



## DMTH4004SPSQ

#### 40V +175°C N-CHANNEL ENHANCEMENT MODE MOSFET PowerDI<sup>®</sup>

# **Product Summary**

BV <sub>DSS</sub>	R <sub>DS(ON)</sub> Max	Qg Typ	I <sub>D</sub> T <sub>C</sub> = +25°C	
40V	2.7mΩ @ V <sub>GS</sub> = 10V	68.6nC	100A	

#### **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> Minimizes Power Losses
- Low Q<sub>a</sub> Minimizes Switching Losses
- 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)

# **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:

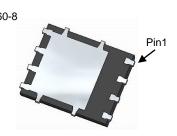
- **Engine Management Systems**
- **Body Control Electronics**
- DC-DC Converters

## **Mechanical Data**

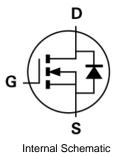
- Case: PowerDI<sup>®</sup>5060-8
- Case Material: Molded Plastic, "Green" Molding Compound. UL Flammability Classification Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminal Finish Matte Tin Annealed over Copper Leadframe. Solderable per MIL-STD-202, Method 208 @3
- Weight: 0.097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

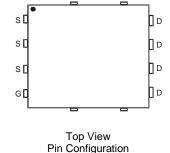


Top View



**Bottom View** 





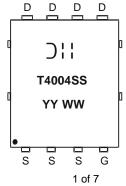
#### Ordering Information (Note 5)

Part Number	Case	Packaging
DMTH4004SPSQ-13	PowerDI5060-8	2,500/Tape & Reel

Notes:

- 1, EU Directive 2002/95/EC (RoHS) & 2011/65/EU (RoHS 2) compliant, All applicable RoHS exemptions applied.
- 2. See 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. Automotive, AEC-Q101 and standard products are electrically and thermally the same, except where specified. For more information, please refer to 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 T4004SS = Product Type Marking Code YYWW = Date Code Marking YY = Year (ex: 14 = 2014) WW = Week (01 - 53)

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

Characteristic	Symbol	Value	Units	
Drain-Source Voltage		$V_{DSS}$	40	V
Gate-Source Voltage		$V_{GSS}$	±20	V
Continuous Drain Current (Note 6) $ T_A = +25^{\circ}C $ $ T_A = +70^{\circ}C $		ΙD	31 26	А
	$T_C = +25^{\circ}C$		100	А
Continuous Drain Current (Note 7)	T <sub>C</sub> = +100°C (Note 9)	l <sub>D</sub>	100	
Maximum Continuous Body Diode Forward Current (Note 6)	I <sub>S</sub>	100	Α	
Pulsed Drain Current (10µs pulse, duty cycle = 1%)		I <sub>DM</sub>	200	Α
Avalanche Current, L=0.2mH		I <sub>AS</sub>	45	Α
Avalanche Energy, L=0.2mH		E <sub>AS</sub>	200	mJ

## **Thermal Characteristics**

Characteristic	Symbol	Value	Units	
Total Power Dissipation (Note 6) $T_A = +25^{\circ}C$		$P_{D}$	3.6	W
Thermal Resistance, Junction to Ambient (Note 6)	$R_{\theta JA}$	41	°C/W	
Total Power Dissipation (Note 7) $T_C = +25^{\circ}C$		P <sub>D</sub>	167	W
Thermal Resistance, Junction to Case (Note 7)	R <sub>0JC</sub>	0.9	°C/W	
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	Тур	Max	Unit	Test Condition	
OFF CHARACTERISTICS (Note 8)							
Drain-Source Breakdown Voltage	BV <sub>DSS</sub>	40	1	_	V	$V_{GS} = 0V$ , $I_D = 1mA$	
Zero Gate Voltage Drain Current	I <sub>DSS</sub>	_	_	1	μΑ	$V_{DS} = 32V, V_{GS} = 0V$	
Gate-Source Leakage	I <sub>GSS</sub>		1	±100	nA	$V_{GS} = \pm 20V, V_{DS} = 0V$	
ON CHARACTERISTICS (Note 8)							
Gate Threshold Voltage	V <sub>GS(th)</sub>	2		4	V	$V_{DS} = V_{GS}$ , $I_D = 250\mu A$	
Static Drain-Source On-Resistance	R <sub>DS(ON)</sub>	l	2.3	2.7	mΩ	$V_{GS} = 10V, I_D = 90A$	
Diode Forward Voltage	V <sub>SD</sub>	_	0.9	1.2	V	$V_{GS} = 0V, I_{S} = 20A$	
DYNAMIC CHARACTERISTICS (Note 9)							
Input Capacitance	C <sub>iss</sub>		4,305	_		$V_{DS}$ = 25V, $V_{GS}$ = 0V, $f$ = 1MHz	
Output Capacitance	Coss		1,441		pF		
Reverse Transfer Capacitance	C <sub>rss</sub>	_	102	_			
Gate resistance	$R_g$	_	0.77	_	Ω	$V_{DS} = 0V$ , $V_{GS} = 0V$ , $f = 1MHz$	
Total Gate Charge	$Q_{g}$	_	68.6	_		V 00V I 00A	
Gate-Source Charge	Q <sub>gs</sub>	_	16.8	_	nC	$V_{DD} = 20V, I_D = 90A,$	
Gate-Drain Charge	$Q_{gd}$	_	14.2	_		V <sub>GS</sub> = 10V	
Turn-On Delay Time	t <sub>D(ON)</sub>	_	9.5	_			
Turn-On Rise Time	t <sub>R</sub>	_	6.7	_	nS	$V_{DD} = 20V, V_{GS} = 10V,$ $I_{D} = 90A, R_{G} = 3.5\Omega$	
Turn-Off Delay Time	t <sub>D(OFF)</sub>		26.4	_	110		
Turn-Off Fall Time	t <sub>F</sub>	_	8.1	_			
Body Diode Reverse Recovery Time	t <sub>RR</sub>	_	52.4	_	nS	1 50A di/dt 400A/v-	
Body Diode Reverse Recovery Charge	Q <sub>RR</sub>	_	78.2	_	nC	I <sub>F</sub> = 50A, di/dt = 100A/μs	

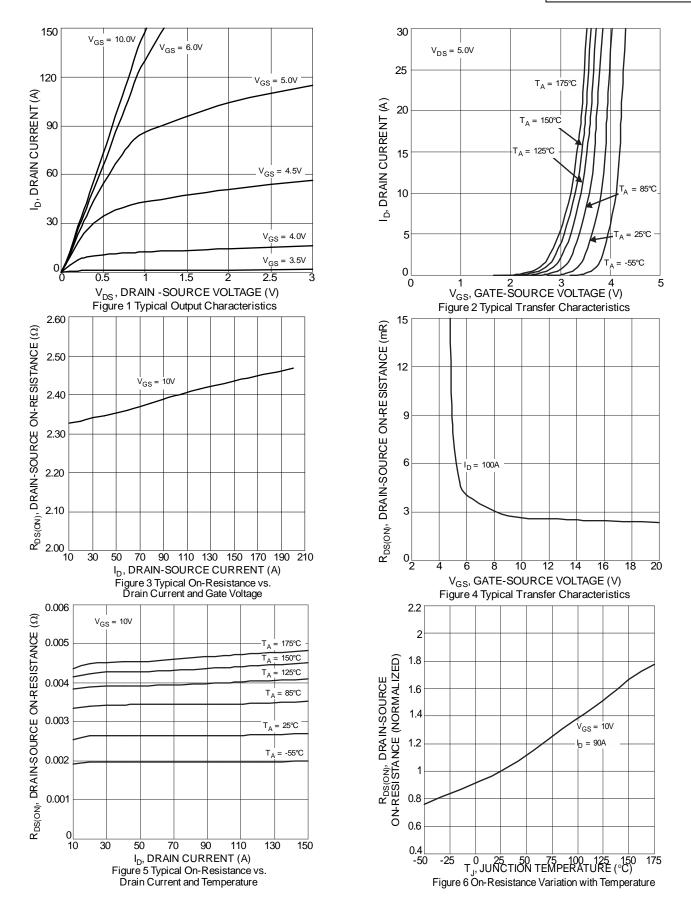
Notes: 6. Device mounted with exposed drain pad on 25mm by 25mm 2oz copper on a single- sided 1.6mm FR4 PCB; device is measured under still air conditions whilst operating in a steady state.

7. Thermal resistance from junction to soldering point (on the exposed drain pad).

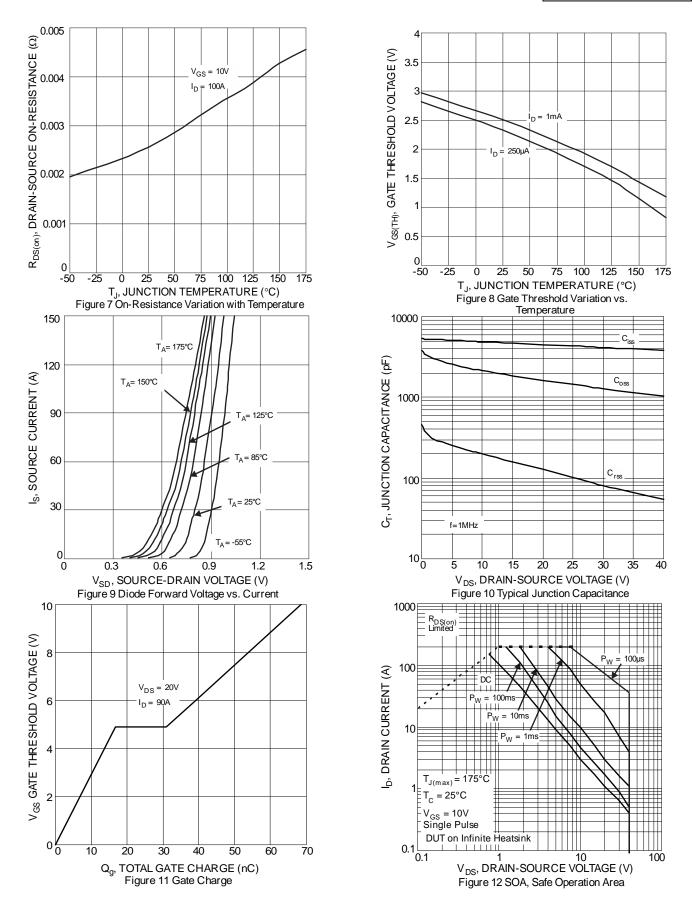
8. Short duration pulse test used to minimize self-heating effect.

9. Guaranteed by design. Not subject to production testing.

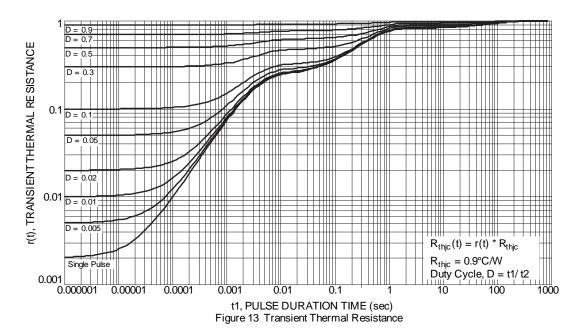








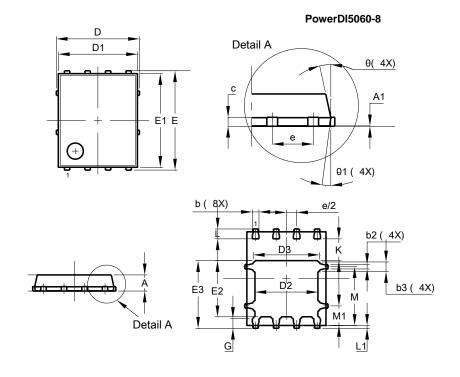






# **Package Outline**

Please see AP02002 at http://www.diodes.com/datasheets/ap02002.pdf for the latest version.

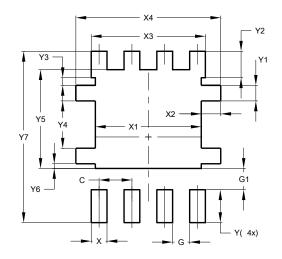


PowerDI5060-8					
Dim	Min Max Ty				
Α	0.90	1.10	1.00		
A1	0.00	0.05	_		
b	0.33	0.51	0.41		
b2	0.200	0.350	0.273		
b3	0.40	0.80	0.60		
С	0.230	0.330	0.277		
D		5.15 BSC	;		
D1	4.70	5.10	4.90		
D2	3.70	4.10	3.90		
D3	3.90 4.30 4.10				
Е	•	6.15 BSC	;		
E1	5.60	6.00	5.80		
E2	3.28	3.68	3.48		
E3	3.99	3.99 4.39 4.19			
е	•	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			3.635		
M1	1.00	1.40	1.21		
θ	10°	12°	11°		
θ1	6°	8°	7°		
All	All Dimensions in mm				

# **Suggested Pad Layout**

Please see AP02001 at http://www.diodes.com/datasheets/ap02001.pdf for the latest version.

## PowerDI5060-8



Dimensions	Value (in mm)				
С	1.270				
G	0.660				
G1	0.820				
X	0.610				
X1	4.100				
X2	0.755				
Х3	4.420				
X4	5.610				
Y	1.270				
Y1	0.600				
Y2	1.020				
Y3	0.295				
Y4	1.825				
<b>Y5</b> 3.810					
Y6	0.180				
Y7	6.610				



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