

## Product Summary

BV <sub>DSS</sub>	R <sub>DS(ON)</sub> MAX	I <sub>D</sub> MAX T <sub>C</sub> = +25°C
40V	4.0mΩ @ V <sub>GS</sub> = 10V	80A

## Description and Applications

This MOSFET is designed to meet the stringent requirements of Automotive applications. It is qualified to AECQ101, supported by a PPAP and is ideal for use in:

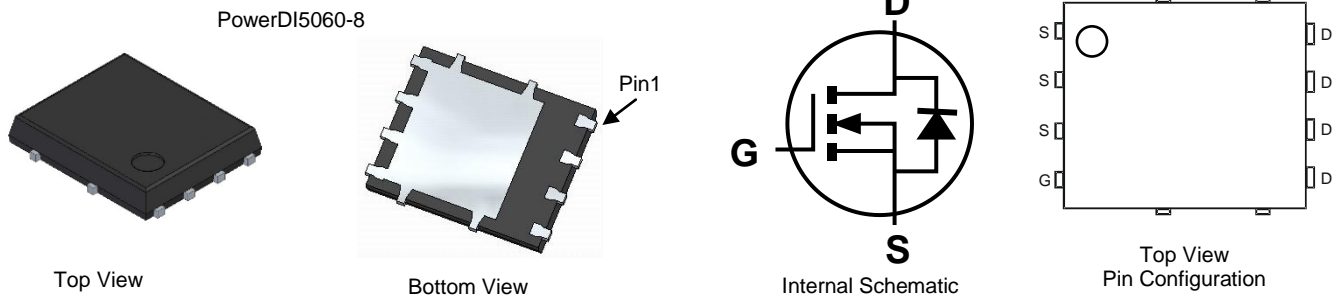
- Engine Management Systems
- Body Control Electronics
- DC-DC Converters

## Features

- Rated to +175°C – Ideal for High Ambient Temperature Environments
- 100% Unclamped Inductive Switching – Ensures More Reliable and Robust End Application
- Low R<sub>DS(ON)</sub> – Minimises Power Losses
- Low Q<sub>g</sub> – Minimises Switching Losses
- <1.1mm Package Profile – Ideal for Thin Applications
- **Lead-Free Finish; 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)**

## Mechanical Data

- Case: PowerDI5060-8
- Case Material: Molded Plastic, “Green” Molding Compound. UL Flammability Classification Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminal Connections: See Diagram Below
- Terminals: Finish – Matte Tin Annealed over Copper Leadframe Solderable per MIL-STD-202, Method 208 Ⓢ
- Weight: 0.097 grams (Approximate)

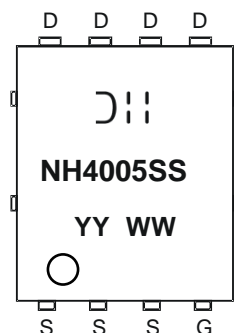


## Ordering Information (Note 5)

Part Number	Case	Packaging
DMNH4005SPSQ-13	PowerDI5060-8	2,500 / Tape & Reel

- 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 [http://www.diodes.com/quality/lead\\_free/](http://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. Automotive products are AEC-Q101 qualified and are PPAP capable. Refer to <https://www.diodes.com/quality/>.
  5. For packaging details, go to our website at <https://www.diodes.com/design/support/packaging/diodes-packaging/>.

## Marking Information



= Manufacturer's Marking  
 NH4005SS = Product Type Marking Code  
 YYWW = Date Code Marking  
 YY = Last Digit of Year (ex: 18 = 2018)  
 WW = Week Code (01 to 53)

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

Characteristic			Symbol	Value	Unit
Drain-Source Voltage			V <sub>DSS</sub>	40	V
Gate-Source Voltage			V <sub>GSS</sub>	20	V
Continuous Drain Current (Note 7) V <sub>GS</sub> = 10V	Steady State	T <sub>C</sub> = +25°C	I <sub>D</sub>	80	A
		T <sub>C</sub> = +100°C		60	
Pulsed Drain Current (10μs Pulse, Duty Cycle = 1%)			I <sub>DM</sub>	90	A
Maximum Continuous Body Diode Forward Current (Note 6)			I <sub>S</sub>	80	A
Avalanche Current (Note 8) L=1mH			I <sub>AS</sub>	30	A
Avalanche Energy (Note 8) L=1mH			E <sub>AS</sub>	445	mJ

**Thermal Characteristics**

Characteristic			Symbol	Value	Unit
Total Power Dissipation (Note 6)			P <sub>D</sub>	1.6	W
Thermal Resistance, Junction to Ambient (Note 6)	Steady State		R <sub>θJA</sub>	98	°C/W
	t < 10s			54	
Total Power Dissipation (Note 7)			P <sub>D</sub>	2.8	W
Thermal Resistance, Junction to Ambient (Note 7)	Steady State		R <sub>θJA</sub>	53	°C/W
	t < 10s			29	
Thermal Resistance, Junction to Case			R <sub>θJC</sub>	0.9	
Operating and Storage Temperature Range			T <sub>J</sub> , T <sub>STG</sub>	-55 to +175	°C

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

Characteristic	Symbol	Min	Typ	Max	Unit	Test Condition
<b>OFF CHARACTERISTICS (Note 9)</b>						
Drain-Source Breakdown Voltage	BV <sub>DSS</sub>	40	—	—	V	V <sub>GS</sub> = 0V, I <sub>D</sub> = 250μA
Zero Gate Voltage Drain Current	I <sub>DSS</sub>	—	—	1	μA	V <sub>DS</sub> = 32V, V <sub>GS</sub> = 0V
Gate-Source Leakage	I <sub>GSS</sub>	—	—	±100	nA	V <sub>GS</sub> = ±16V, V <sub>DS</sub> = 0V
<b>ON CHARACTERISTICS (Note 9)</b>						
Gate Threshold Voltage	V <sub>GS(TH)</sub>	1	—	3	V	V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = 250μA
Static Drain-Source On-Resistance	R <sub>DS(ON)</sub>	—	3.2	4.0	mΩ	V <sub>GS</sub> = 10V, I <sub>D</sub> = 20A
Diode Forward Voltage	V <sub>SD</sub>	—	—	1.2	V	V <sub>GS</sub> = 0V, I <sub>S</sub> = 1A
<b>DYNAMIC CHARACTERISTICS (Note 10)</b>						
Input Capacitance	C <sub>iss</sub>	—	2847	—	pF	V <sub>DS</sub> = 20V, V <sub>GS</sub> = 0V f = 1.0MHz
Output Capacitance	C <sub>oss</sub>	—	743	—		
Reverse Transfer Capacitance	C <sub>rss</sub>	—	243	—		
Gate Resistance	R <sub>g</sub>	—	2.0	—	Ω	V <sub>DS</sub> = 0V, V <sub>GS</sub> = 0V, f = 1.0MHz
Total Gate Charge (V <sub>GS</sub> = 10V)	Q <sub>g</sub>	—	48	—	nC	V <sub>DD</sub> = 20V, I <sub>D</sub> = 20A
Total Gate Charge (V <sub>GS</sub> = 4.5V)	Q <sub>g</sub>	—	23	—		
Gate-Source Charge	Q <sub>gs</sub>	—	9.5	—		
Gate-Drain Charge	Q <sub>gd</sub>	—	11.5	—		
Turn-On Delay Time	t <sub>D(ON)</sub>	—	6.6	—	ns	V <sub>DD</sub> = 20V, V <sub>GS</sub> = 10V, R <sub>g</sub> = 1Ω, I <sub>D</sub> = 20A
Turn-On Rise Time	t <sub>r</sub>	—	12.1	—		
Turn-Off Delay Time	t <sub>D(OFF)</sub>	—	18.3	—		
Turn-Off Fall Time	t <sub>f</sub>	—	4.9	—		
Reverse Recovery Time	t <sub>RR</sub>	—	29	—	ns	I <sub>F</sub> = 15A, di/dt = 100A/μs
Reverse Recovery Charge	Q <sub>RR</sub>	—	24	—	nC	

- 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 1inch square copper plate.
  8. I<sub>AS</sub> and E<sub>AS</sub> ratings are based on low frequency and duty cycles to keep T<sub>J</sub> = +25°C.
  9. Short duration pulse test used to minimize self-heating effect.
  10. Guaranteed by design. Not subject to product testing.

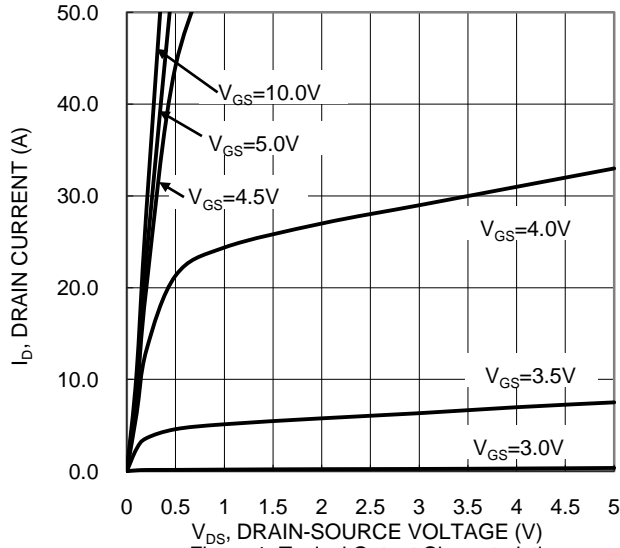


Figure 1. Typical Output Characteristic

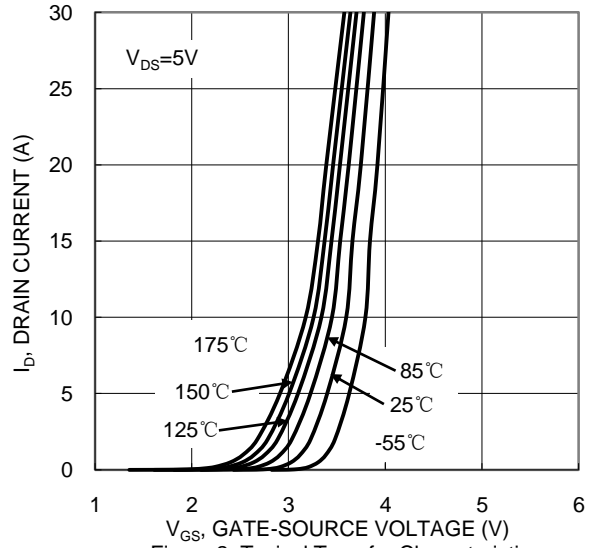


Figure 2. Typical Transfer Characteristic

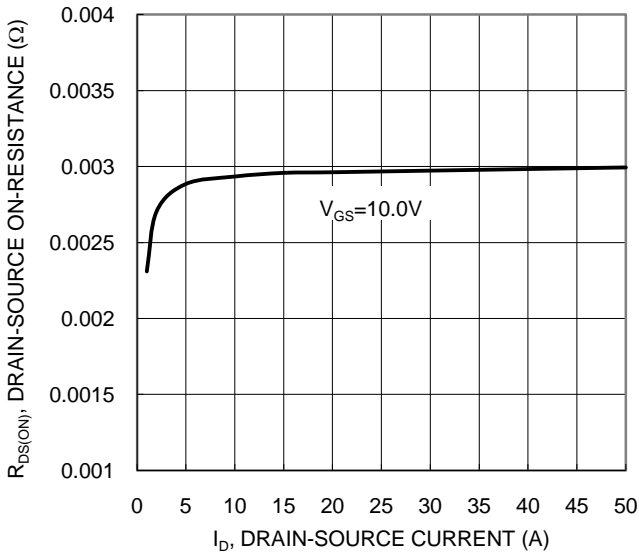


Figure 3. Typical On-Resistance vs. Drain Current and Gate Voltage

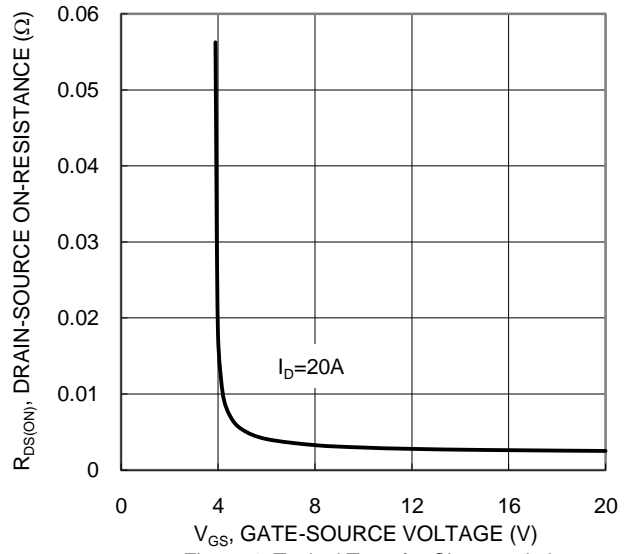


Figure 4. Typical Transfer Characteristic

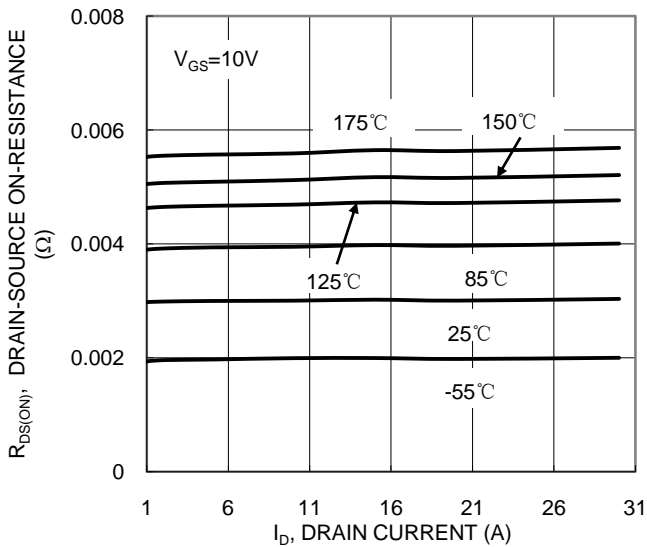


Figure 5. Typical On-Resistance vs. Drain Current and Junction Temperature

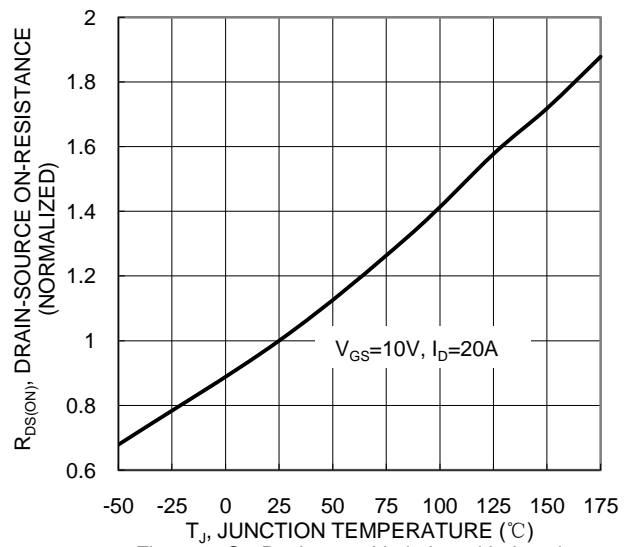


Figure 6. On-Resistance Variation with Junction Temperature

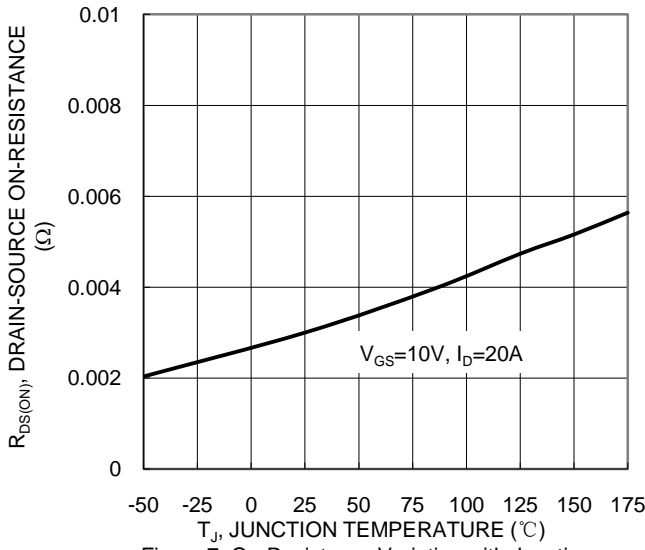


Figure 7. On-Resistance Variation with Junction Temperature

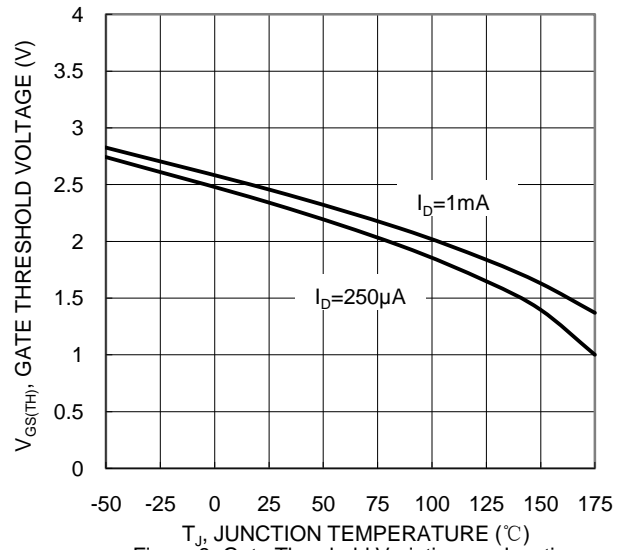


Figure 8. Gate Threshold Variation vs. Junction Temperature

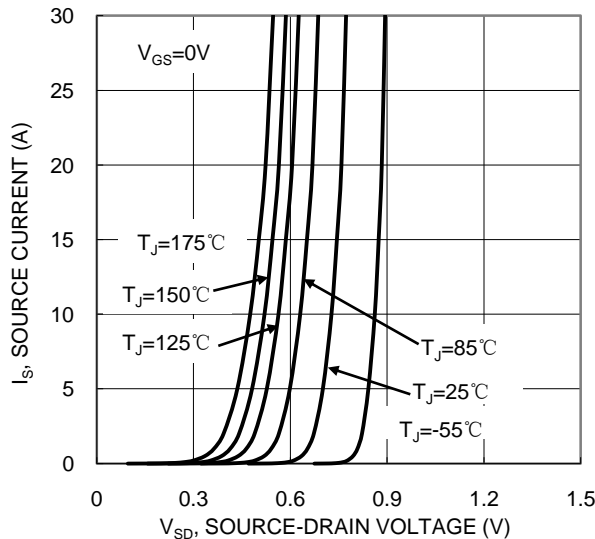


Figure 9. Diode Forward Voltage vs. Current

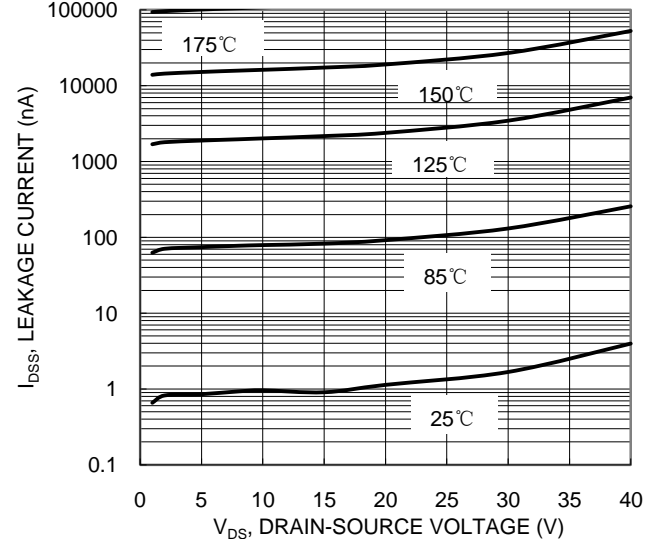


Figure 10. Typical Drain-Source Leakage Current vs. Voltage

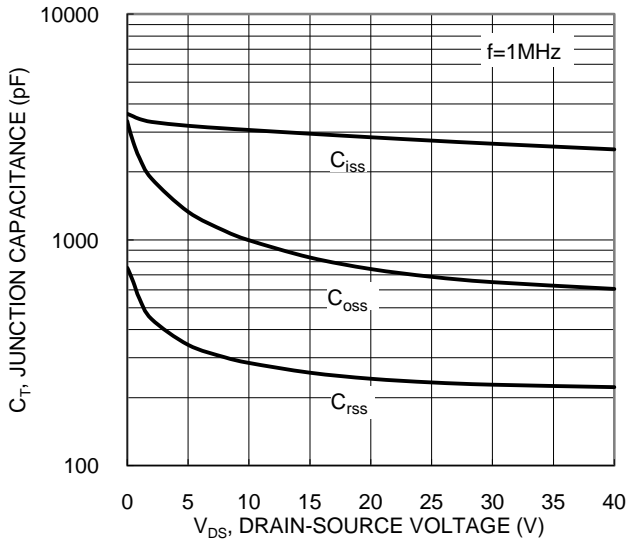


Figure 11. Typical Junction Capacitance

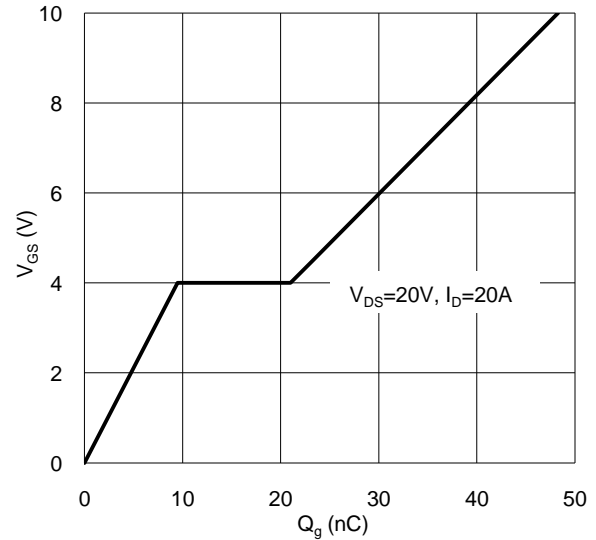
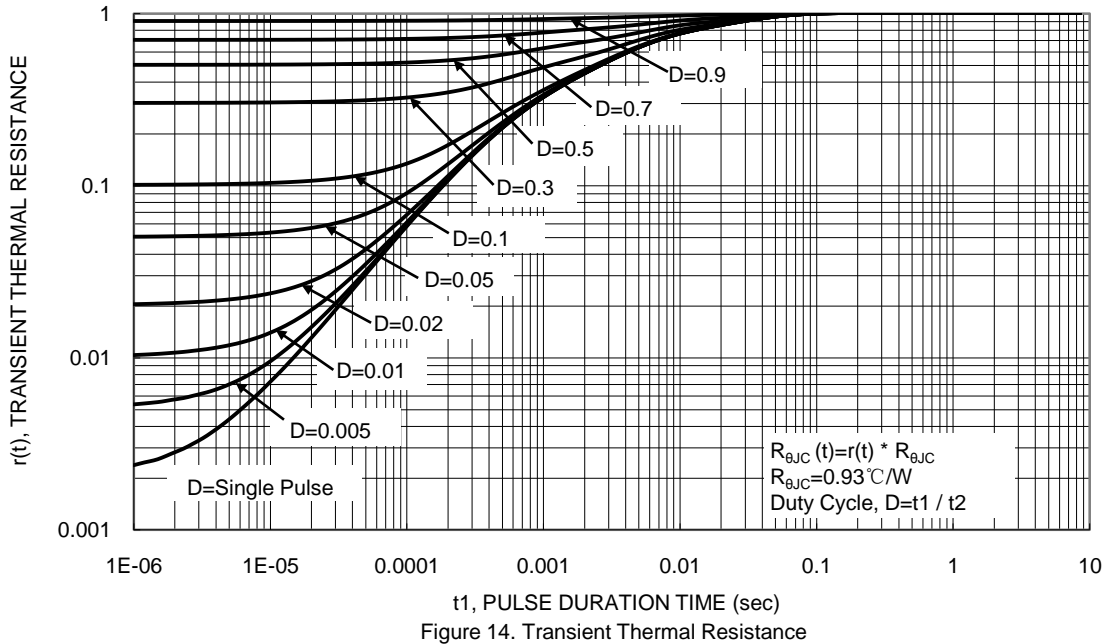
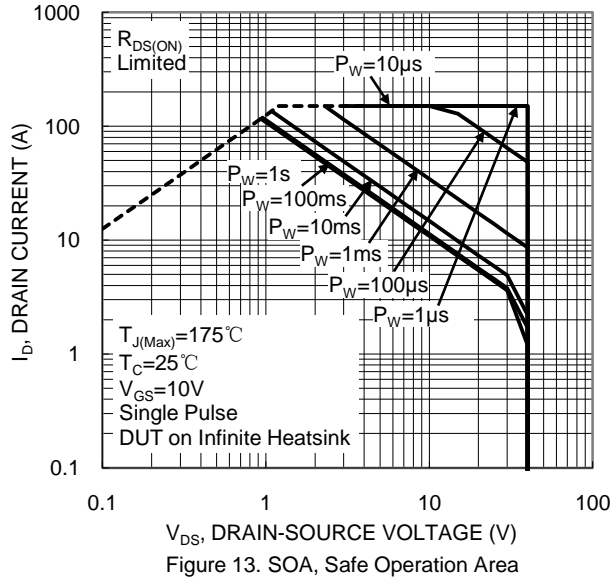


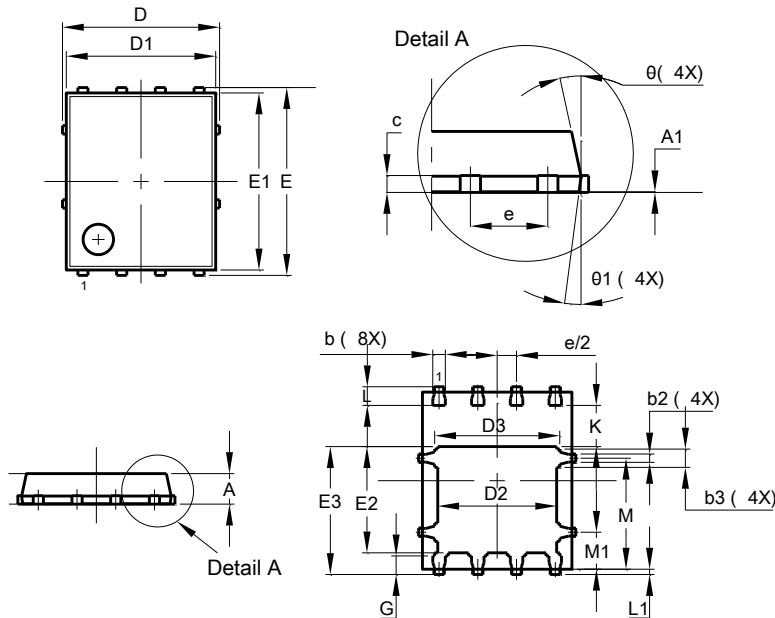
Figure 12. Gate Charge



**Package Outline Dimensions**

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

**PowerDI5060-8**

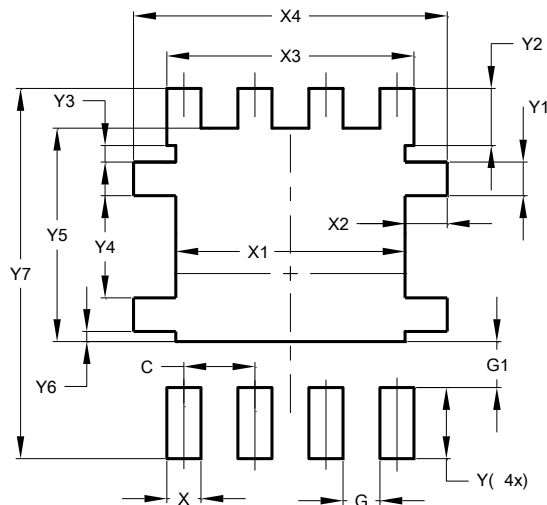


PowerDI5060-8			
Dim	Min	Max	Typ
A	0.90	1.10	1.00
A1	0.00	0.05	-
b	0.33	0.51	0.41
b2	0.200	0.350	0.273
b3	0.40	0.80	0.60
c	0.230	0.330	0.277
D	5.15 BSC		
D1	4.70	5.10	4.90
D2	3.70	4.10	3.90
D3	3.90	4.30	4.10
E	6.15 BSC		
E1	5.60	6.00	5.80
E2	3.28	3.68	3.48
E3	3.99	4.39	4.19
e	1.27 BSC		
G	0.51	0.71	0.61
K	0.51	-	-
L	0.51	0.71	0.61
L1	0.100	0.200	0.175
M	3.235	4.035	3.635
M1	1.00	1.40	1.21
$\theta$	10°	12°	11°
$\theta 1$	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**



Dimensions	Value (in mm)
C	1.270
G	0.660
G1	0.820
X	0.610
X1	4.100
X2	0.755
X3	4.420
X4	5.610
Y	1.270
Y1	0.600
Y2	1.020
Y3	0.295
Y4	1.825
Y5	3.810
Y6	0.180
Y7	6.610

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