

Product Summary

BV _{DSS}	R _{DS(ON)} Max	I _D T _C = +25°C
-40V	13mΩ @ V _{GS} = -10V	-80A
	23mΩ @ V _{GS} = -4.5V	-60A

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:

- Reverse-polarity protection
- BLDC motor controls
- Power-management functions

Features and Benefits

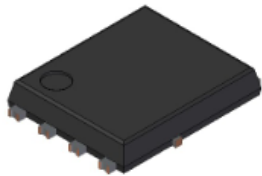
- 100% Unclamped Inductive Switch (UIS) Test in Production
- Wettable Flank for Improved Optical Inspections
- Low On-Resistance
- Fast Switching Speed
- Lead-Free Finish; RoHS Compliant (Notes 1 & 2)**
- Halogen and Antimony Free. "Green" Device (Note 3)**
- The DMP4012SPSWQ is suitable for automotive 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/>

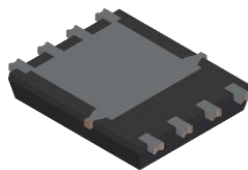
Mechanical Data

- 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
- Terminals: Finish – 100% Matte Tin Annealed over Copper Leadframe. Solderable per MIL-STD-202, Method 208 (E3)
- Weight: 0.097 grams (Approximate)

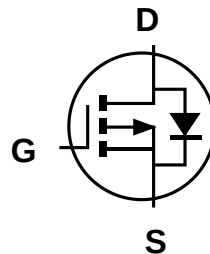
PowerDI5060-8/SWP (Type UX)



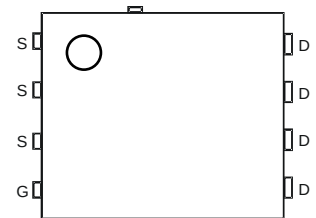
Top View



Bottom View



Internal Schematic



Top View
Pin Configuration

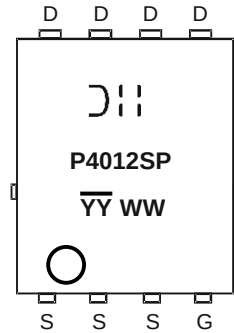
Ordering Information (Note 4)

Orderable Part Number	Package	Packing	
		Qty.	Carrier
DMP4012SPSWQ-13	PowerDI5060-8/SWP (Type UX)	2,500	Reel

- Notes:
- EU Directive 2002/95/EC (RoHS), 2011/65/EU (RoHS 2) & 2015/863/EU (RoHS 3) compliant. All applicable RoHS exemptions applied.
 - 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.
 - Halogen- and Antimony-free "Green" products are defined as those which contain <900ppm bromine, <900ppm chlorine (<1500ppm total Br + Cl) and <1000ppm antimony compounds.
 - For packaging details, go to our website at <https://www.diodes.com/design/support/packaging/diodes-packaging/>.

PowerDI is a registered trademark of Diodes Incorporated in the United States and other countries.

Marking Information



DII = Manufacturer's Marking
 P4012SP = Product Type Marking Code
 YYWW or YYWW = Date Code Marking
 YY or YY = Year (ex: 25 = 2025)
 WW = Week (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, V _{GS} = -10V (Note 6)	Steady State	T _C = +25°C T _C = +70°C	I _D	-80 -60	A
Pulsed Drain Current (10µs Pulse, Duty Cycle = 1%)			I _{DM}	-320	A
Maximum Body Diode Continuous Current (Note 6)			I _S	-80	A
Pulsed Source Current (10µs Pulse, Duty Cycle = 1%)			I _{SM}	-320	A
Avalanche Current, L = 1mH			I _{AS}	-14.7	A
Avalanche Energy, L = 1mH			E _{AS}	108	mJ

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

Characteristic		Symbol	Value	Unit
Total Power Dissipation (Note 5)	T _A = +25°C	P _D	3.3	W
Thermal Resistance, Junction to Ambient (Note 5)	Steady State	R _{θJA}	45	°C/W
Total Power Dissipation (Note 6)	T _C = +25°C	P _D	139	W
Thermal Resistance, Junction to Case (Note 6)		R _{θJC}	0.9	°C/W
Operating and Storage Temperature Range		T _J , T _{STG}	-55 to +150	°C

Notes: 5. Device mounted on FR-4 substrate PC board, 2oz copper, with thermal bias to bottom layer 1inch square copper plate.
 6. Thermal resistance from junction to soldering point (on the exposed drain pad).

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

Characteristic	Symbol	Min	Typ	Max	Unit	Test Condition
OFF CHARACTERISTICS (Note 7)						
Drain-Source Breakdown Voltage	BV _{DSS}	-40	—	—	V	V _{GS} = 0, I _D = -250μA
Zero Gate Voltage Drain Current	I _{DSS}	—	—	-1	μA	V _{DS} = -40V, V _{GS} = 0
Gate-Source Leakage	I _{GSS}	—	—	±100	nA	V _{GS} = ±20V, V _{DS} = 0
ON CHARACTERISTICS (Note 7)						
Gate Threshold Voltage	V _{GS(TH)}	-1	—	-3	V	V _{DS} = V _{GS} , I _D = -250μA
Static Drain-Source On-Resistance	R _{DS(ON)}	—	9.8	13	mΩ	V _{GS} = -10V, I _D = -10A
		—	14.1	23		V _{GS} = -4.5V, I _D = -8A
Diode Forward Voltage	V _{SD}	—	-0.7	-1.2	V	V _{GS} = 0, I _S = -1A
DYNAMIC CHARACTERISTICS (Note 8)						
Input Capacitance	C _{iss}	—	3643	—	pF	V _{DS} = -20V, V _{GS} = 0, f = 1MHz
Output Capacitance	C _{oss}	—	306	—		
Reverse Transfer Capacitance	C _{rss}	—	259	—		
Gate Resistance	R _g	—	2.4	—	Ω	V _{DS} = 0, V _{GS} = 0, f = 1MHz
Total Gate Charge (V _{GS} = -4.5V)	Q _g	—	33.4	—	nC	V _{DS} = -20V, I _D = -10A
Total Gate Charge (V _{GS} = -10V)	Q _g	—	68.6	—		
Gate-Source Charge	Q _{gs}	—	12.7	—		
Gate-Drain Charge	Q _{gd}	—	11.1	—		
Turn-On Delay Time	t _{D(ON)}	—	5.5	—	ns	V _{GS} = -10V, V _{DD} = -20V, R _G = 3Ω, I _D = -10A
Turn-On Rise Time	t _R	—	22	—		
Turn-Off Delay Time	t _{D(OFF)}	—	76.5	—		
Turn-Off Fall Time	t _F	—	42	—		
Reverse-Recovery Time	t _{RR}	—	52.5	—	ns	I _F = -10A, di/dt = -100A/μs
Reverse-Recovery Charge	Q _{RR}	—	39	—	nC	I _F = -10A, di/dt = -100A/μs

Notes: 7. Short duration pulse test used to minimize self-heating effect.
8. Guaranteed by design. Not subject to product testing.

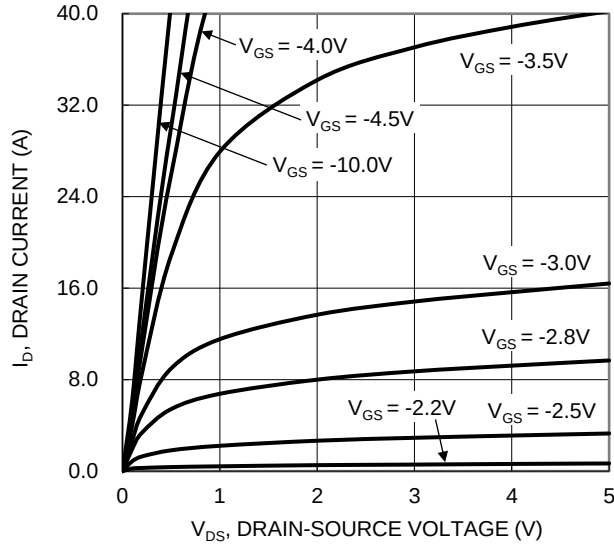


Figure 1. Typical Output Characteristic

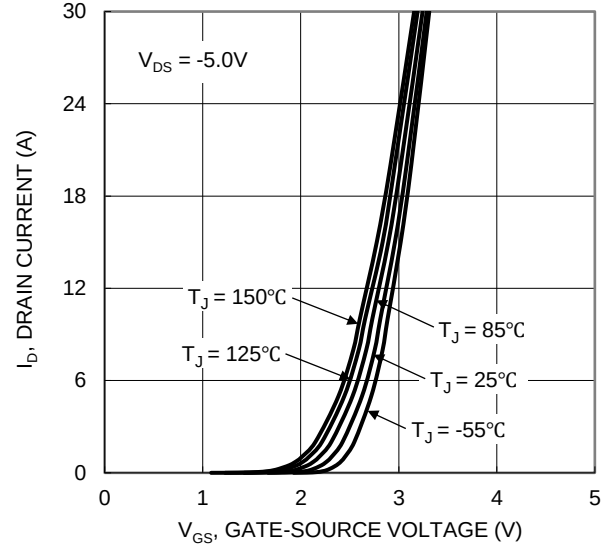


Figure 2. Typical Transfer Characteristic

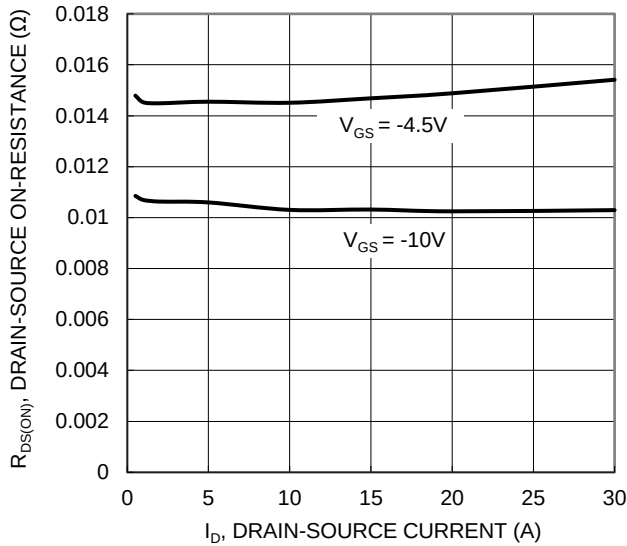


Figure 3. Typical On-Resistance vs. Drain Current and Gate Voltage

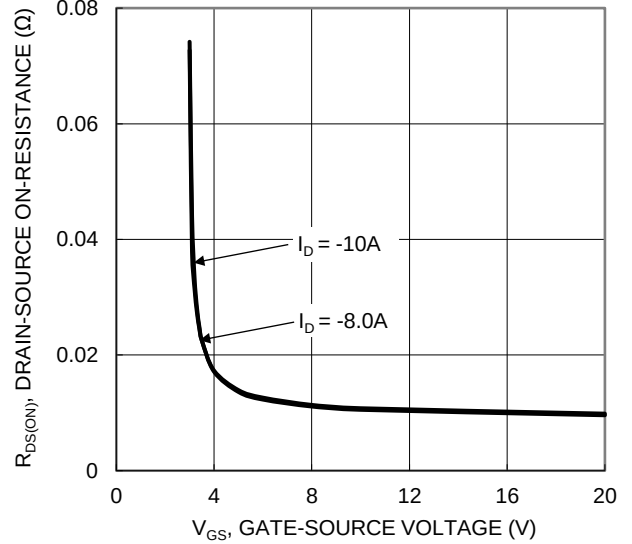


Figure 4. Typical Transfer Characteristic

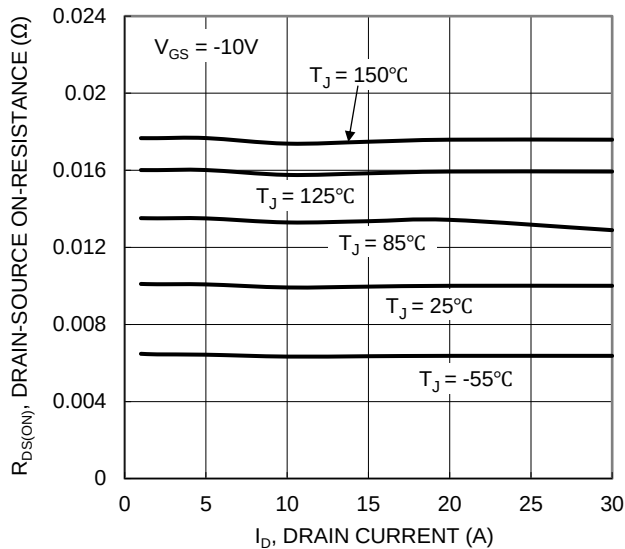


Figure 5. Typical On-Resistance vs. Drain Current and Junction Temperature

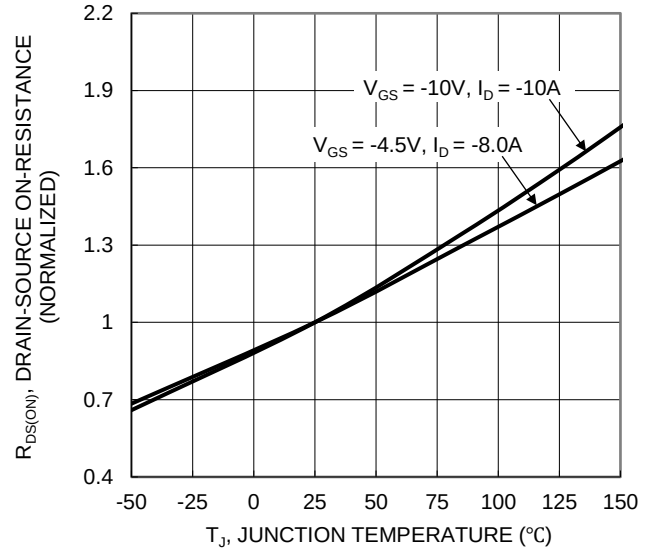


Figure 6. On-Resistance Variation with Junction Temperature

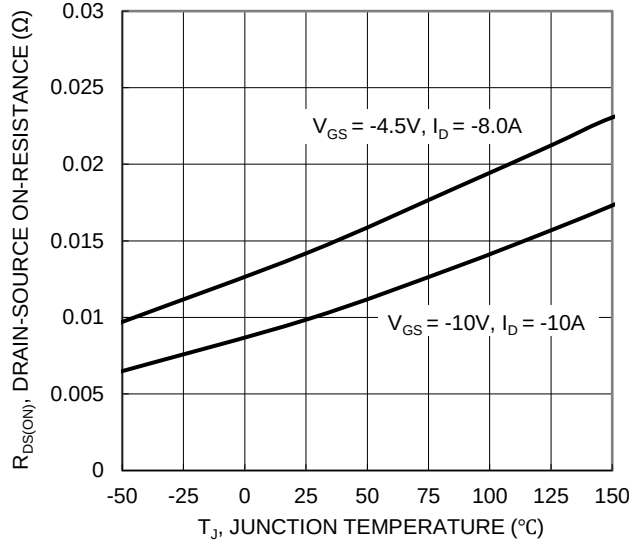


Figure 7. On-Resistance Variation with Junction Temperature

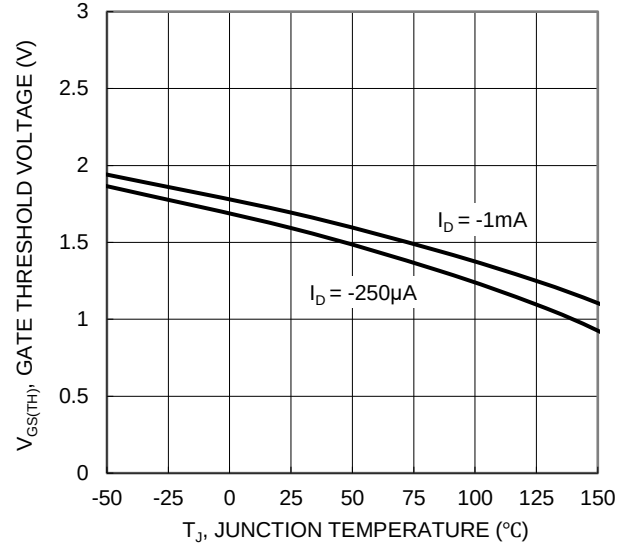


Figure 8. Gate Threshold Variation vs. Junction Temperature

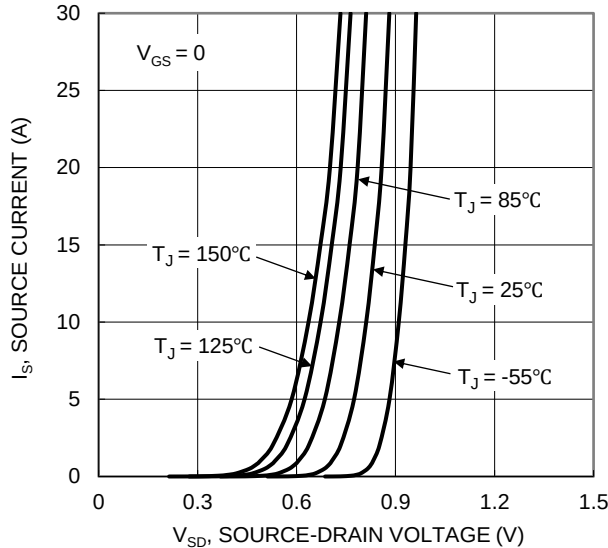


Figure 9. Diode Forward Voltage vs. Current

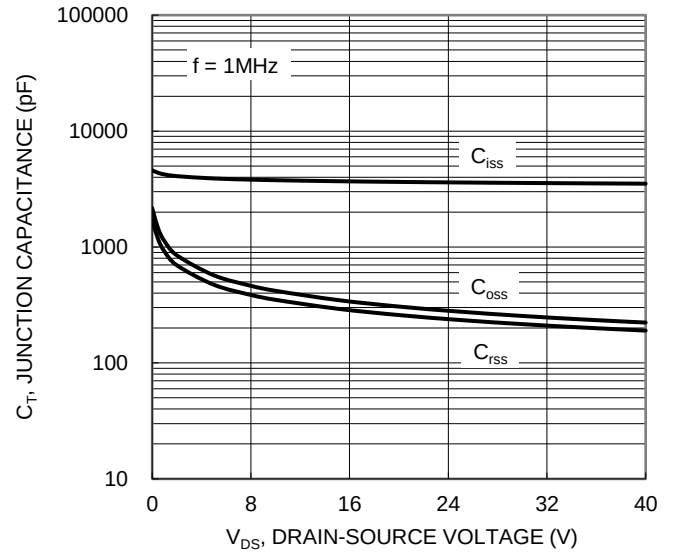


Figure 10. Typical Junction Capacitance

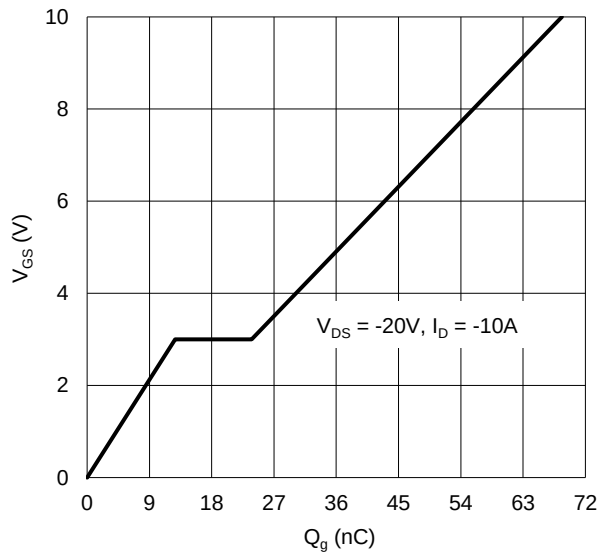


Figure 11. Gate Charge

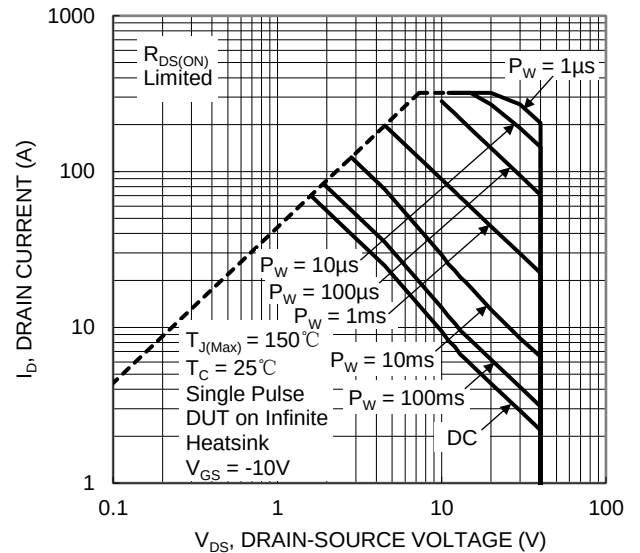


Figure 12. SOA, Safe Operation Area

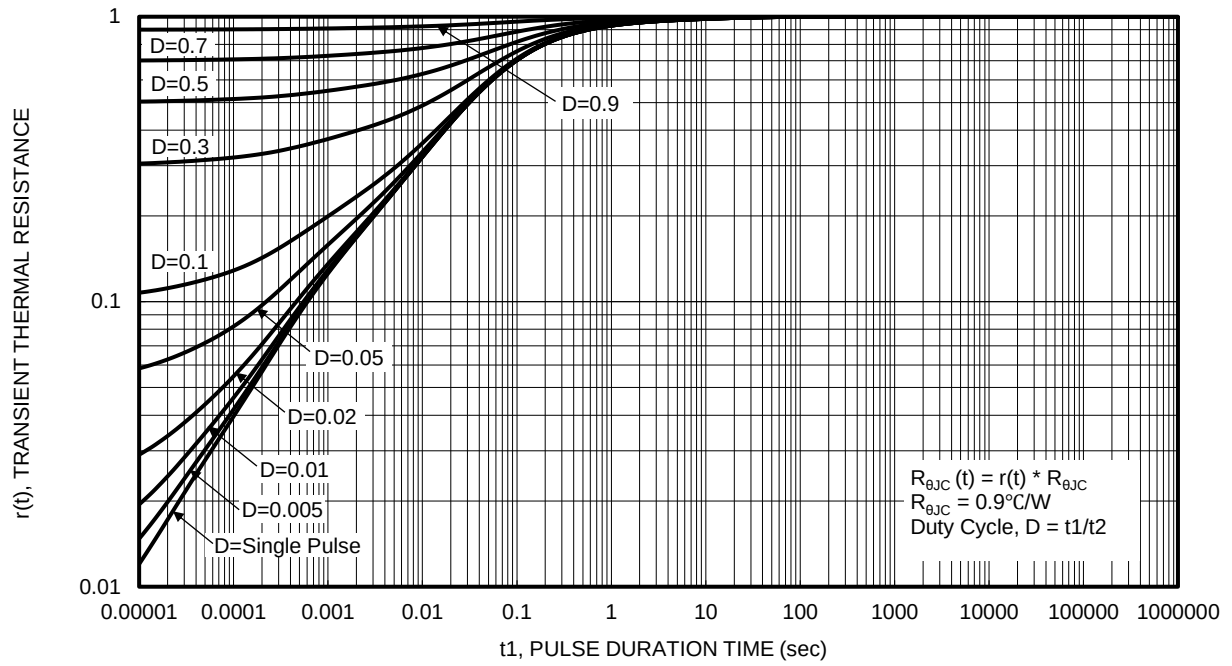
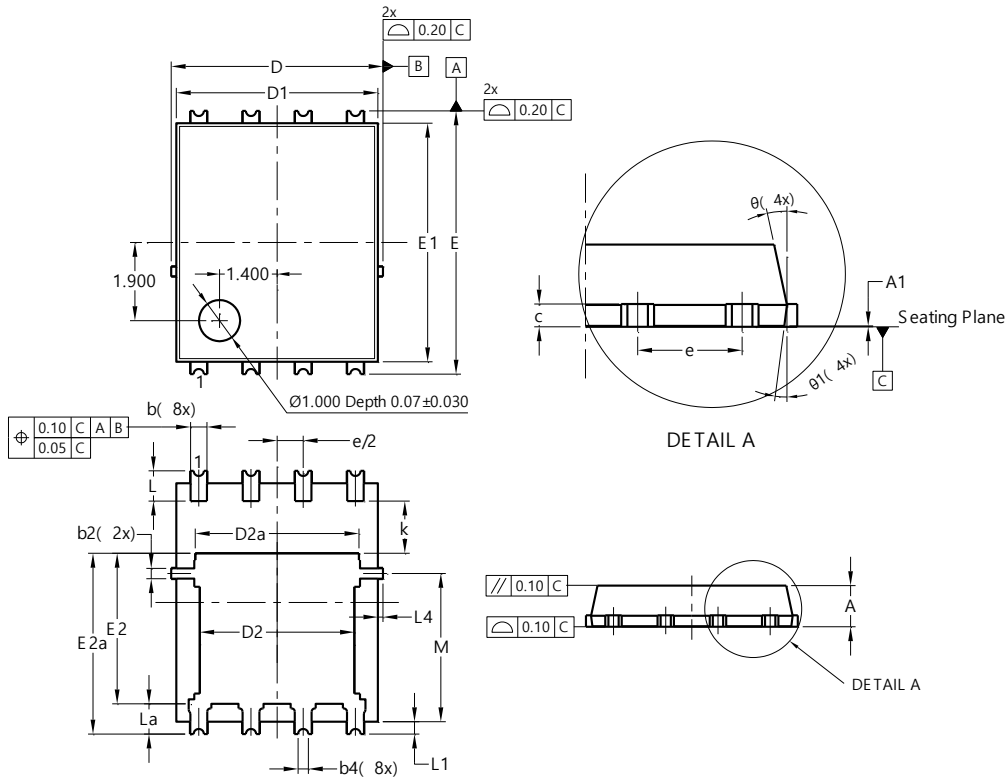


Figure 13. Transient Thermal Resistance

Package Outline Dimensions

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

PowerDI5060-8/SWP (Type UX)

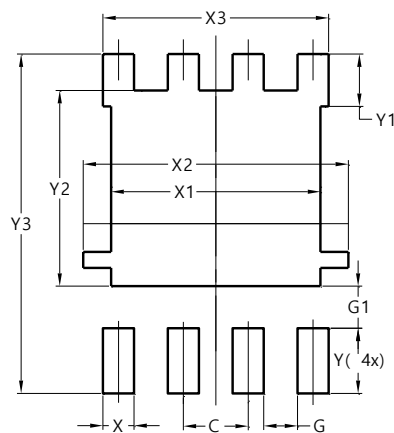


PowerDI5060-8/SWP (Type UX)			
Dim	Min	Max	Typ
A	0.90	1.10	1.00
A1	0	0.05	--
b	0.30	0.50	0.41
b2	0.20	0.35	0.25
b4	0.25REF		
c	0.230	0.330	0.277
D	5.15 BSC		
D1	4.70	5.10	4.90
D2	3.56	3.96	3.76
D2a	3.78	4.18	3.98
E	6.40 BSC		
E1	5.60	6.00	5.80
E2	3.46	3.86	3.66
E2a	4.195	4.595	4.395
e	1.27BSC		
k	1.05	--	--
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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