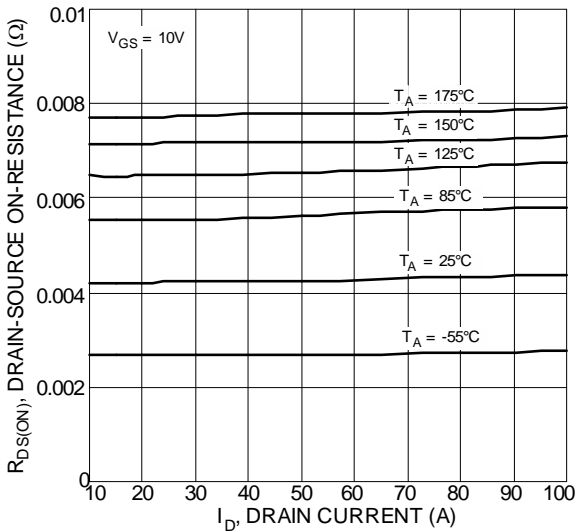


Figure 5 Typical On-Resistance vs. Drain Current and Temperature

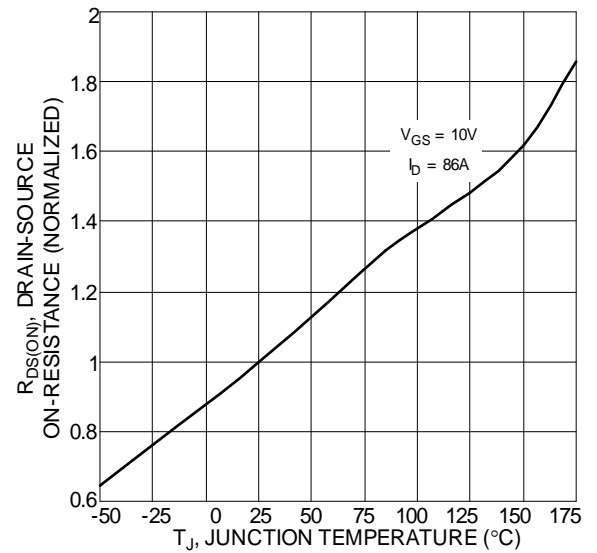


Figure 6 On-Resistance Variation with Temperature

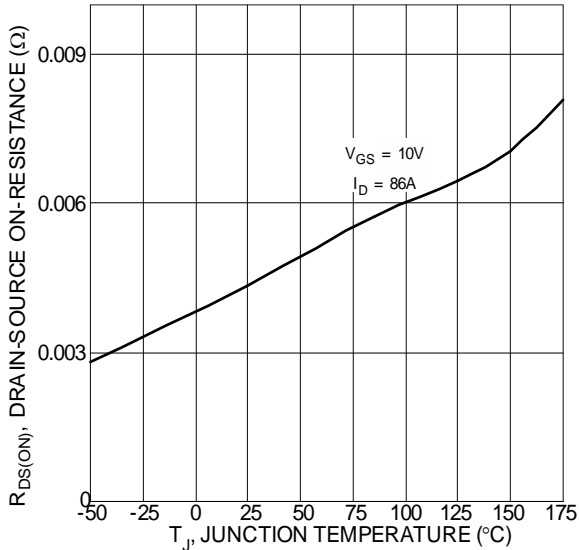


Figure 7 On-Resistance Variation with Temperature

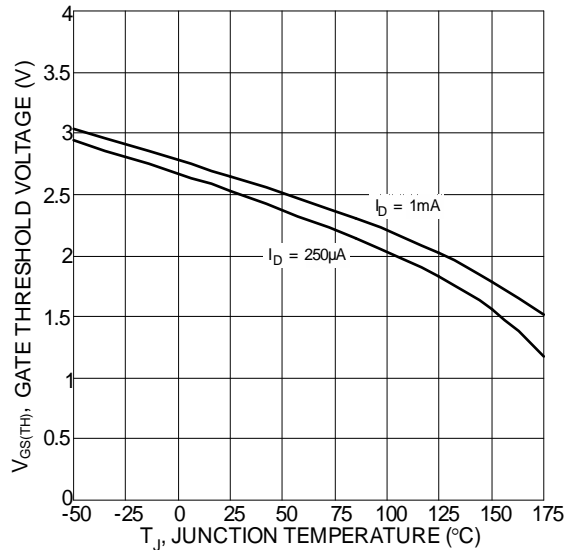


Figure 8 Gate Threshold Variation vs. Ambient Temperature

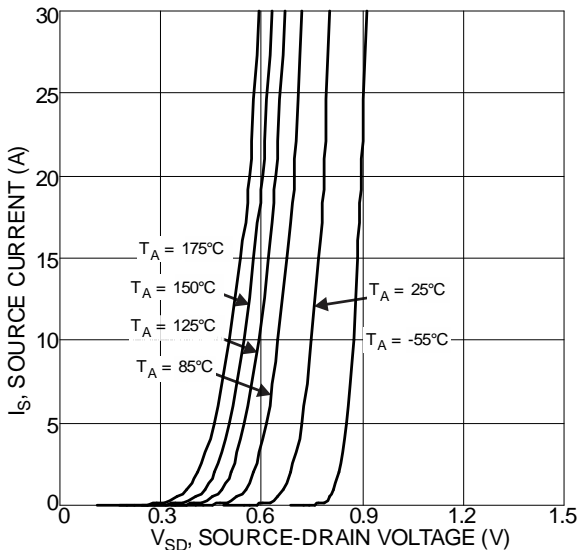


Figure 9 Diode Forward Voltage vs. Current

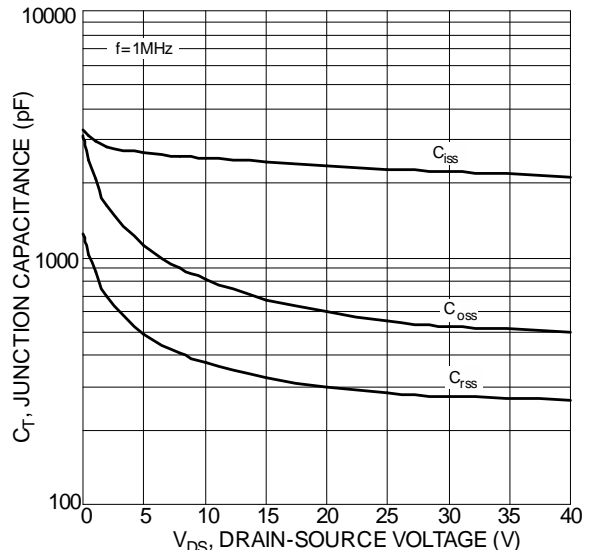


Figure 10 Typical Junction Capacitance

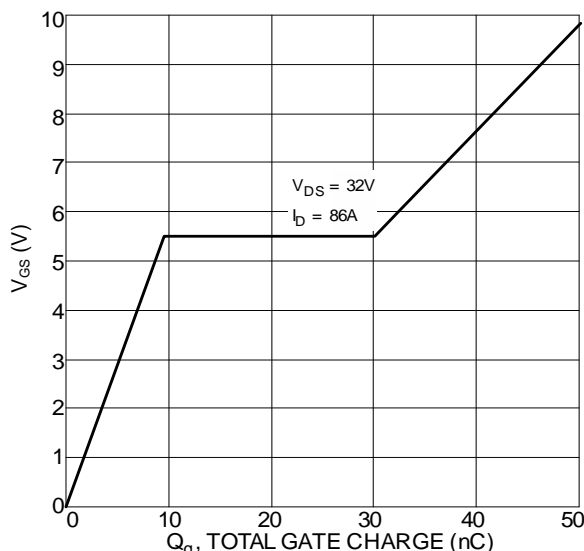


Figure 11 Gate Charge

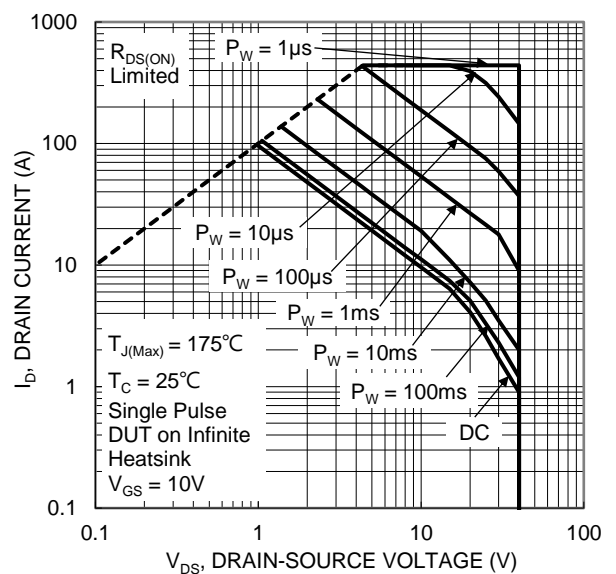
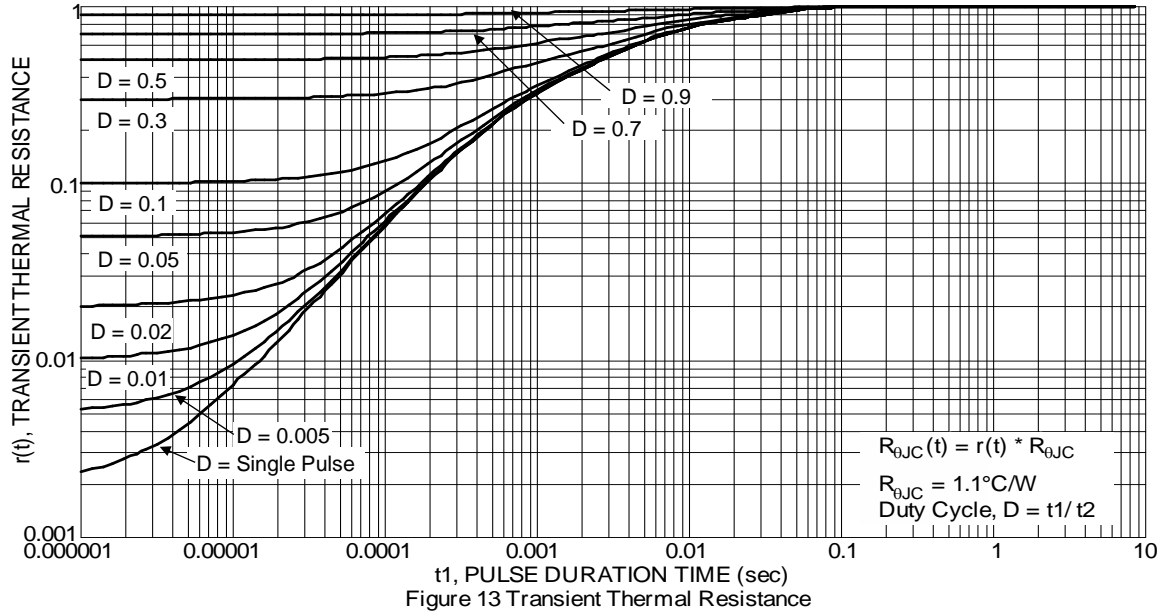


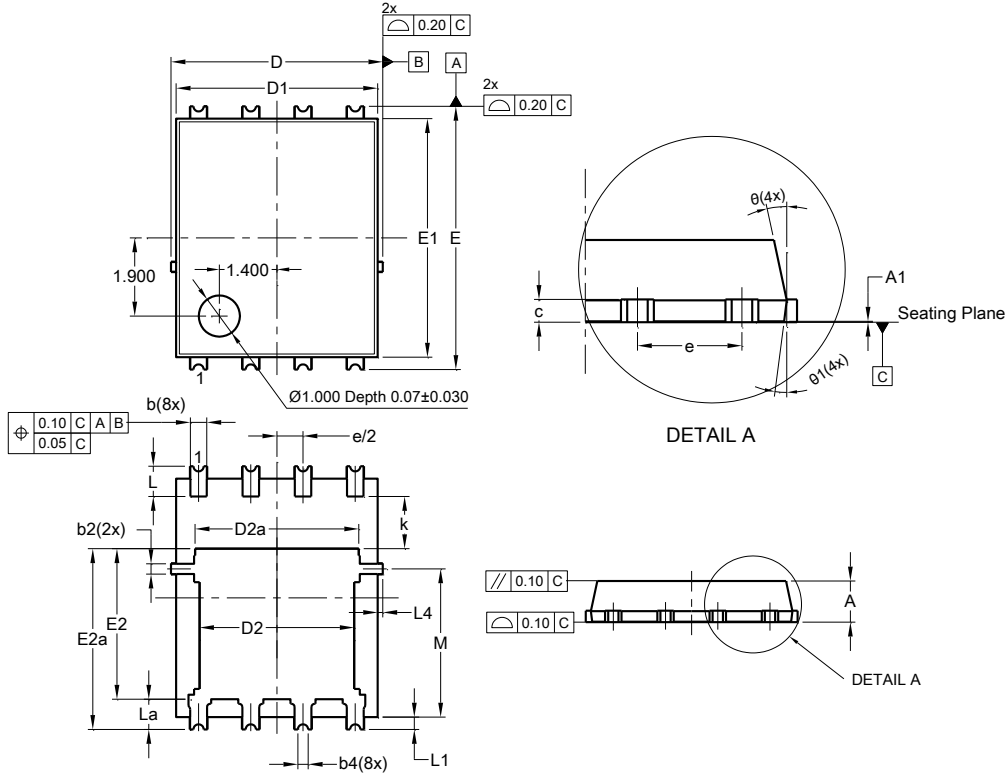
Figure 12 SOA, Safe Operation Area



Package Outline Dimensions

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

PowerDI5060-8/SWP (Type UX)

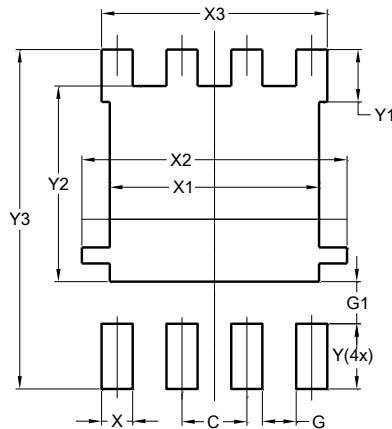


PowerDI5060-8/SWP (Type UX)			
Dim	Min	Max	Typ
A	0.90	1.10	1.00
A1	0	0.05	--
b	0.30	0.50	0.41
b2	0.20	0.35	0.25
b4	0.25REF		
c	0.230	0.330	0.277
D	5.15 BSC		
D1	4.70	5.10	4.90
D2	3.56	3.96	3.76
D2a	3.78	4.18	3.98
E	6.40 BSC		
E1	5.60	6.00	5.80
E2	3.46	3.86	3.66
E2a	4.195	4.595	4.395
e	1.27BSC		
k	1.05	--	--
L	0.635	0.835	0.735
La	0.635	0.835	0.735
L1	0.200	0.400	0.300
L4	0.025	0.225	0.125
M	3.205	4.005	3.605
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/SWP (Type UX)



Dimensions	Value (in mm)
C	1.270
G	0.660
G1	0.820
X	0.610
X1	4.100
X2	5.190
X3	4.420
Y	1.270
Y1	1.020
Y2	3.810
Y3	6.610

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