

## Product Summary

BV <sub>DSS</sub>	R <sub>DS(ON)</sub>	I <sub>D</sub> T <sub>C</sub> = +25°C
80V	17mΩ @ V <sub>GS</sub> = 10V	53.7A
	23.5mΩ @ V <sub>GS</sub> = 4.5V	44.3A

## Description and Applications

This MOSFET is designed to minimize the on-state resistance (R<sub>DS(ON)</sub>) yet maintain superior switching performance, making it ideal for high-efficiency power-management applications.

- Synchronous rectifiers
- Backlighting
- Power-management functions
- DC-DC converters

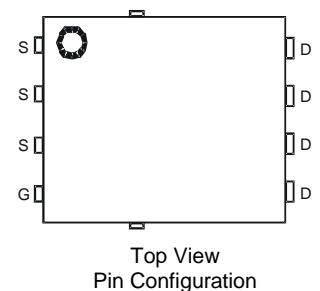
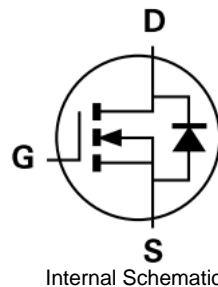
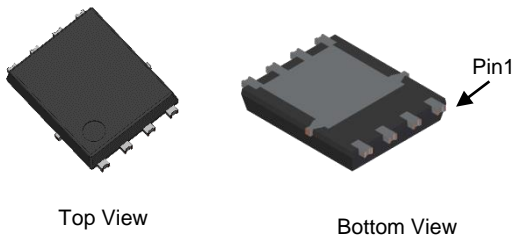
## Features

- 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<sub>DS(ON)</sub> – Minimizes On State Losses
- Low Input Capacitance
- Fast Switching Speed
- Additional Tin-Plated on Sidewall Pads for Optical Solder Inspection
- **Lead-Free Finish; RoHS Compliant (Notes 1 & 2)**
- **Halogen and Antimony Free. “Green” Device (Note 3)**
- **For automotive applications requiring specific change control (i.e.: parts qualified to AEC-Q100/101/104/200, PPAP capable, and manufactured in IATF 16949 certified facilities), please refer to the related automotive grade (Q-suffix) part. A listing can be found at <https://www.diodes.com/products/automotive/automotive-products/>.**
- **This part is qualified to JEDEC standards (as references in AEC-Q) for High Reliability. <https://www.diodes.com/quality/product-definitions/>**

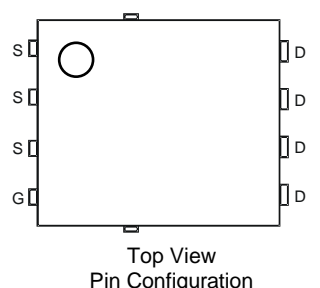
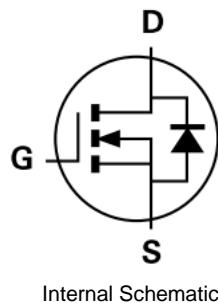
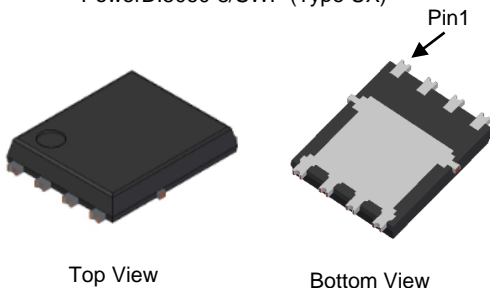
## Mechanical Data

- Package: PowerDI<sup>®</sup>5060-8
- Package Material: Molded Plastic, “Green” Molding Compound. UL Flammability Classification Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminal Finish – Matte Tin Annealed over Copper Leadframe; Solderable per MIL-STD-202, Method 208 @3
- Weight: 0.097 grams (Approximate)

PowerDI5060-8 (SWP) (Type Q)



PowerDI5060-8/SWP (Type UX)

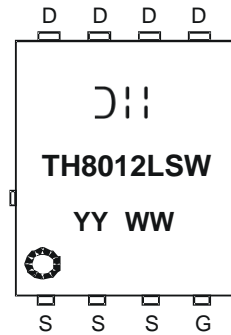


- Notes:
1. EU Directive 2002/95/EC (RoHS), 2011/65/EU (RoHS 2) & 2015/863/EU (RoHS 3) compliant. All applicable RoHS exemptions applied.
  2. See <https://www.diodes.com/quality/lead-free/> for more information about Diodes Incorporated's definitions of Halogen- and Antimony-free, "Green" and Lead-free.
  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.

**Ordering Information** (Note 4)

Orderable Part Number	Package	Packing	
		Qty.	Carrier
DMTH8012LPSW-13	PowerDI5060-8 (SWP) (Type Q)	2,500	Tape & Reel
DMTH8012LPSW-13	PowerDI5060-8/SWP (Type UX)	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**


= Manufacturer's Marking  
 TH8012LSW = Product Type Marking Code  
 YYWW or YYWW = Date Code Marking  
 YY or 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	$V_{DS}$	80	V	
Gate-Source Voltage	$V_{GS}$	$\pm 20$	V	
Continuous Drain Current, $V_{GS} = 10\text{V}$ (Note 5)	$I_D$	$T_A = +25^\circ\text{C}$ $T_A = +100^\circ\text{C}$	10.3 7.3	A
Continuous Drain Current, $V_{GS} = 10\text{V}$ (Note 6)		$T_C = +25^\circ\text{C}$ $T_C = +100^\circ\text{C}$	53.7 38	A
Pulsed Drain Current (10 $\mu\text{s}$ Pulse, Duty Cycle = 1%)	$I_{DM}$	80	A	
Maximum Continuous Body Diode Forward Current (Note 6)	$I_S$	69	A	
Pulsed Body Diode Forward Current (10 $\mu\text{s}$ Pulse, Duty Cycle = 1%)	$I_{SM}$	80	A	
Avalanche Current, $L = 0.1\text{mH}$	$I_{AS}$	11.6	A	
Avalanche Energy, $L = 0.1\text{mH}$	$E_{AS}$	6.7	mJ	

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).

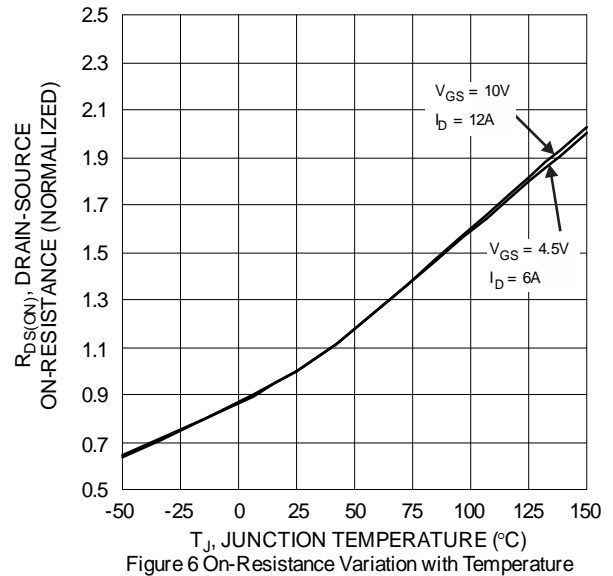
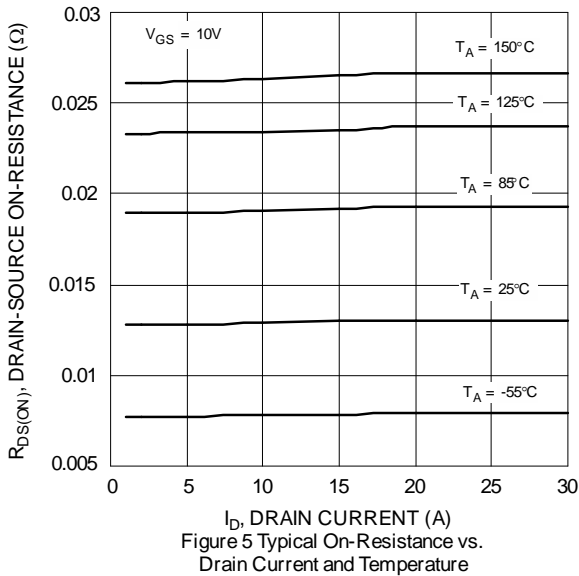
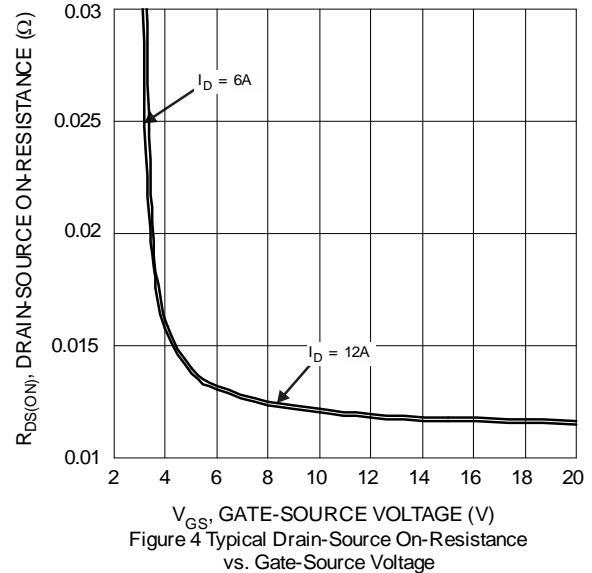
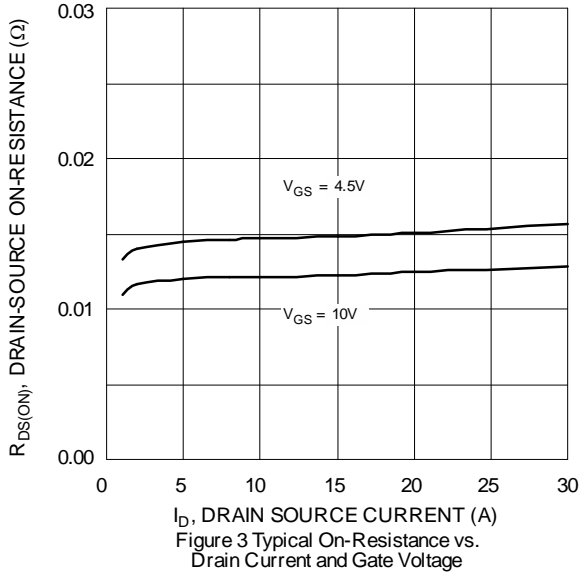
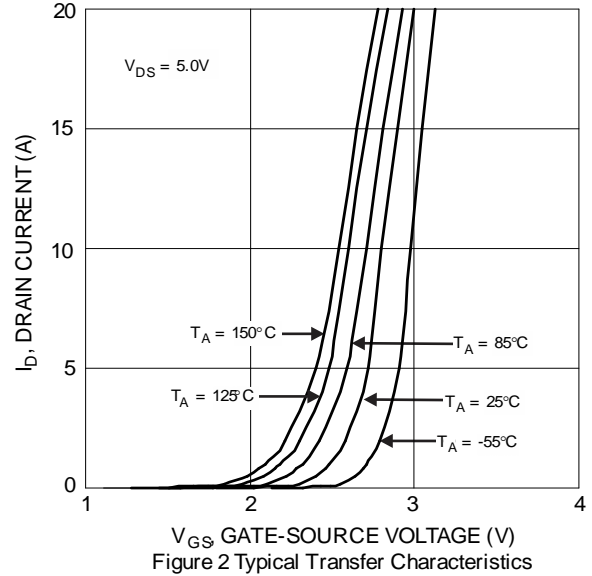
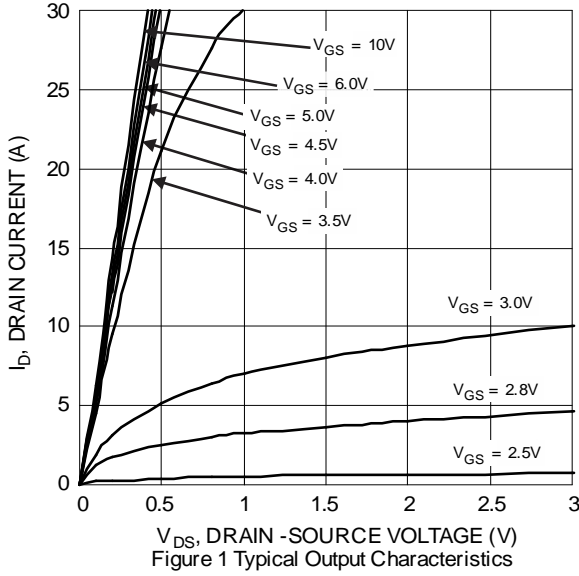
## Thermal Characteristics

Characteristic	Symbol	Value	Unit
Total Power Dissipation (Note 5)	$T_A = +25^\circ\text{C}$ $P_D$	3.1	W
Thermal Resistance, Junction to Ambient (Note 5)	$R_{\theta JA}$	49	$^\circ\text{C/W}$
Total Power Dissipation (Note 6)	$T_C = +25^\circ\text{C}$ $P_D$	83.3	W
Thermal Resistance, Junction to Case (Note 6)	$R_{\theta JC}$	1.8	$^\circ\text{C/W}$
Operating and Storage Temperature Range	$T_J, T_{STG}$	-55 to +175	$^\circ\text{C}$

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

Characteristic	Symbol	Min	Typ	Max	Unit	Test Condition
<b>OFF CHARACTERISTICS (Note 7)</b>						
Drain-Source Breakdown Voltage	$BV_{DSS}$	80	—	—	V	$V_{GS} = 0V, I_D = 1mA$
Zero Gate Voltage Drain Current	$I_{DSS}$	—	—	1	$\mu\text{A}$	$V_{DS} = 64V, V_{GS} = 0V$
Gate-Source Leakage	$I_{GSS}$	—	—	$\pm 100$	nA	$V_{GS} = \pm 20V, V_{DS} = 0V$
<b>ON CHARACTERISTICS (Note 7)</b>						
Gate Threshold Voltage	$V_{GS(TH)}$	1	—	3	V	$V_{DS} = V_{GS}, I_D = 250\mu\text{A}$
Static Drain-Source On-Resistance	$R_{DS(ON)}$	—	14	17	m $\Omega$	$V_{GS} = 10V, I_D = 12A$
		—	16.5	23.5		$V_{GS} = 4.5V, I_D = 6A$
Diode Forward Voltage	$V_{SD}$	—	0.9	1.2	V	$V_{GS} = 0V, I_S = 20A$
<b>DYNAMIC CHARACTERISTICS (Note 8)</b>						
Input Capacitance	$C_{iss}$	—	1949	—	pF	$V_{DS} = 40V, V_{GS} = 0V,$ $f = 1MHz$
Output Capacitance	$C_{oss}$	—	177	—		
Reverse Transfer Capacitance	$C_{rss}$	—	10	—		
Gate Resistance	$R_g$	—	0.7	—	$\Omega$	$V_{DS} = 0V, V_{GS} = 0V, f = 1MHz$
Total Gate Charge ( $V_{GS} = 4.5V$ )	$Q_g$	—	15	—	nC	$V_{DS} = 40V, I_D = 12A$
Total Gate Charge ( $V_{GS} = 10V$ )	$Q_g$	—	34	—		
Gate-Source Charge	$Q_{gs}$	—	6	—		
Gate-Drain Charge	$Q_{gd}$	—	4.5	—		
Turn-On Delay Time	$t_{D(ON)}$	—	4.9	—	ns	$V_{DD} = 40V, V_{GS} = 10V,$ $I_D = 12A, R_g = 1.6\Omega$
Turn-On Rise Time	$t_r$	—	3.8	—		
Turn-Off Delay Time	$t_{D(OFF)}$	—	16.5	—		
Turn-Off Fall Time	$t_f$	—	3.5	—		
Body Diode Reverse Recovery Time	$t_{RR}$	—	30.2	—	ns	$I_F = 12A, di/dt = 100A/\mu\text{s}$
Body Diode Reverse Recovery Charge	$Q_{RR}$	—	34.6	—	nC	

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



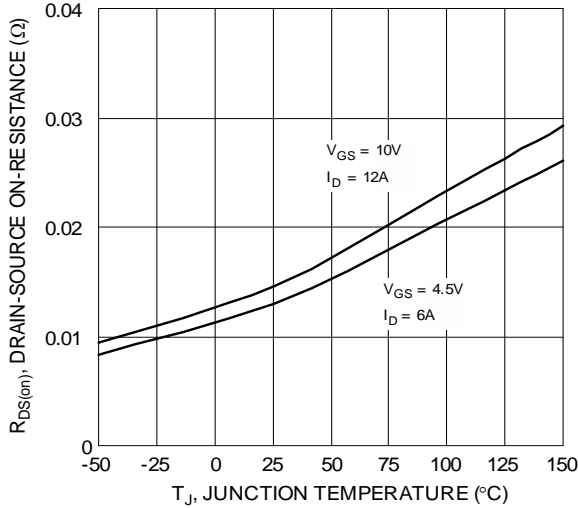


Figure 7 On-Resistance Variation with Temperature

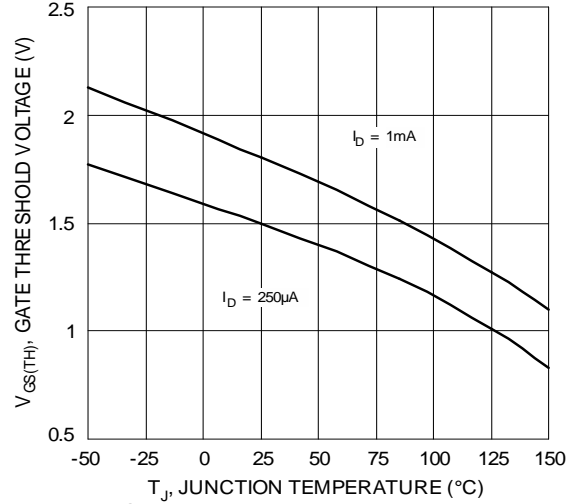


Figure 8 Gate Threshold Variation vs. Junction Temperature

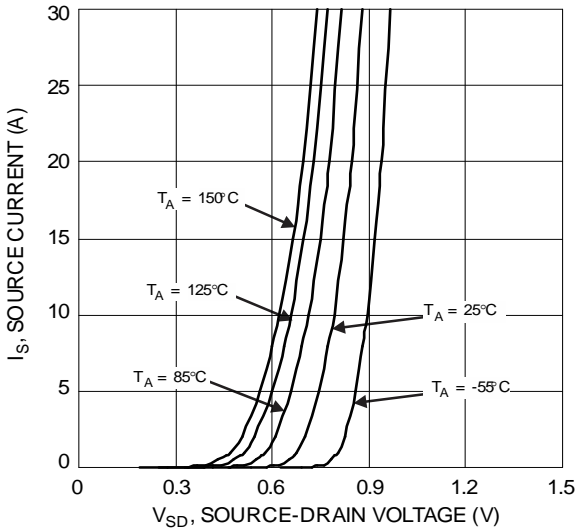


Figure 9 Diode Forward Voltage vs. Current

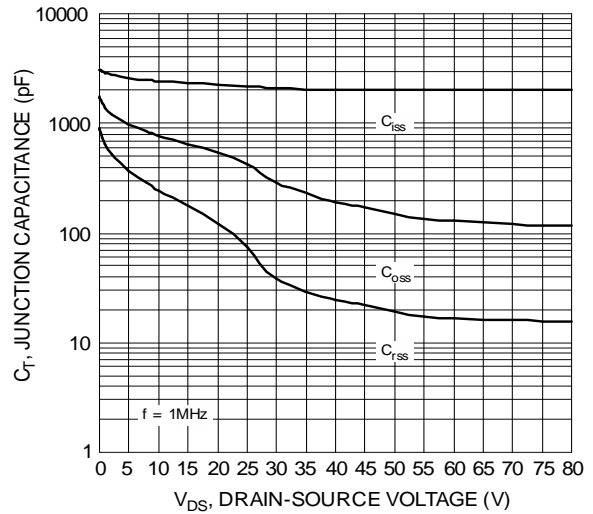


Figure 10 Typical Junction Capacitance

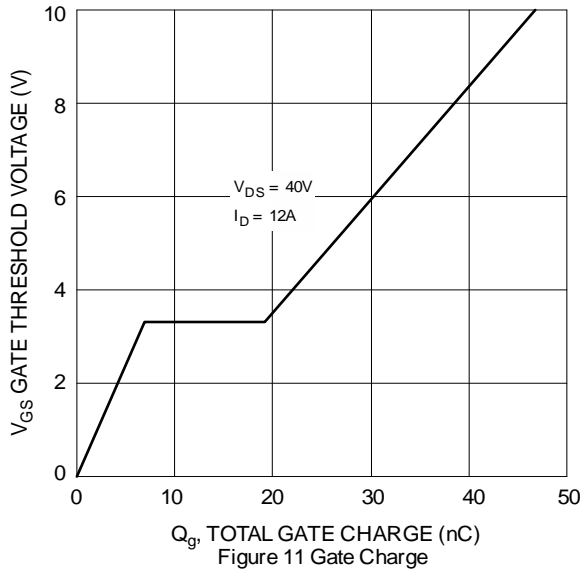


Figure 11 Gate Charge

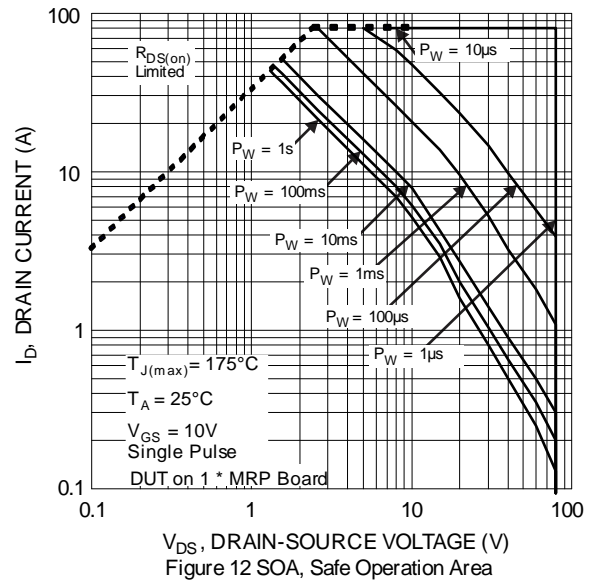


Figure 12 SOA, Safe Operation Area

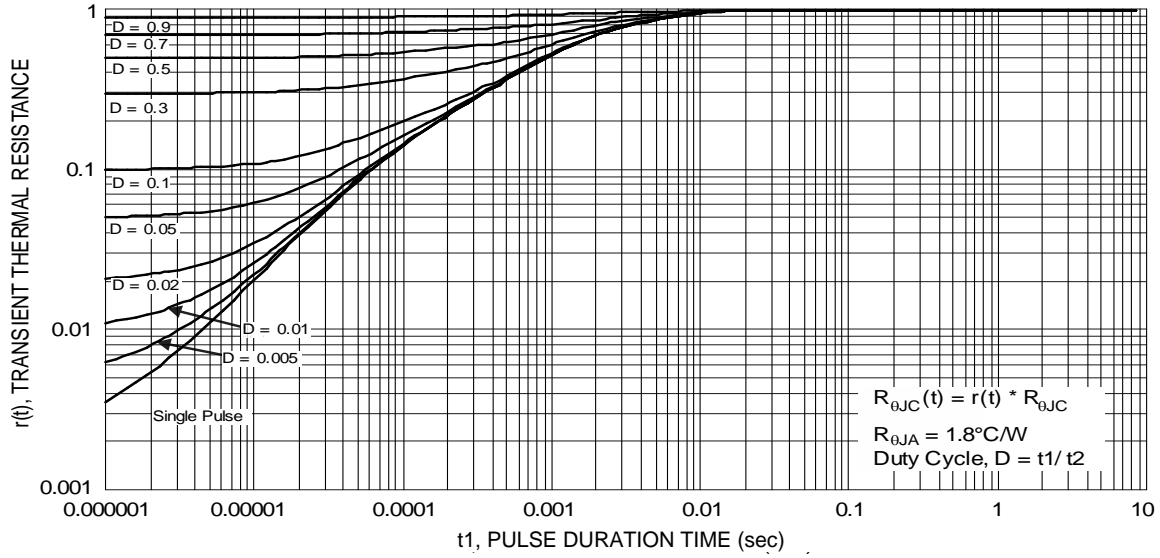
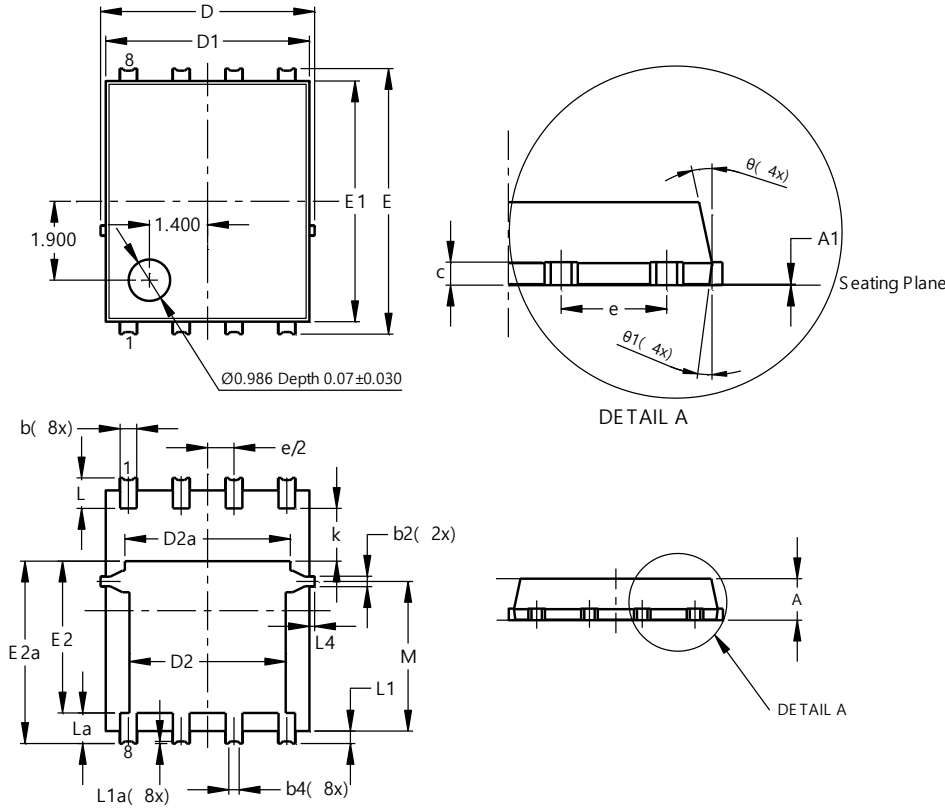


Figure 13 Transient Thermal Resistance

**Package Outline Dimensions**

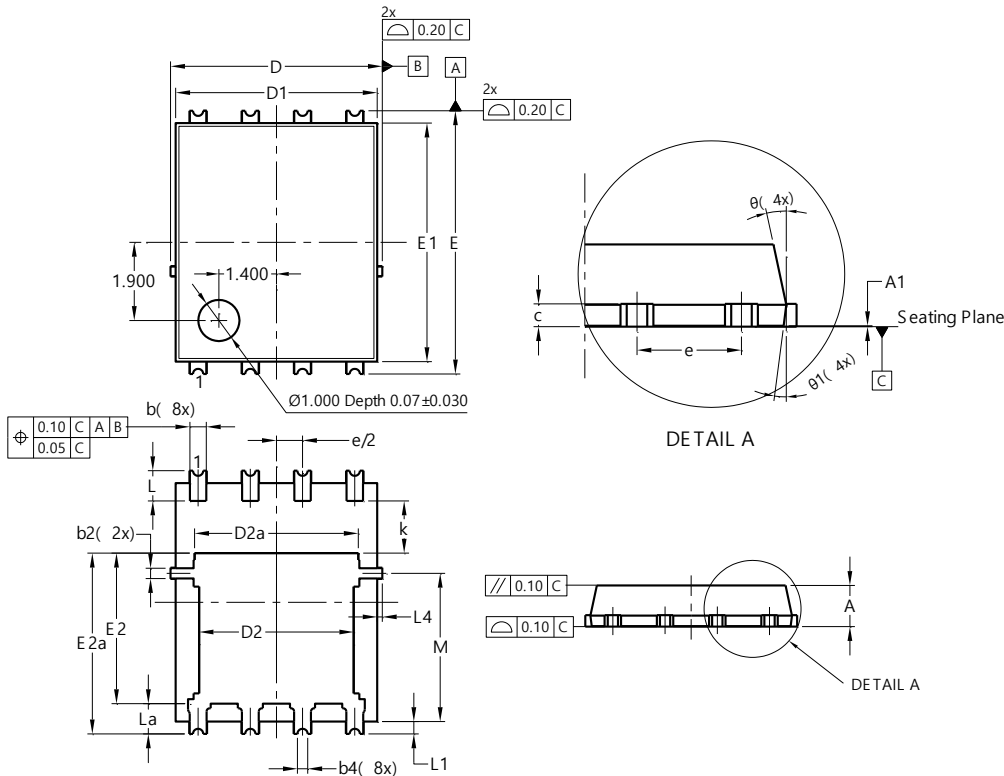
Please see <http://www.diodes.com/package-outlines.html> for the latest version.

**PowerDI5060-8 (SWP) (Type Q)**



PowerDI5060-8 (SWP) (Type Q)			
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
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			

**PowerDI5060-8/SWP (Type UX)**

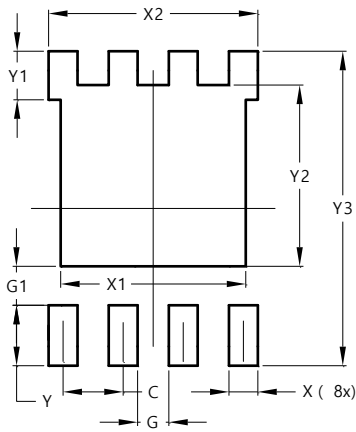


PowerDI5060-8/SWP (Type UX)			
Dim	Min	Max	Typ
A	0.90	1.10	1.00
A1	0	0.05	--
b	0.30	0.50	0.41
b2	0.20	0.35	0.25
b4	0.25REF		
c	0.230	0.330	0.277
D	5.15 BSC		
D1	4.70	5.10	4.90
D2	3.56	3.96	3.76
D2a	3.78	4.18	3.98
E	6.40 BSC		
E1	5.60	6.00	5.80
E2	3.46	3.86	3.66
E2a	4.195	4.595	4.395
e	1.27BSC		
k	1.05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

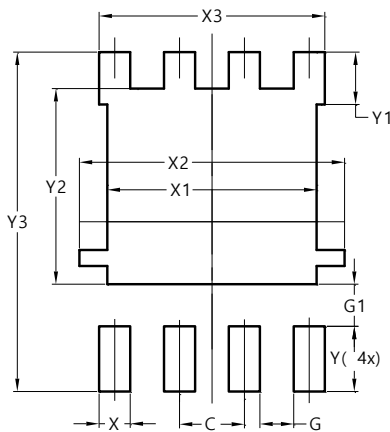
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### PowerDI5060-8 (SWP) (Type Q)



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

### PowerDI5060-8/SWP (Type UX)



Dimensions	Value (in mm)
<b>C</b>	1.270
<b>G</b>	0.660
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<b>X2</b>	5.190
<b>X3</b>	4.420
<b>Y</b>	1.270
<b>Y1</b>	1.020
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<b>Y3</b>	6.610



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