

Product Summary

BV _{DSS}	R _{DS(ON)} Max	I _D Max T _C = +25°C
60V	25mΩ @ V _{GS} = 10V	32A
	40mΩ @ V _{GS} = 4.5V	25A

Features and Benefits

- Rated to +175°C—Ideal for High Ambient Temperature Environments
- 100% Unclamped Inductive Switching—Ensures More Reliable and Robust End Application
- High Conversion Efficiency
- Low R_{DS(ON)}—Minimizes On-State Losses
- Low Input Capacitance
- Fast Switching Speed
- Wettable Flank for Improved Optical Inspection
- **Totally Lead-Free & Fully RoHS Compliant (Notes 1 & 2)**
- **Halogen and Antimony Free. “Green” Device (Note 3)**
- **The DMNH6021SPDWQ is suitable for automotive applications requiring specific change control; this part is AEC-Q101 qualified, PPAP capable, and manufactured in IATF 16949 certified facilities.**

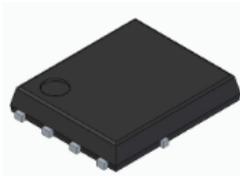
<https://www.diodes.com/quality/product-definitions/>

Description and Applications

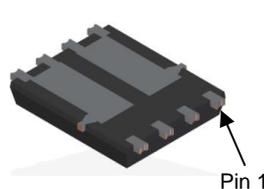
This MOSFET is designed to meet the stringent requirements of automotive applications. It is qualified to AEC-Q101, supported by a PPAP, and is ideal for use in:

- Backlighting
- Power-management functions
- DC-DC converters

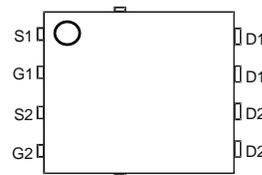
PowerDI5060-8 (SWP) (Type R)
PowerDI5060-8/SWP (Type UXD)



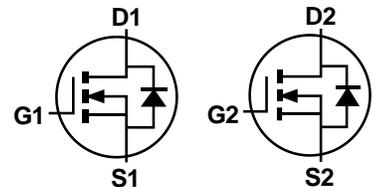
Top View



Bottom View



Pin Out
Top View



Equivalent Circuit

Mechanical Data

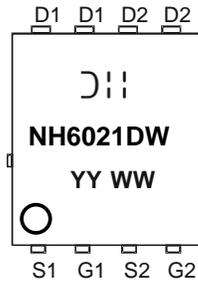
- Package: PowerDI[®]5060-8
- Package Material: Molded Plastic, "Green" Molding Compound. UL Flammability Classification Rating 94V-0
- Moisture Sensitivity: Level 3 per J-STD-020
- Terminal Connections Indicator: See Diagram
- Terminals: Finish—Matte Tin Annealed over Copper Leadframe. Solderable per MIL-STD-202, Method 208 Ⓔ3
- Weight: 0.097 grams (Approximate)

Ordering Information (Note 4)

Part Number	Package	Packing	
		Qty.	Carrier
DMNH6021SPDWQ-13	PowerDI5060-8 (SWP) (Type R)	2500	Tape & Reel
	PowerDI5060-8/SWP (Type UXD)	2500	Tape & Reel

- Notes:
1. No purposely added lead. Fully EU Directive 2002/95/EC (RoHS), 2011/65/EU (RoHS 2) & 2015/863/EU (RoHS 3) compliant.
 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
 NH6021DW = Product Type Marking Code
 YYWW = Date Code Marking
 YY = Year (ex: 23 = 2023)
 WW = Week (01 to 53)

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

Characteristic	Symbol	Value	Unit
Drain-Source Voltage	V _{DSS}	60	V
Gate-Source Voltage	V _{GSS}	±20	V
Continuous Drain Current (Note 5) V _{GS} = 10V	I _D	T _A = +25°C	8.2
		T _A = +70°C	6.5
Continuous Drain Current (Note 6) V _{GS} = 10V	I _D	T _C = +25°C	32
		T _C = +100°C	22
Pulsed Drain Current (380µs Pulse, Duty Cycle = 1%)	I _{DM}	80	A
Maximum Continuous Body Diode Forward Current (Note 5)	I _S	32	A
Avalanche Current, L = 0.1mH (Note 7)	I _{AS}	35	A
Avalanche Energy, L = 0.1mH (Note 7)	E _{AS}	64	mJ

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

Characteristic	Symbol	Value	Unit
Total Power Dissipation (Note 8)	P _D	1.5	W
Thermal Resistance, Junction to Ambient (Note 8)	R _{θJA}	Steady State	99
		t < 10s	53
Total Power Dissipation (Note 5)	P _D	2.8	W
Thermal Resistance, Junction to Ambient (Note 5)	R _{θJA}	Steady State	54
		t < 10s	27
Thermal Resistance, Junction to Case (Note 6)	R _{θJC}	2.2	°C/W
Operating and Storage Temperature Range	T _J , T _{STG}	-55 to +175	°C

- Notes:
- Device mounted on FR-4 substrate PC board, 2oz copper, with thermal bias to bottom layer 1inch square copper plate.
 - Thermal resistance from junction to soldering point (on the exposed drain pad).
 - I_{AS} and E_{AS} ratings are based on low frequency and duty cycles to keep T_J = +25°C.
 - 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 9)						
Drain-Source Breakdown Voltage	BV _{DSS}	60	—	—	V	V _{GS} = 0V, I _D = 250μA
Zero Gate Voltage Drain Current T _J = +25°C	I _{DSS}	—	—	1	μA	V _{DS} = 60V, V _{GS} = 0V
Gate-Source Leakage	I _{GSS}	—	—	±100	nA	V _{GS} = ±20V, 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)}	—	15	25	mΩ	V _{GS} = 10V, I _D = 15A
		—	21	40		V _{GS} = 4.5V, I _D = 12A
Diode Forward Voltage	V _{SD}	—	0.75	1.2	V	V _{GS} = 0V, I _S = 2.6A
DYNAMIC CHARACTERISTICS (Note 10)						
Input Capacitance	C _{iss}	—	1,143	—	pF	V _{DS} = 25V, V _{GS} = 0V f = 1MHz
Output Capacitance	C _{oss}	—	168	—	pF	
Reverse Transfer Capacitance	C _{rss}	—	69	—	pF	V _{DS} = 0V, V _{GS} = 0V, f = 1MHz
Gate Resistance	R _g	—	2.5	—	Ω	
Total Gate Charge (V _{GS} = 10V)	Q _g	—	20.1	—	nC	V _{DS} = 30V, I _D = 20A
Total Gate Charge (V _{GS} = 6V)	Q _g	—	12	—	nC	
Gate-Source Charge	Q _{gs}	—	4.3	—	nC	
Gate-Drain Charge	Q _{gd}	—	5.5	—	nC	
Turn-On Delay Time	t _{D(ON)}	—	4.4	—	ns	V _{DD} = 30V, V _{GS} = 10V R _g = 4.7Ω, I _D = 20A
Turn-On Rise Time	t _R	—	6.0	—	ns	
Turn-Off Delay Time	t _{D(OFF)}	—	14.2	—	ns	
Turn-Off Fall Time	t _F	—	5.4	—	ns	
Body Diode Reverse Recovery Time	t _{RR}	—	21.2	—	ns	I _F = 20A, dI/dt = 100A/μs
Body Diode Reverse Recovery Charge	Q _R	—	15.2	—	nC	

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

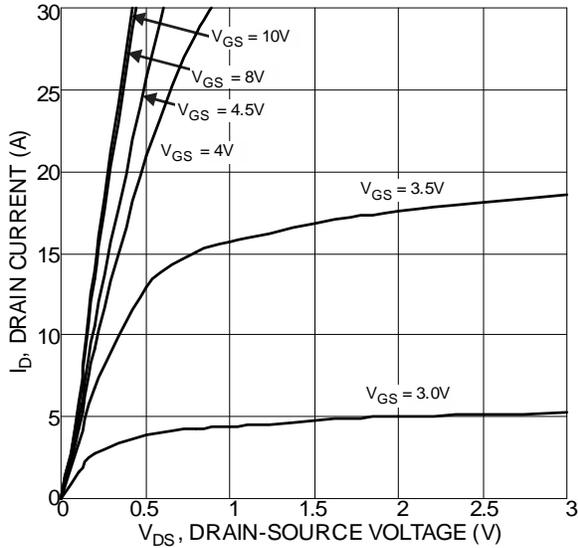


Figure 1 Typical Output Characteristic

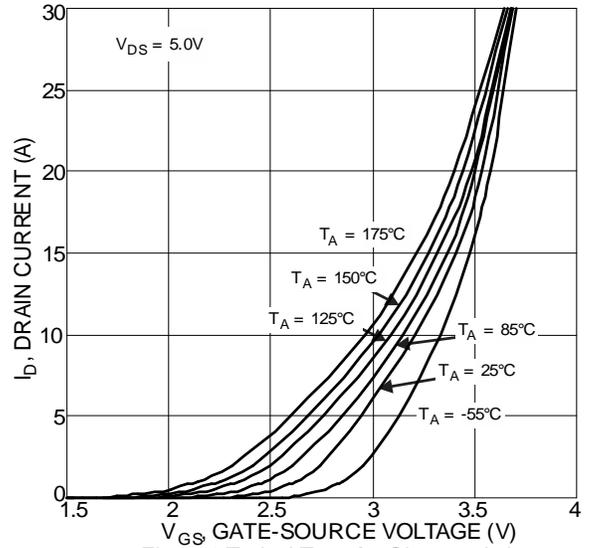


Figure 2 Typical Transfer Characteristics

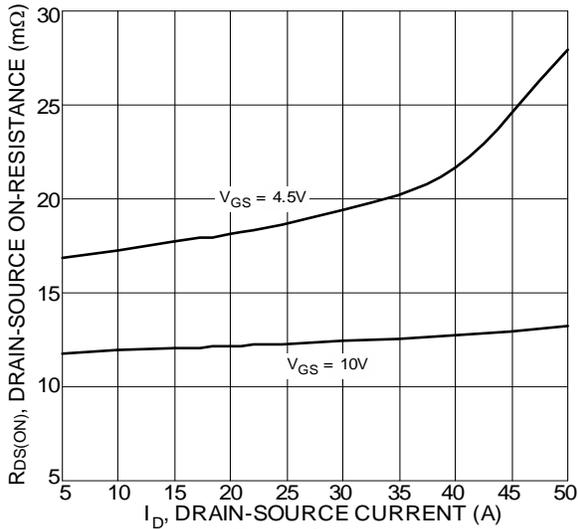


Figure 3 Typical On-Resistance vs. Drain Current and Gate Voltage

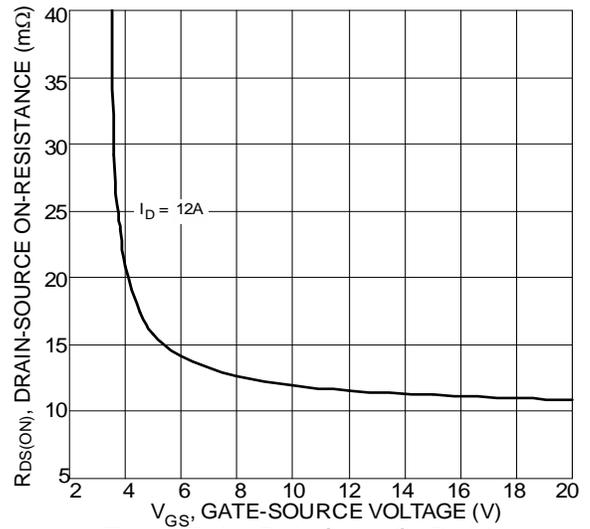


Figure 4 Typical Drain-Source On-Resistance vs. Gate-Source Voltage

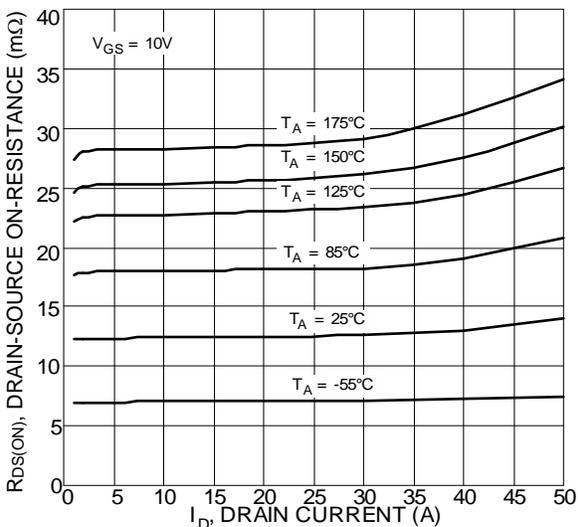


Figure 5 Typical On-Resistance vs. Drain Current and Temperature

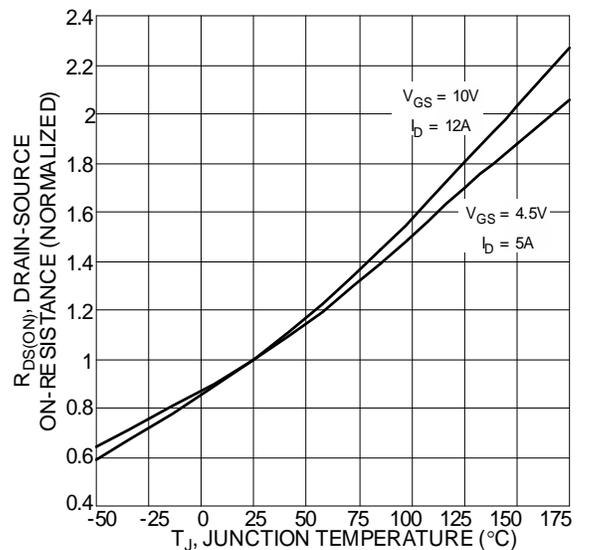


Figure 6 On-Resistance Variation with Temperature

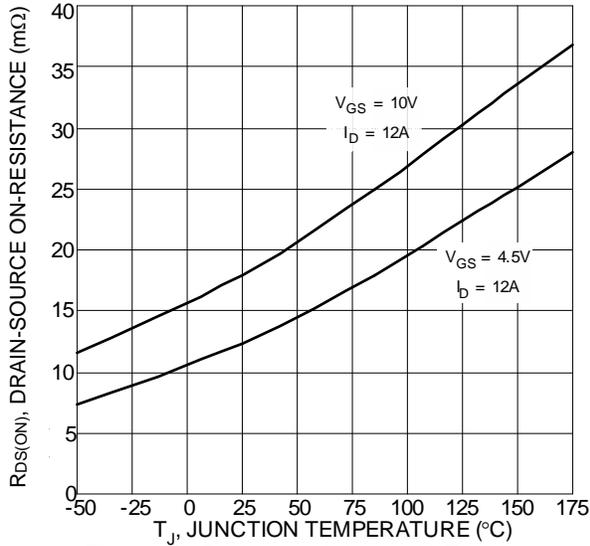


Figure 7 On-Resistance Variation with Temperature

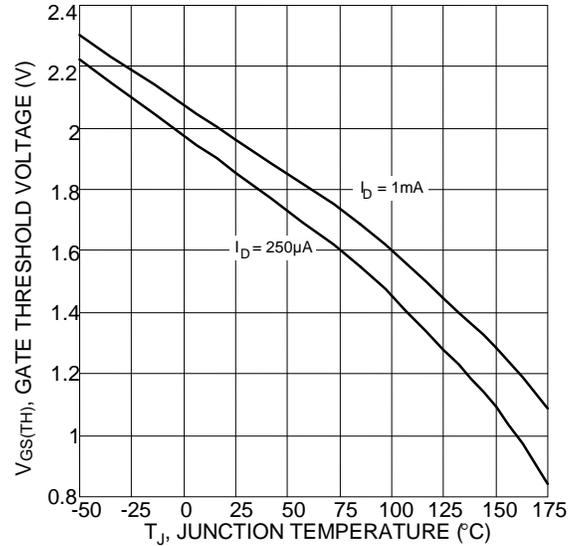


Figure 8 Gate Threshold Variation vs. Junction Temperature

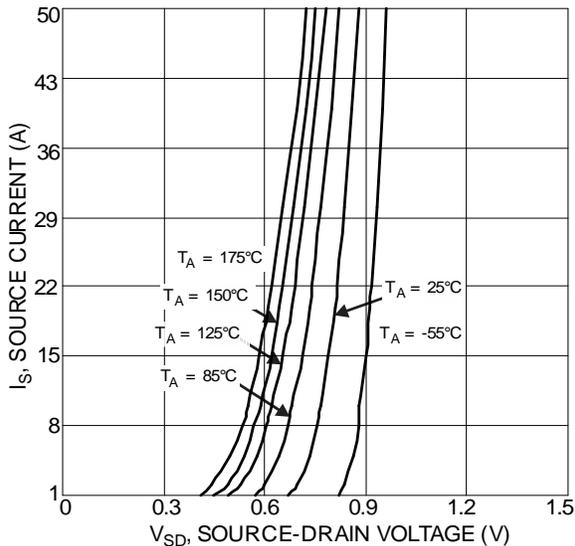


Figure 9 Diode Forward Voltage vs. Current

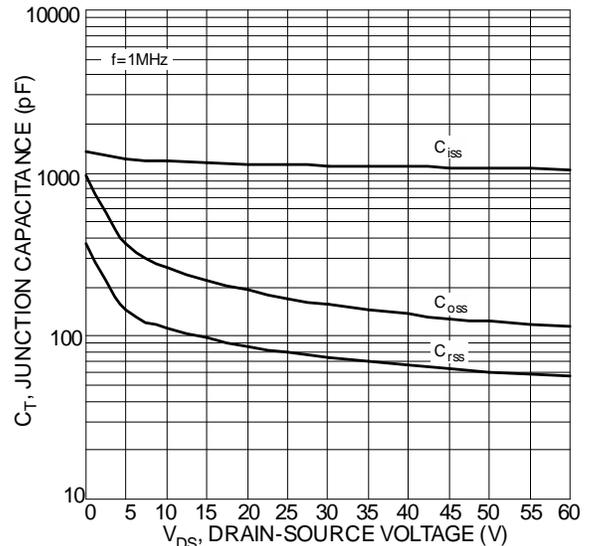


Figure 10 Typical Junction Capacitance

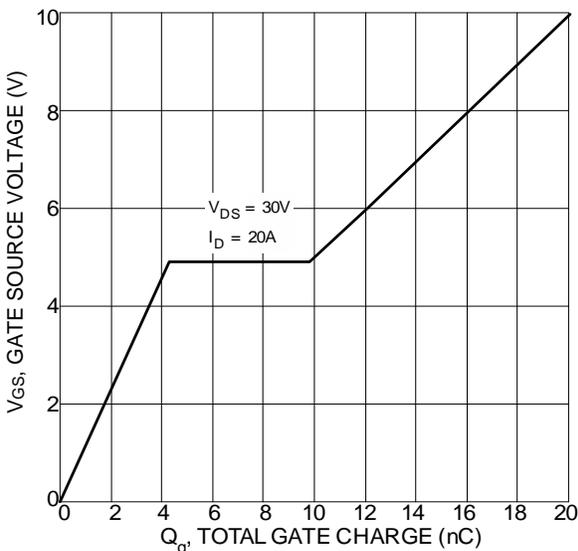


Figure 11 Gate Charge

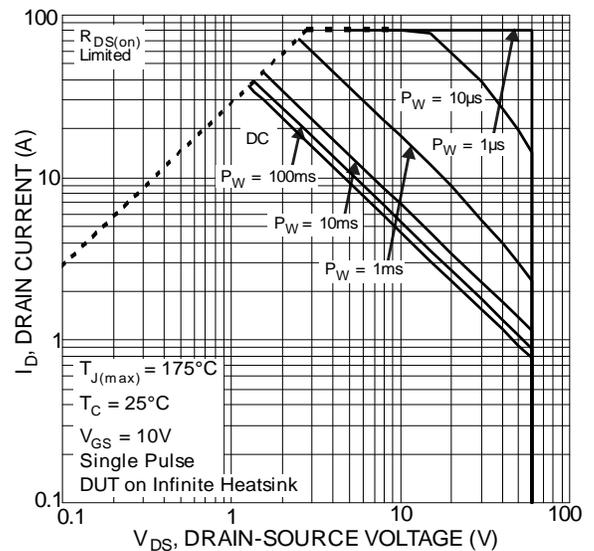
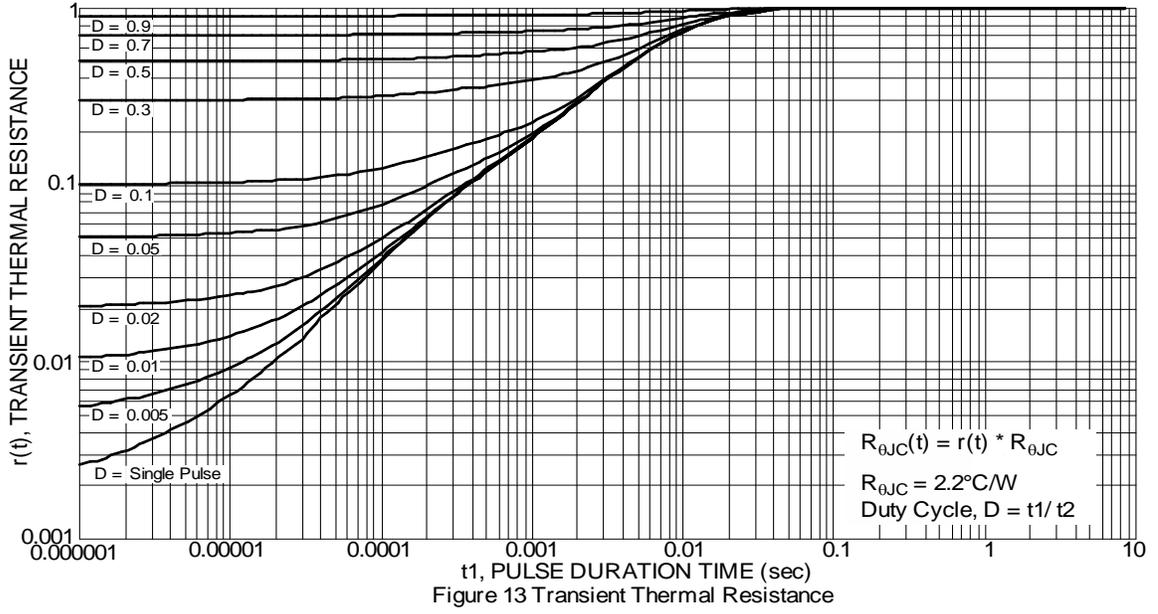


Figure 12 SOA, Safe Operation Area

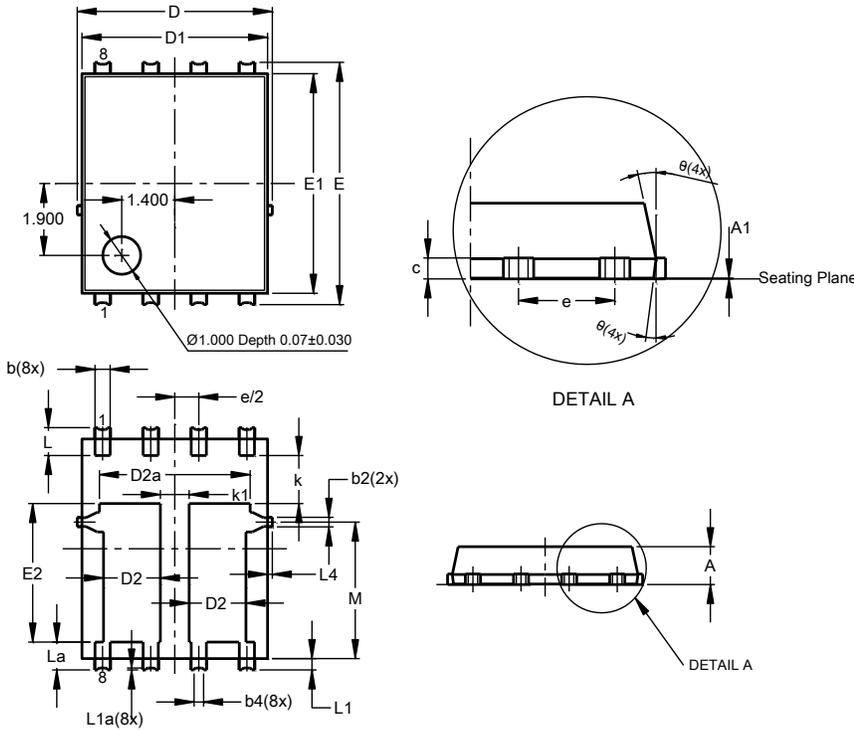


Package Outline Dimensions

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

Site 1:

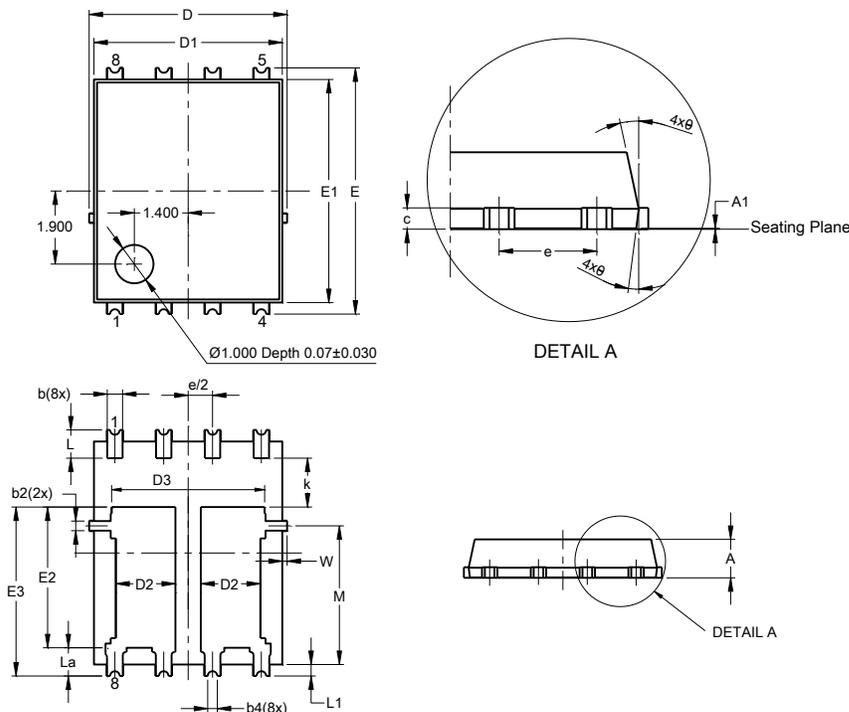
PowerDI5060-8 (SWP) (Type R)



PowerDI5060-8 (SWP) (Type R)			
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	1.40	1.60	1.50
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
e	1.27BSC		
k	1.05	--	--
k1	0.56	--	--
L	0.635	0.835	0.735
La	0.635	0.835	0.735
L1	0.200	0.400	0.300
L1a	0.050REF		
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			

Site 2:

PowerDI5060-8/SWP (Type UXD)



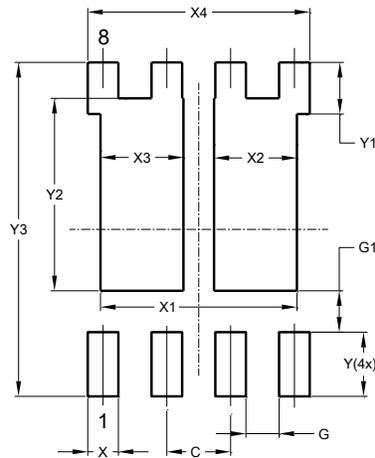
PowerDI5060-8/SWP (Type UXD)			
Dim	Min	Max	Typ
A	0.90	1.10	1.00
A1	0.00	0.05	--
b	0.30	0.50	0.41
b2	0.20	0.35	0.25
b4	0.25REF		
c	0.230	0.330	0.277
D	5.15 BSC		
D1	4.70	5.10	4.90
D2	1.46	1.66	1.55
D3	3.78	4.18	3.98
E	6.40 BSC		
E1	5.60	6.00	5.80
E2	3.46	3.86	3.66
E2a	4.195	4.595	4.395
e	1.27BSC		
k	1.05	--	--
L	0.635	0.835	0.735
La	0.635	0.835	0.735
L1	0.200	0.400	0.300
M	3.205	4.005	3.605
W	0.025	0.225	0.125
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.

Site 1:

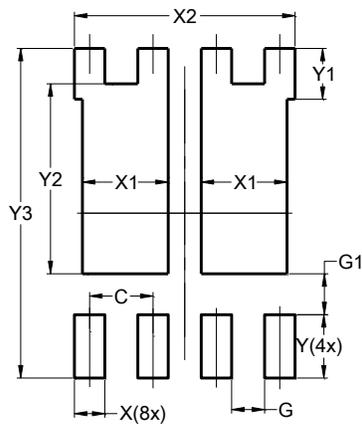
PowerDI5060-8 (SWP) (Type R)



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

Site 2:

PowerDI5060-8/SWP (Type UXD)



Dimensions	Value (in mm)
C	1.270
G	0.660
G1	0.820
X	0.610
X1	1.720
X2	4.420
Y	1.270
Y1	1.020
Y2	3.810
Y3	6.610

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