

## Product Summary

BV <sub>DSS</sub>	R <sub>DS(ON)</sub> Max	I <sub>D</sub> Max T <sub>C</sub> = +25°C
60V	50mΩ @ V <sub>GS</sub> = 10V	24A
	65mΩ @ V <sub>GS</sub> = 4.5V	21A

## 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<sub>DS(ON)</sub> – Minimizes Power Losses
- Low Q<sub>G</sub> – Minimizes Switching Losses
- **Totally Lead-Free & Fully RoHS Compliant (Notes 1 & 2)**
- **Halogen and Antimony Free. "Green" Device (Note 3)**
- **Qualified to AEC-Q101 Standards for High Reliability**
- **PPAP Capable (Note 4)**

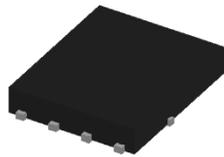
## Description and Applications

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:

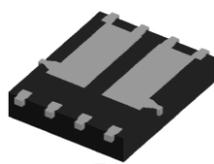
- Engine Management Systems
- Body Control Electronics
- DC-DC Converters

## Mechanical Data

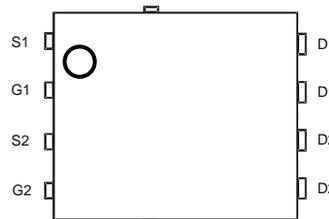
- Case: PowerDI<sup>®</sup>5060-8 (Type C)
- Case Material: Molded Plastic, "Green" Molding Compound. UL Flammability Classification Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminal Connections Indicator: See Diagram
- Terminals: Finish – Matte Tin Annealed over Copper Leadframe. Solderable per MIL-STD-202, Method 208 Ⓔ3
- Weight: 0.097 grams (Approximate)



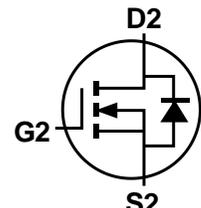
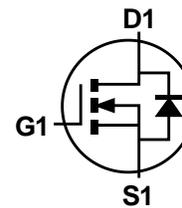
Top View



Bottom View



Pin Out  
Top View



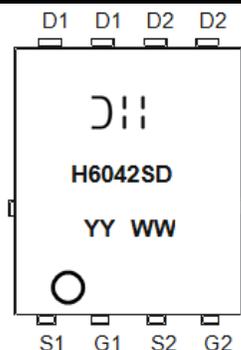
Equivalent Circuit

## Ordering Information (Note 5)

Part Number	Case	Packaging
DMNH6042SPDQ-13	PowerDI5060-8 (Type C)	2,500/Tape & Reel

- Notes:
1. No purposely added lead. Fully EU Directive 2002/95/EC (RoHS) & 2011/65/EU (RoHS 2) compliant.
  2. See [http://www.diodes.com/quality/lead\\_free.html](http://www.diodes.com/quality/lead_free.html) 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. Automotive products are AEC-Q101 qualified and are PPAP capable. Refer to [http://www.diodes.com/quality/product\\_compliance\\_definitions/](http://www.diodes.com/quality/product_compliance_definitions/).
  5. For packaging details, go to our website at <http://www.diodes.com/products/packages.html>.

## Marking Information



☺;| = Manufacturer's Marking  
 H6042SD = Product Type Marking Code  
 YYWW = Date Code Marking  
 YY = Year (ex: 16 = 2016)  
 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			$V_{GSS}$	$\pm 20$	V
Continuous Drain Current (Note 7) $V_{GS} = 10\text{V}$	Steady State	$T_A = +25^\circ\text{C}$	$I_D$	5.7	A
		$T_A = +70^\circ\text{C}$		4.6	
Continuous Drain Current (Note 8) $V_{GS} = 10\text{V}$	Steady State	$T_C = +25^\circ\text{C}$	$I_D$	24	A
		$T_C = +100^\circ\text{C}$		17	
Pulsed Drain Current (10 $\mu\text{s}$ Pulse, Duty Cycle = 1%)			$I_{DM}$	32	A
Maximum Continuous Body Diode Forward Current (Note 8)			$I_S$	24	A
Avalanche Current (Note 9) $L = 10\text{mH}$			$I_{AS}$	3.5	A
Avalanche Energy (Note 9) $L = 10\text{mH}$			$E_{AS}$	65	mJ

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

Characteristic			Symbol	Value	Unit
Total Power Dissipation (Note 6)			$P_D$	1.2	W
Thermal Resistance, Junction to Ambient (Note 6)	Steady State	$R_{\theta JA}$		105	$^\circ\text{C/W}$
	$t < 10\text{s}$			54	
Total Power Dissipation (Note 7)			$P_D$	2.5	W
Thermal Resistance, Junction to Ambient (Note 7)	Steady State	$R_{\theta JA}$		51	$^\circ\text{C/W}$
	$t < 10\text{s}$			26	
Thermal Resistance, Junction to Case (Note 8)			$R_{\theta JC}$	3.5	
Operating and Storage Temperature Range			$T_J, T_{STG}$	-55 to +175	$^\circ\text{C}$

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

**Electrical Characteristics** (@T<sub>A</sub> = +25°C, unless otherwise specified.)

Characteristic	Symbol	Min	Typ	Max	Unit	Test Condition
<b>OFF CHARACTERISTICS</b> (Note 10)						
Drain-Source Breakdown Voltage	BV <sub>DSS</sub>	60	—	—	V	V <sub>GS</sub> = 0V, I <sub>D</sub> = 250μA
Zero Gate Voltage Drain Current T <sub>J</sub> = +25°C	I <sub>DSS</sub>	—	—	1	μA	V <sub>DS</sub> = 60V, V <sub>GS</sub> = 0V
Gate-Source Leakage	I <sub>GSS</sub>	—	—	±100	nA	V <sub>GS</sub> = ±20V, V <sub>DS</sub> = 0V
<b>ON CHARACTERISTICS</b> (Note 10)						
Gate Threshold Voltage	V <sub>GS(TH)</sub>	1.0	—	3.0	V	V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = 250μA
Static Drain-Source On-Resistance	R <sub>DS(ON)</sub>	—	34	50	mΩ	V <sub>GS</sub> = 10V, I <sub>D</sub> = 5.1A
		—	45	65		V <sub>GS</sub> = 4.5V, I <sub>D</sub> = 4.4A
Diode Forward Voltage	V <sub>SD</sub>	—	0.8	1.2	V	V <sub>GS</sub> = 0V, I <sub>S</sub> = 2.6A
<b>DYNAMIC CHARACTERISTICS</b> (Note 11)						
Input Capacitance	C <sub>ISS</sub>	—	584	—	pF	V <sub>DS</sub> = 25V, V <sub>GS</sub> = 0V, f = 1.0MHz
Output Capacitance	C <sub>OSS</sub>	—	83	—	pF	
Reverse Transfer Capacitance	C <sub>RSS</sub>	—	24	—	pF	
Gate Resistance	R <sub>G</sub>	—	3.8	—	Ω	V <sub>DS</sub> = 0V, V <sub>GS</sub> = 0V, f = 1MHz
Total Gate Charge (V <sub>GS</sub> = 4.5V)	Q <sub>G</sub>	—	4.2	—	nC	V <sub>DS</sub> = 44V, I <sub>D</sub> = 5.2A
Total Gate Charge (V <sub>GS</sub> = 10V)	Q <sub>G</sub>	—	8.8	—	nC	
Gate-Source Charge	Q <sub>GS</sub>	—	1.8	—	nC	
Gate-Drain Charge	Q <sub>GD</sub>	—	1.8	—	nC	
Turn-On Delay Time	t <sub>D(ON)</sub>	—	3.4	—	ns	V <sub>GS</sub> = 10V, V <sub>DS</sub> = 30V, R <sub>G</sub> = 6Ω, I <sub>D</sub> = 1A
Turn-On Rise Time	t <sub>R</sub>	—	1.9	—	ns	
Turn-Off Delay Time	t <sub>D(OFF)</sub>	—	10.1	—	ns	
Turn-Off Fall Time	t <sub>F</sub>	—	4.5	—	ns	
Body Diode Reverse Recovery Time	t <sub>RR</sub>	—	12.9	—	ns	I <sub>F</sub> = 2.6A, di/dt = 100A/μs
Body Diode Reverse Recovery Charge	Q <sub>RR</sub>	—	5.4	—	nC	I <sub>F</sub> = 2.6A, di/dt = 100A/μs

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

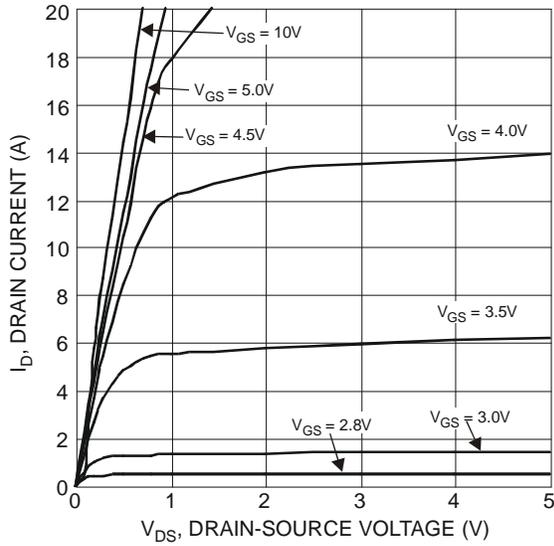


Figure 1 Typical Output Characteristics

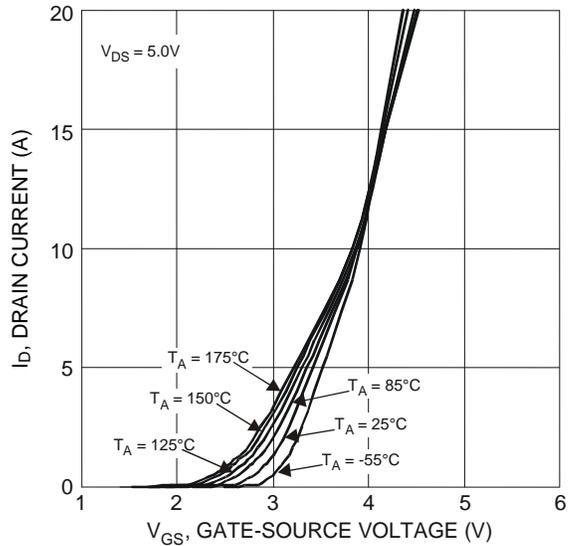


Figure 2 Typical Transfer Characteristics

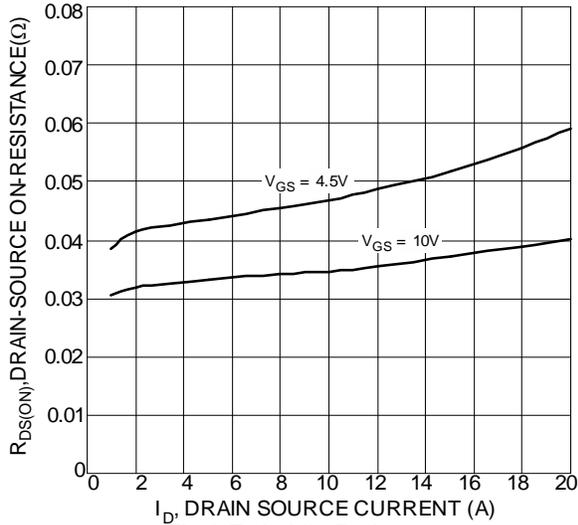


Figure 3 Typical On-Resistance vs. Drain Current and Gate Voltage

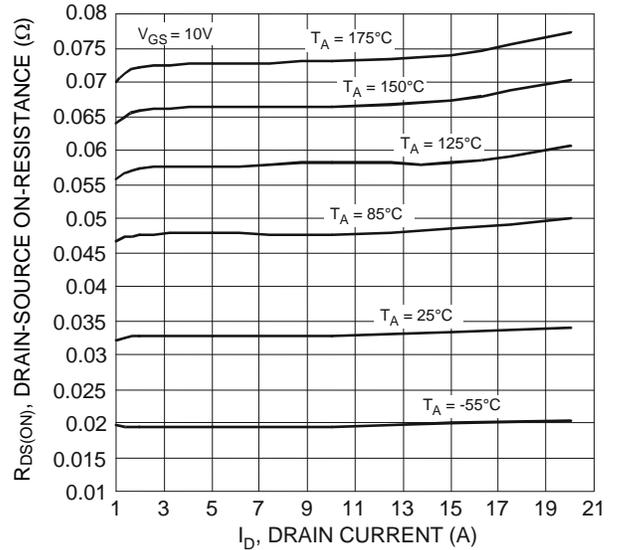


Figure 4 Typical On-Resistance vs. Drain Current and Temperature

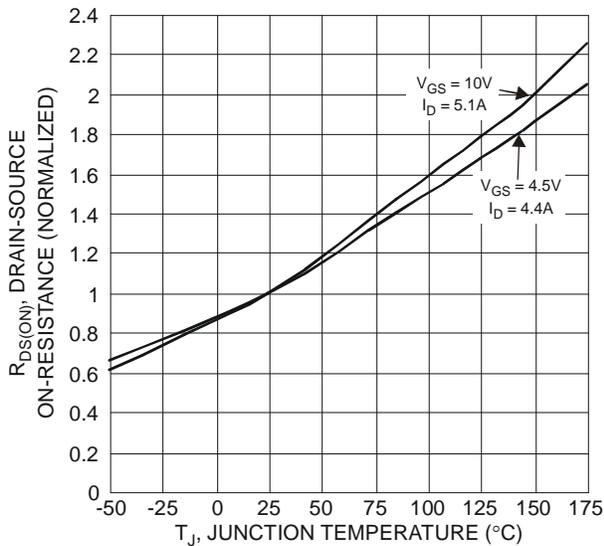


Figure 5 On-Resistance Variation with Temperature

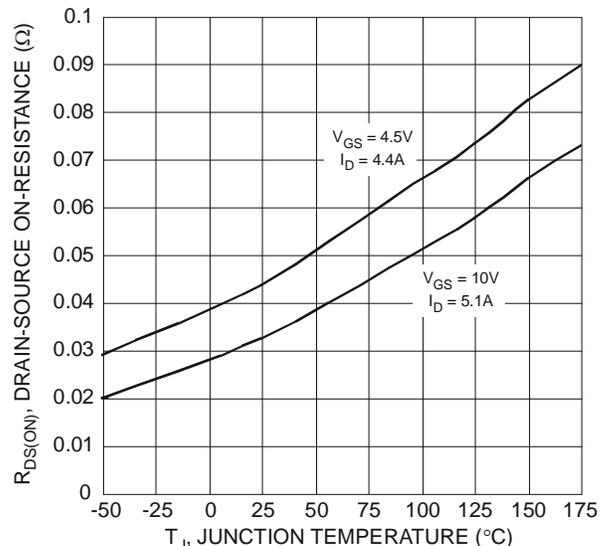


Figure 6 On-Resistance Variation with Temperature

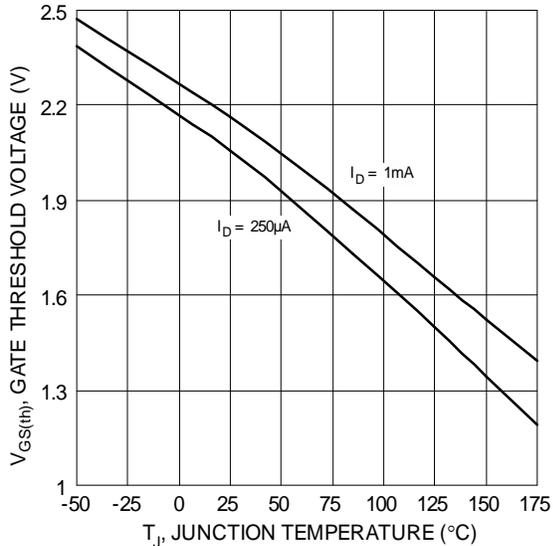


Figure 7 Gate Threshold Variation vs. Junction Temperature

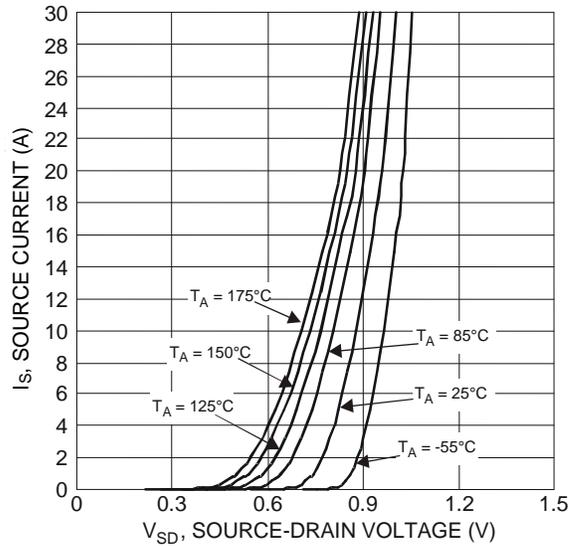


Figure 8 Diode Forward Voltage vs. Current

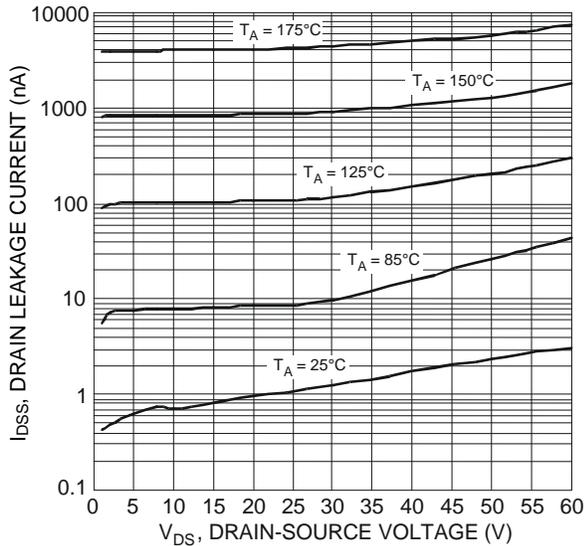


Figure 9 Typical Drain-Source Leakage Current vs. Voltage

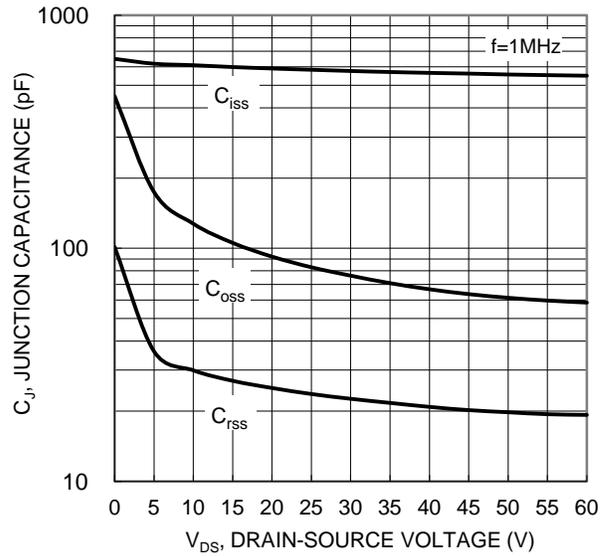


Figure 10 Typical Junction Capacitance

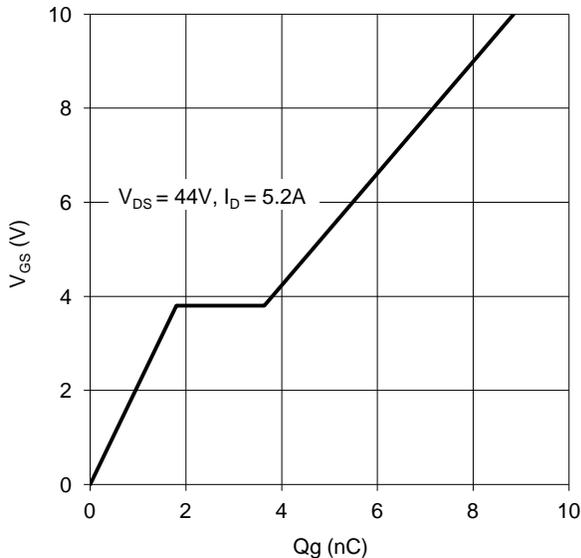


Figure 11 Gate Charge

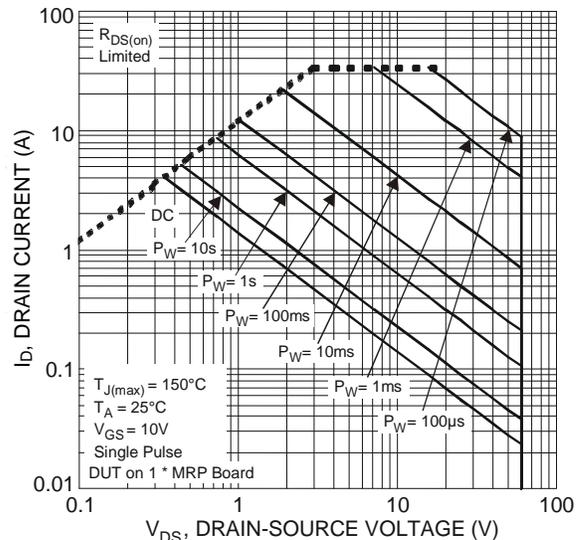


Figure 12 SOA, Safe Operation Area

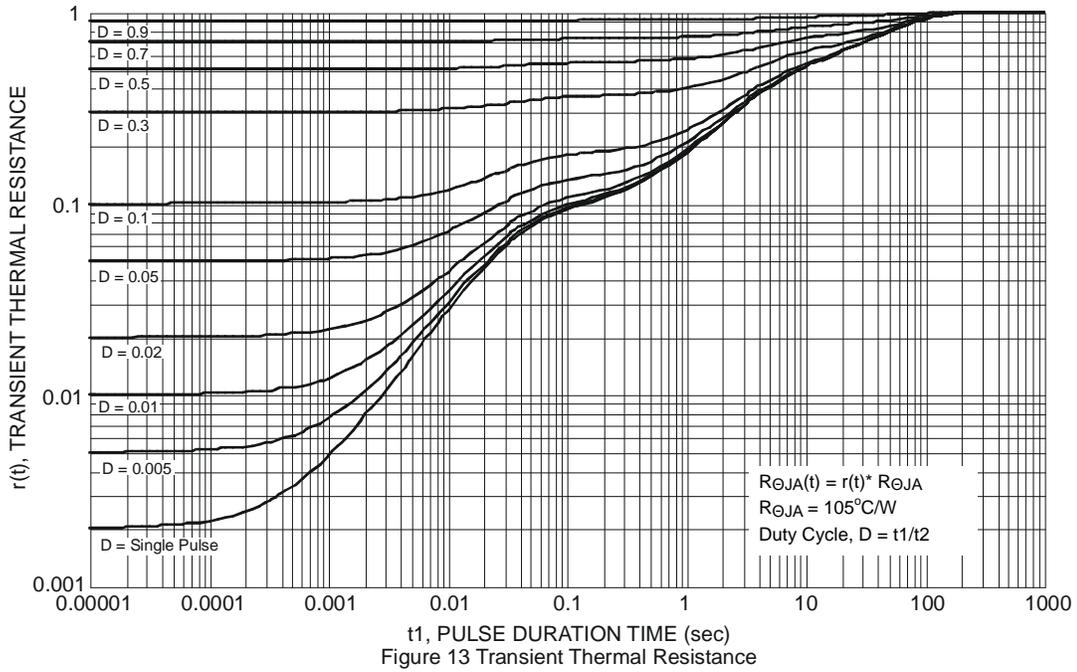
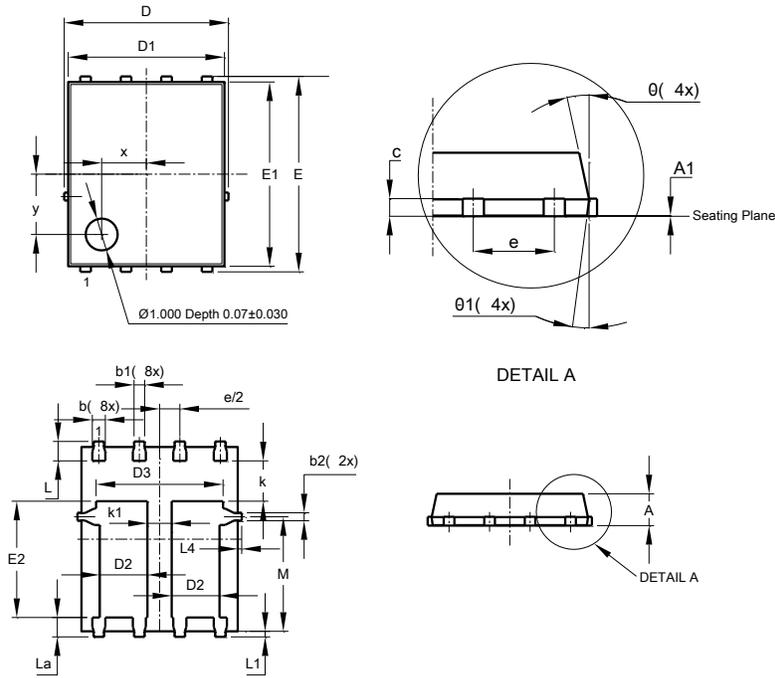


Figure 13 Transient Thermal Resistance

## Package Outline Dimensions

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

### PowerDI5060-8 (Type C)

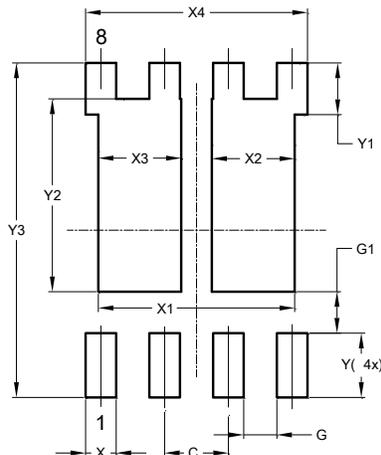


PowerDI5060-8 (Type C)			
Dim	Min	Max	Typ
A	0.90	1.10	1.00
A1	0	0.05	0.02
b	0.33	0.51	0.41
b1	0.300	0.366	0.333
b2	0.20	0.35	0.25
c	0.23	0.33	0.277
D	5.15 BSC		
D1	4.85	4.95	4.90
D2	1.40	1.60	1.50
D3	–	–	3.98
E	6.15 BSC		
E1	5.75	5.85	5.80
E2	3.56	3.76	3.66
e	1.27BSC		
k	–	–	1.27
k1	0.56	–	–
L	0.51	0.71	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			

## Suggested Pad Layout

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

### 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

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