

Product Summary

BV_{DSS}	R_{D(S)} 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_{D(S)} – 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)
- The DMNH6021SPDQ is suitable for automotive applications requiring specific change control; this part is AEC-Q101 qualified, PPAP capable, and manufactured in IATF 16949 certified facilities.

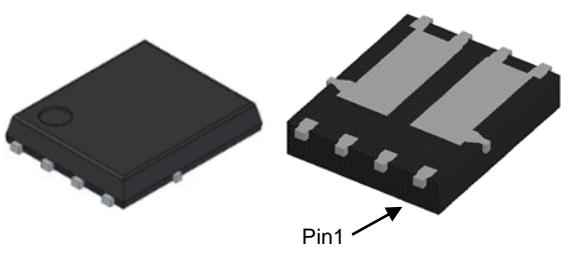
<https://www.diodes.com/quality/product-definitions/>

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:

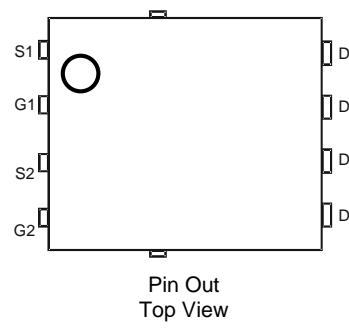
- Backlighting
- Power-management functions
- DC-DC converters

Site 1: PowerDI5060-8 (Type C)

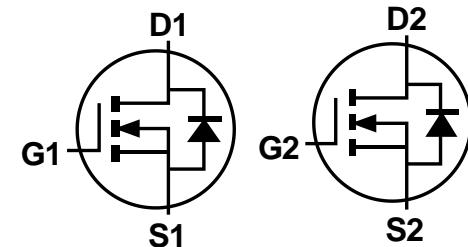


Top View

Bottom View



Pin Out
Top View



Equivalent Circuit

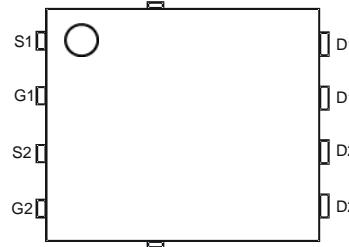
Site 2:

PowerDI5060-8/SWP (Type UXD)

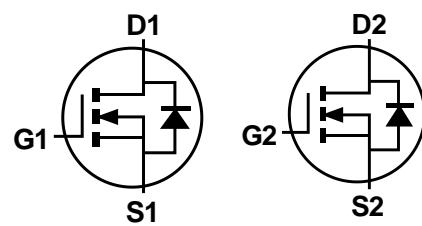


Top View

Bottom View



Pin out
Top View



Equivalent Circuit

Notes:

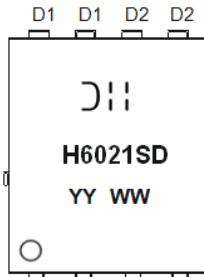
1. No purposely added lead. Fully EU Directive 2002/95/EC (RoHS), 2011/65/EU (RoHS 2) & 2015/863/EU (RoHS 3) compliant.
2. See <https://www.diodes.com/quality/lead-free/> for more information about Diodes Incorporated's definitions of Halogen- and Antimony-free, “Green” and Lead-free.
3. Halogen- and Antimony-free “Green” products are defined as those which contain <900ppm bromine, <900ppm chlorine (<1500ppm total Br + Cl) and <1000ppm antimony compounds.

Ordering Information (Note 4)

Part Number	Package	Packing	
		Qty.	Carrier
DMNH6021SPDQ-13	PowerDI5060-8 (Type C) PowerDI5060-8/SWP (Type UXD)	2,500	Tape & Reel

Note: 4. For packaging details, go to our website at <https://www.diodes.com/design/support/packaging/diodes-packaging/>.

Marking Information



DII = Manufacturer's Marking
H6021SD = Product Type Marking Code
YYWW = Date Code Marking
YY or YY = Year (ex: 23 = 2023)
WW = Week (01 to 53)

Maximum Ratings (@ $T_A = +25^\circ\text{C}$, 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 6) $V_{GS} = 10\text{V}$	I_D $T_A = +25^\circ\text{C}$ $T_A = +70^\circ\text{C}$	8.2 6.5	A
Continuous Drain Current (Note 7) $V_{GS} = 10\text{V}$	I_D $T_C = +25^\circ\text{C}$ $T_C = +100^\circ\text{C}$	32 22	A
Pulsed Drain Current (380 μs Pulse, Duty Cycle = 1%)	I_{DM}	80	A
Maximum Continuous Body Diode Forward Current (Note 8)	I_S	32	A
Avalanche Current, $L = 0.1\text{mH}$ (Note 8)	I_{AS}	35	A
Avalanche Energy, $L = 0.1\text{mH}$ (Note 8)	E_{AS}	64	mJ

Thermal Characteristics

Characteristic	Symbol	Value	Unit
Total Power Dissipation (Note 5)	P_D	1.5	W
Thermal Resistance, Junction to Ambient (Note 5)	$R_{\theta JA}$	99	$^\circ\text{C}/\text{W}$
		53	
Total Power Dissipation (Note 6)	P_D	2.8	W
Thermal Resistance, Junction to Ambient (Note 6)	$R_{\theta JA}$	54	$^\circ\text{C}/\text{W}$
		27	
Thermal Resistance, Junction to Case (Note 7)	$R_{\theta JC}$	2.2	$^\circ\text{C}/\text{W}$
Operating and Storage Temperature Range	T_J, T_{STG}	-55 to +175	$^\circ\text{C}$

Notes:

5. Device mounted on FR-4 PC board, with minimum recommended pad layout, single sided.
6. Device mounted on FR-4 substrate PC board, 2oz copper, with thermal bias to bottom layer 1-inch square copper plate.
7. Thermal resistance from junction to soldering point (on the exposed drain pad).
8. IAS and EAS ratings are based on low frequency and duty cycles to keep $T_J = +25^\circ\text{C}$.

Electrical Characteristics (@ $T_A = +25^\circ\text{C}$, unless otherwise specified.)

Characteristic	Symbol	Min	Typ	Max	Unit	Test Condition
OFF CHARACTERISTICS (Note 9)						
Drain-Source Breakdown Voltage	BV_{DSS}	60	—	—	V	$\text{V}_{\text{GS}} = 0\text{V}$, $\text{I}_D = 250\mu\text{A}$
Zero Gate Voltage Drain Current $\text{T}_J = +25^\circ\text{C}$	I_{DSS}	—	—	1	μA	$\text{V}_{\text{DS}} = 60\text{V}$, $\text{V}_{\text{GS}} = 0\text{V}$
Gate-Source Leakage	I_{GSS}	—	—	± 100	nA	$\text{V}_{\text{GS}} = \pm 20\text{V}$, $\text{V}_{\text{DS}} = 0\text{V}$
ON CHARACTERISTICS (Note 10)						
Gate Threshold Voltage	$\text{V}_{\text{GS(TH)}}$	1	—	3	V	$\text{V}_{\text{DS}} = \text{V}_{\text{GS}}$, $\text{I}_D = 250\mu\text{A}$
Static Drain-Source On-Resistance	$\text{R}_{\text{DS(ON)}}$	—	15	25	$\text{m}\Omega$	$\text{V}_{\text{GS}} = 10\text{V}$, $\text{I}_D = 15\text{A}$
		—	21	40		$\text{V}_{\text{GS}} = 4.5\text{V}$, $\text{I}_D = 12\text{A}$
Diode Forward Voltage	V_{SD}	—	0.75	1.2	V	$\text{V}_{\text{GS}} = 0\text{V}$, $\text{I}_S = 2.6\text{A}$
DYNAMIC CHARACTERISTICS (Note 10)						
Input Capacitance	C_{iss}	—	1,143	—	pF	$\text{V}_{\text{DS}} = 25\text{V}$, $\text{V}_{\text{GS}} = 0\text{V}$, $f = 1\text{MHz}$
Output Capacitance	C_{oss}	—	168	—	pF	
Reverse Transfer Capacitance	C_{rss}	—	69	—	pF	
Gate Resistance	R_g	—	2.1	—	Ω	$\text{V}_{\text{DS}} = 0\text{V}$, $\text{V}_{\text{GS}} = 0\text{V}$, $f = 1\text{MHz}$
Total Gate Charge ($\text{V}_{\text{GS}} = 10\text{V}$)	Q_g	—	20.1	—	nC	$\text{V}_{\text{DS}} = 30\text{V}$, $\text{I}_D = 20\text{A}$
Total Gate Charge ($\text{V}_{\text{GS}} = 6\text{V}$)	Q_g	—	12	—	nC	
Gate-Source Charge	Q_{gs}	—	4.3	—	nC	
Gate-Drain Charge	Q_{gd}	—	5.5	—	nC	
Turn-On Delay Time	$\text{t}_{\text{D(ON)}}$	—	4.4	—	ns	$\text{V}_{\text{DD}} = 30\text{V}$, $\text{V}_{\text{GS}} = 10\text{V}$, $\text{R}_g = 4.7\Omega$, $\text{I}_D = 20\text{A}$
Turn-On Rise Time	t_R	—	6.0	—	ns	
Turn-Off Delay Time	$\text{t}_{\text{D(OFF)}}$	—	14.2	—	ns	
Turn-Off Fall Time	t_F	—	5.4	—	ns	
Body Diode Reverse Recovery Time	t_{RR}	—	21.2	—	ns	$\text{I}_F = 20\text{A}$, $\text{di/dt} = 100\text{A}/\mu\text{s}$
Body Diode Reverse Recovery Charge	Q_{RR}	—	15.2	—	nC	

Notes: 9. Short duration pulse test used to minimize self-heating effect.

10. Guaranteed by design. Not subject to product testing.

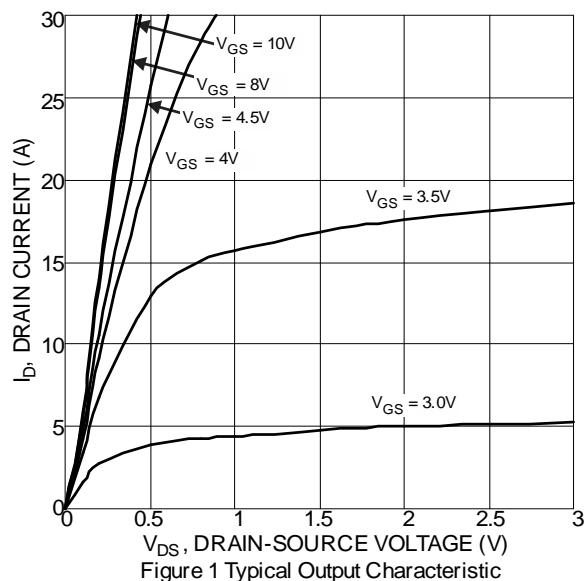


Figure 1 Typical Output Characteristic

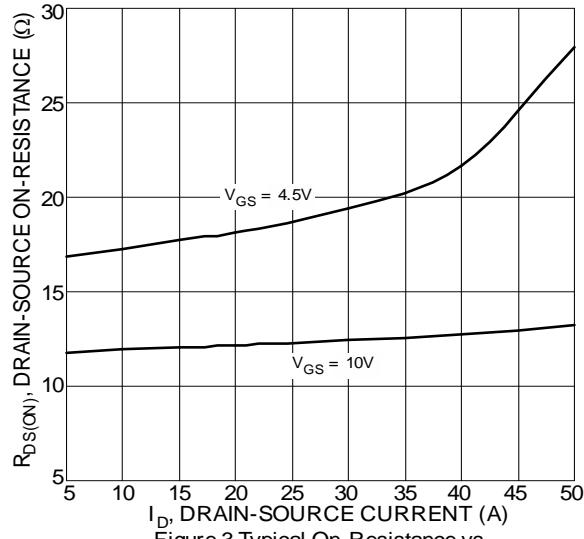


Figure 3 Typical On-Resistance vs.
Drain Current and Gate Voltage

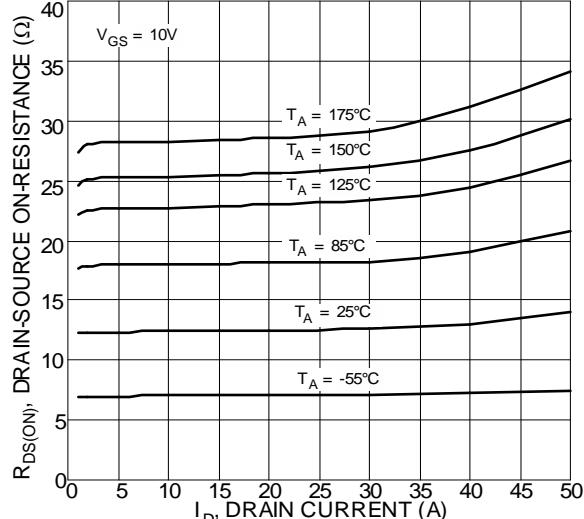


Figure 5 Typical On-Resistance vs.
Drain Current and Temperature

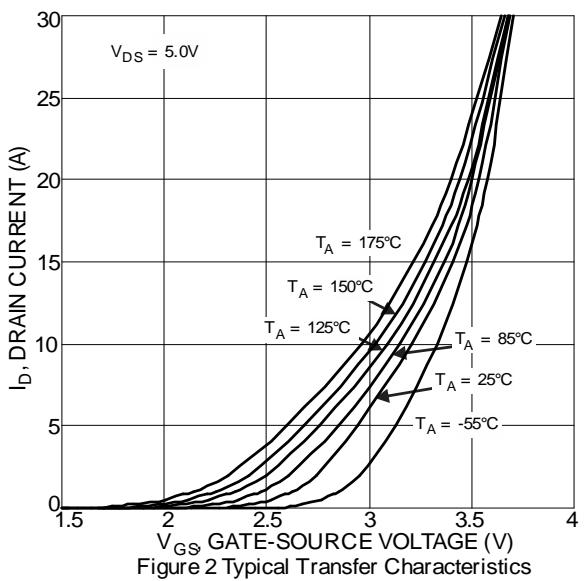


Figure 2 Typical Transfer Characteristics

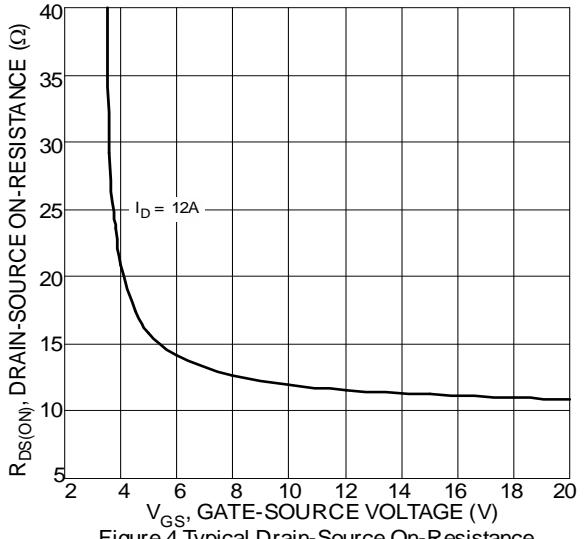


Figure 4 Typical Drain-Source On-Resistance
vs. Gate-Source Voltage

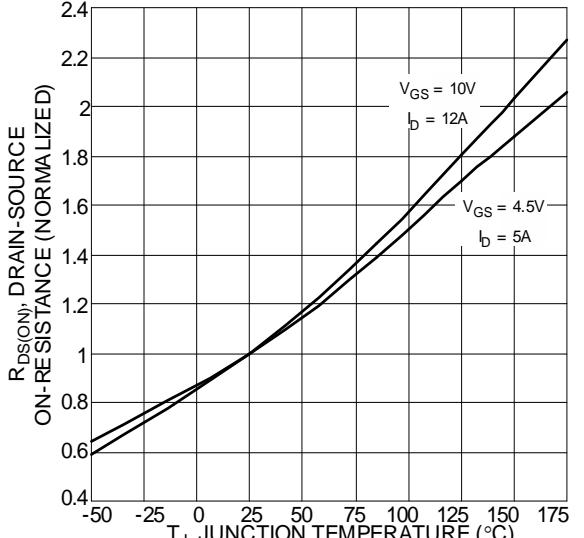


Figure 6 On-Resistance Variation with Temperature

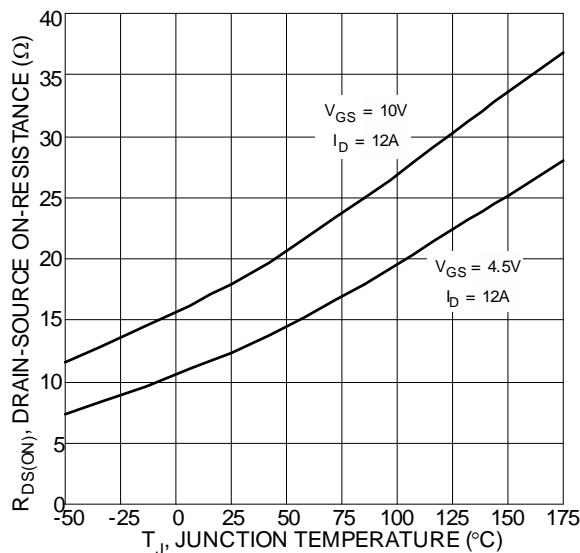


Figure 7 On-Resistance Variation with Temperature

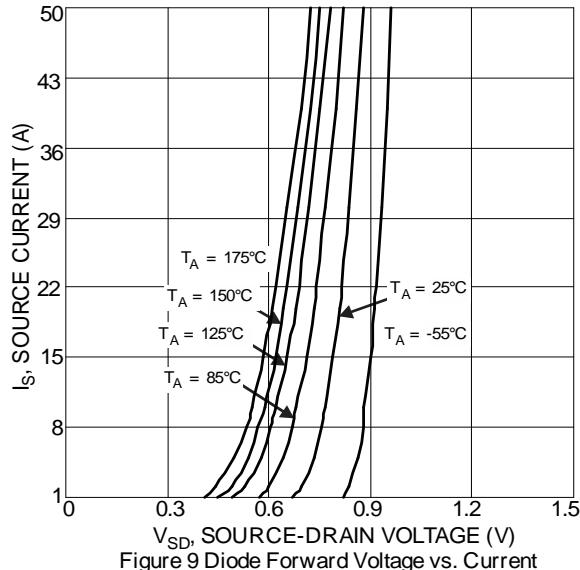


Figure 9 Diode Forward Voltage vs. Current

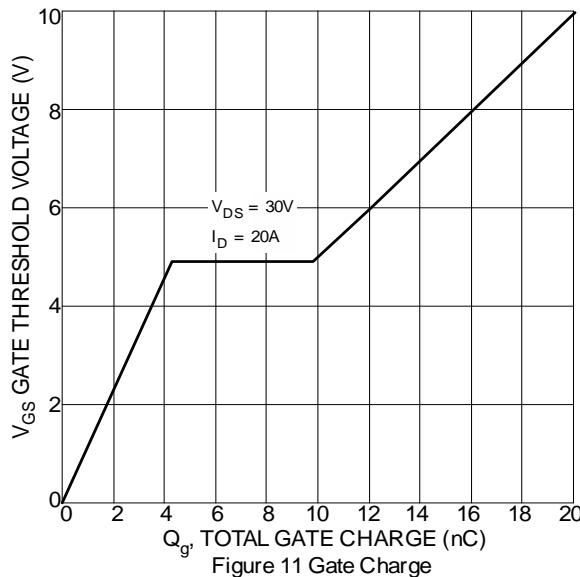


Figure 11 Gate Charge

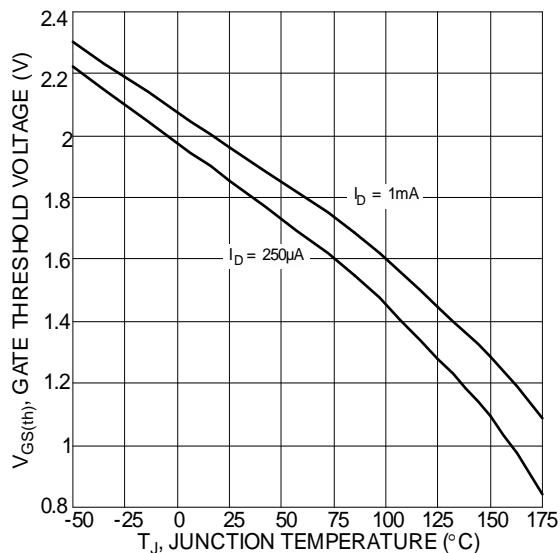


Figure 8 Gate Threshold Variation vs. Ambient Temperature

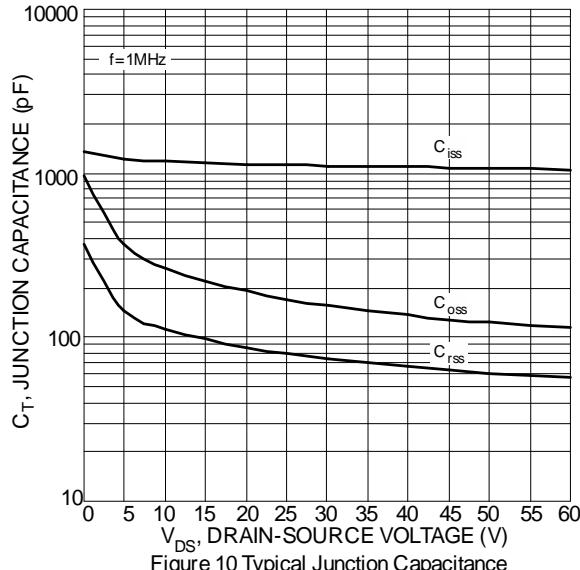


Figure 10 Typical Junction Capacitance

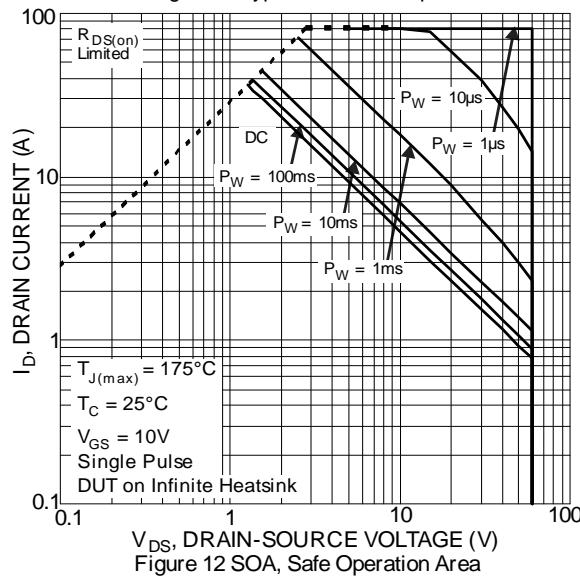


Figure 12 SOA, Safe Operation Area

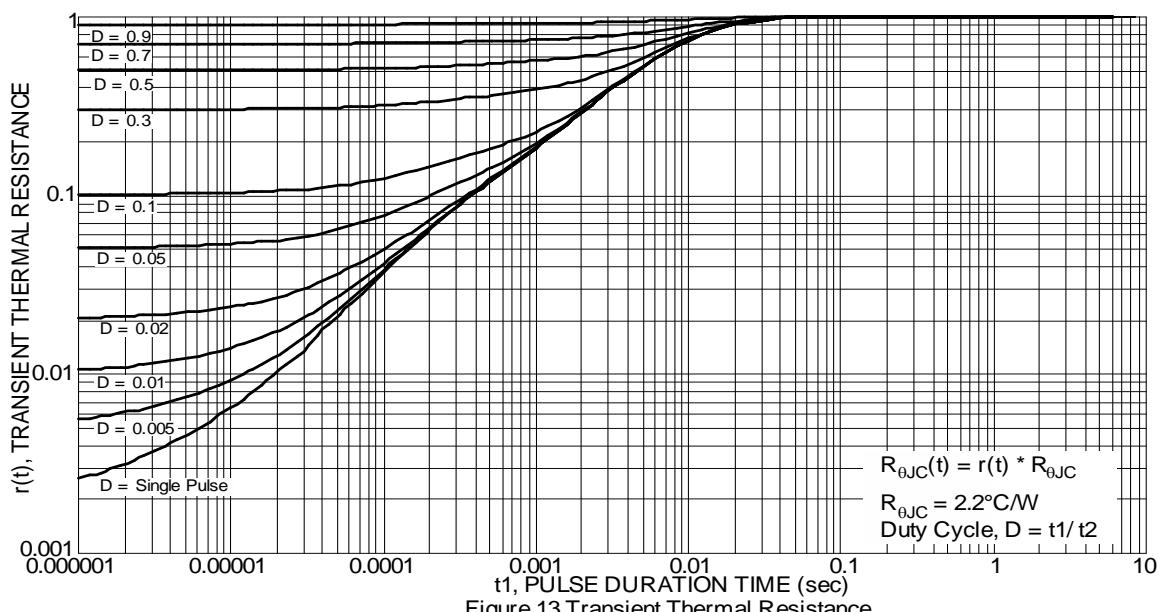


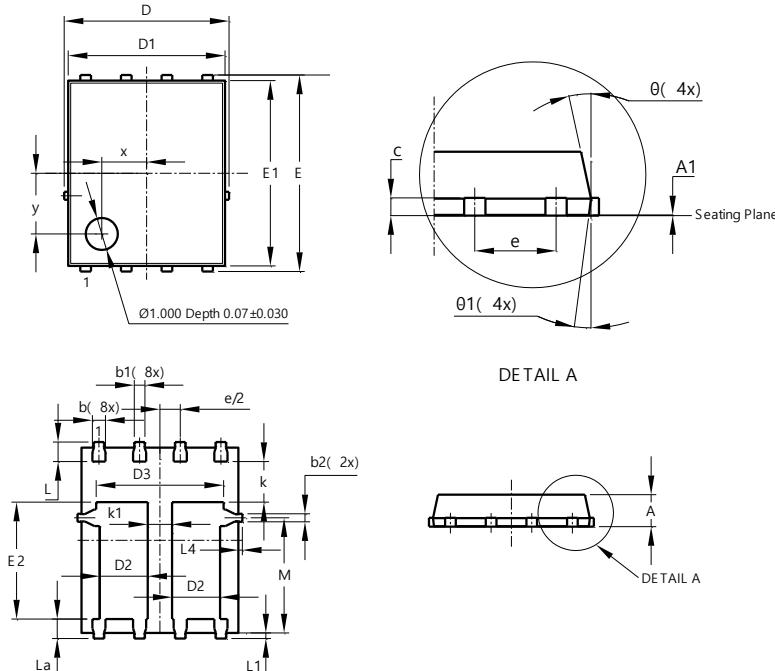
Figure 13 Transient Thermal Resistance

Package Outline Dimensions

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

Site 1:

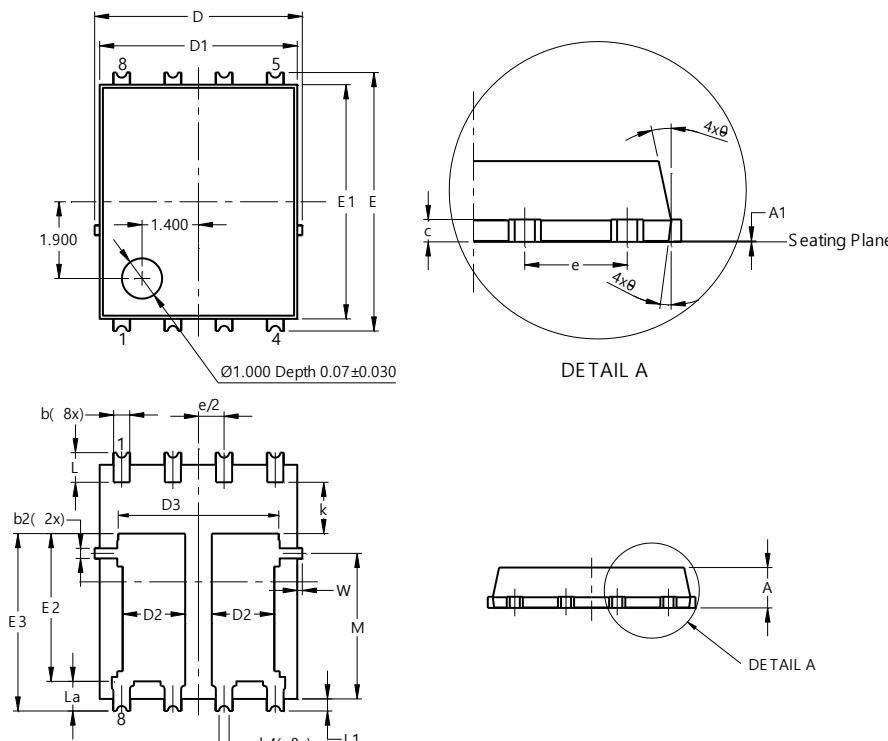
PowerDI5060-8 (Type C)



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			

Site 2:

PowerDI5060-8/SWP (Type UXD)



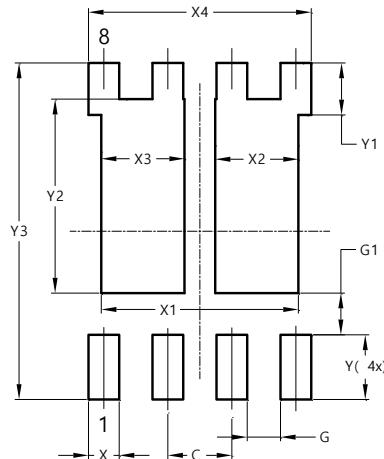
PowerDI5060-8/SWP (Type UXD)			
Dim	Min	Max	Typ
A	0.90	1.10	1.00
A1	0.00	0.05	--
b	0.30	0.50	0.41
b2	0.20	0.35	0.25
b4	0.25REF		
c	0.230	0.330	0.277
D	5.15 BSC		
D1	4.70	5.10	4.90
D2	1.46	1.66	1.55
D3	3.78	4.18	3.98
E	6.40 BSC		
E1	5.60	6.00	5.80
E2	3.46	3.86	3.66
E2a	4.195	4.595	4.395
e	1.27BSC		
k	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:

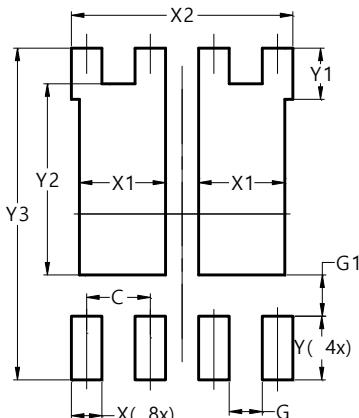
PowerDI5060-8 (Type C)



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

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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