



40V 175°C DUAL N-CHANNEL ENHANCEMENT MODE MOSFET

Product Summary

BV _{DSS}	R _{DS(ON)} max	I _D max T _C = +25°C
40V	$15m\Omega @ V_{GS} = 10V$	42A

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:

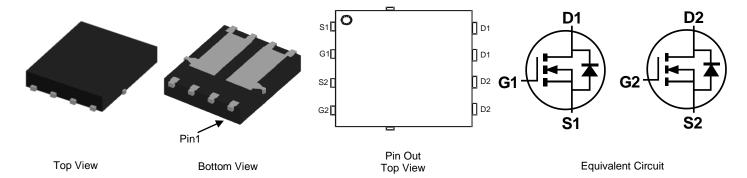
- Backlighting
- Power Management Functions
- DC-DC Converters

Features and Benefits

- 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_{DS(ON)} Minimizes On State Losses
- Low Input Capacitance
- Fast Switching Speed
- 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)

Mechanical Data

- Case: PowerDI[®]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
- Terminals: Finish Matte Tin Annealed over Copper Leadframe.
 Solderable per MIL-STD-202, Method 208 63
- Weight: 0.097 grams (Approximate)



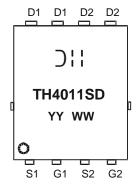
Ordering Information (Note 5)

-			
	Part Number	Case	Packaging
	DMTH4011SPDQ-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) & 2015/863/EU (RoHS 3) compliant.
- 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.
- 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 TH4011SD = Product Type Marking Code YYWW = Date Code Marking YY = Year (ex: 18 = 2018) WW = Week (01 to 53)

PowerDI is a registered trademark of Diodes Incorporated.



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 (Note 7) $ T_C = +25^{\circ}C $ $T_C = +100^{\circ}C $		I _D	42 29.7	А
Continuous Drain Current (Note 6) $T_A = +25^{\circ}C$ $T_A = +100^{\circ}C$		I _D	11.1 7.8	А
Pulsed Drain Current (10µs Pulse, Duty Cycle = 1%)	I _{DM}	60	Α	
Maximum Continuous Body Diode Forward Current (Note 7)	Is	3.3	Α	
Pulsed Body Diode Forward Current (10µs Pulse, Duty Cycle = 1%)	I _{SM}	60	Α	
Avalanche Current, L = 0.3mH		I _{AS}	11.9	Α
Avalanche Energy, L = 0.3mH		E _{AS}	21.4	mJ

Thermal Characteristics

Characteristic	Symbol	Value	Unit	
Total Power Dissipation (Note 6) $T_A = +25^{\circ}C$		P_{D}	2.6	W
Thermal Resistance, Junction to Ambient (Note 6)	$R_{\theta JA}$	57	°C/W	
Total Power Dissipation (Note 7)	P _D	37.5	W	
Thermal Resistance, Junction to Case (Note 7)	$R_{ heta JC}$	4	°C/W	
Operating and Storage Temperature Range	T _{J,} T _{STG}	-55 to +175	°C	

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

Characteristic	Symbol	Min	Тур	Max	Unit	Test Condition	
OFF CHARACTERISTICS (Note 8)							
Drain-Source Breakdown Voltage	BV _{DSS}	40	_	_	V	$V_{GS} = 0V$, $I_D = 1mA$	
Zero Gate Voltage Drain Current	I _{DSS}	_	_	1	μA	$V_{DS} = 32V, V_{GS} = 0V$	
Gate-Source Leakage	I _{GSS}	_	_	±100	nA	$V_{GS} = \pm 20V, V_{DS} = 0V$	
ON CHARACTERISTICS (Note 8)							
Gate Threshold Voltage	V _{GS(TH)}	2	_	4	V	$V_{DS} = V_{GS}$, $I_D = 250\mu A$	
Static Drain-Source On-Resistance	R _{DS(ON)}	I	11.6	15	mΩ	$V_{GS} = 10V, I_D = 20A$	
Diode Forward Voltage	V_{SD}	-	_	1.2	V	$V_{GS} = 0V, I_{S} = 20A$	
DYNAMIC CHARACTERISTICS (Note 9)							
Input Capacitance	C _{iss}	-	805	_	pF		
Output Capacitance	Coss	_	208	_	pF	$V_{DS} = 20V, V_{GS} = 0V,$ f = 1MHz	
Reverse Transfer Capacitance	Crss	_	15	_	pF		
Gate Resistance	Rg	_	2.76	_	Ω	$V_{DS} = 0V$, $V_{GS} = 0V$, $f = 1MHz$	
Total Gate Charge	Qg	_	10.6	_	nC	V 00V I 00A	
Gate-Source Charge	Qgs	_	2.2	_	nC	$V_{DS} = 20V, I_{D} = 20A,$ $V_{GS} = 10V$	
Gate-Drain Charge	Q _{gd}	_	2.7	_	nC		
Turn-On Delay Time	t _{D(ON)}	_	4.1	_	ns		
Turn-On Rise Time	t _R	_	3.8	_	ns	$V_{DD} = 20V, V_{GS} = 10V,$ $R_G = 1.6\Omega, I_D = 20A$	
Turn-Off Delay Time	t _{D(OFF)}	_	8.6	_	ns		
Turn-Off Fall Time	t _F	_	1.9	_	ns		
Body Diode Reverse Recovery Time	t _{RR}	_	10.2	_	ns	I _F = 15A, di/dt = 400A/μs	
Body Diode Reverse Recovery Charge	Q _{RR}	_	9.6	_	nC		

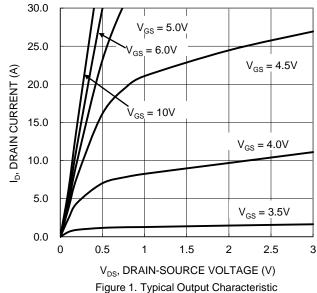
6. Device mounted on FR-4 substrate PC board, 2oz. copper, with thermal bias to bottom layer 1inch square copper plate.

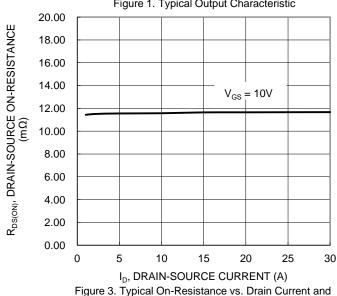
7. Thermal resistance from junction to soldering point (on the exposed drain pad).
8. Short duration pulse test used to minimize self-heating effect.

^{9.} Guaranteed by design. Not subject to product testing.









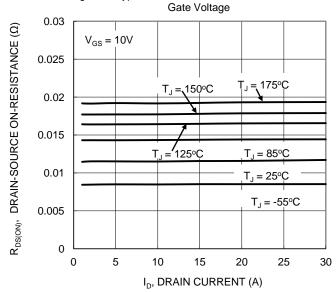


Figure 5. Typical On-Resistance vs. Drain Current and Temperature

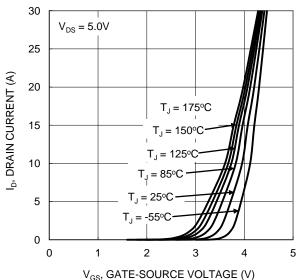


Figure 2. Typical Transfer Characteristic

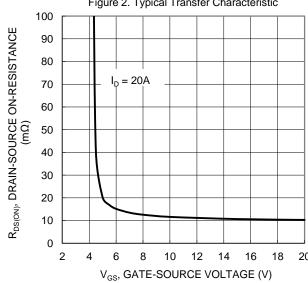


Figure 4. Typical Transfer Characteristic

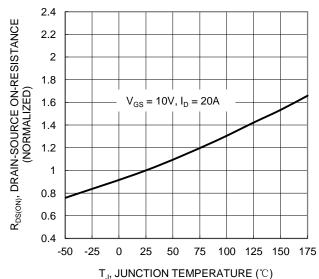


Figure 6. On-Resistance Variation with Temperature





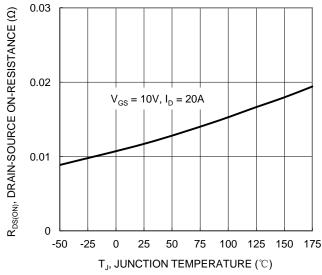


Figure 7. On-Resistance Variation with Temperature

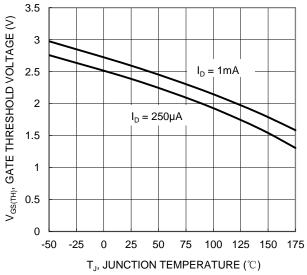
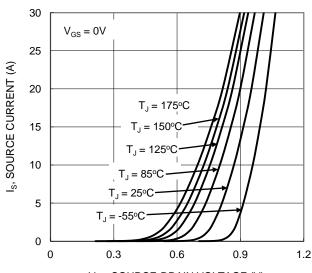


Figure 8. Gate Threshold Variation vs. Temperature



V_{SD}, SOURCE-DRAIN VOLTAGE (V) Figure 9. Diode Forward Voltage vs. Current

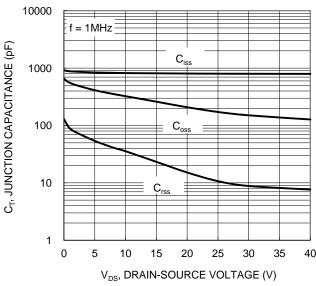
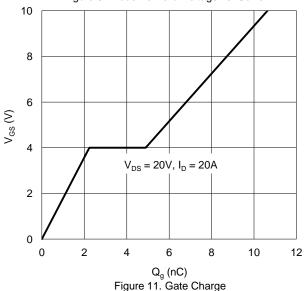


Figure 10. Typical Junction Capacitance



V_{DS}, DRAIN-SOURCE VOLTAGE (V) Figure 12. SOA, Safe Operation Area

10

100

10

0.1

0.1

D, DRAIN CURRENT (A)

R_{DS(ON)} Limited

> = 100ms P_W = 10ms

 $T_{J(Max)} = 175^{\circ}C$ $T_{C} = 25^{\circ}C$ Single Pulse

DUT on Infinite Heatsink V_{GS} = 10V

100



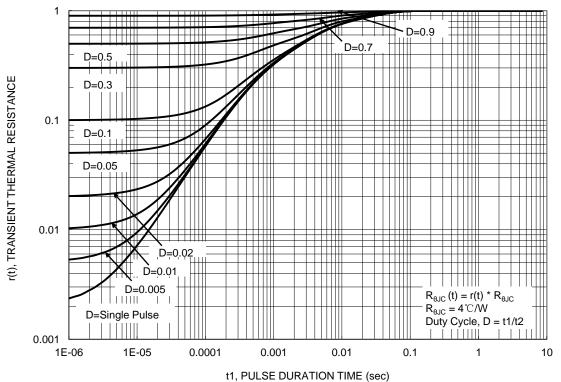


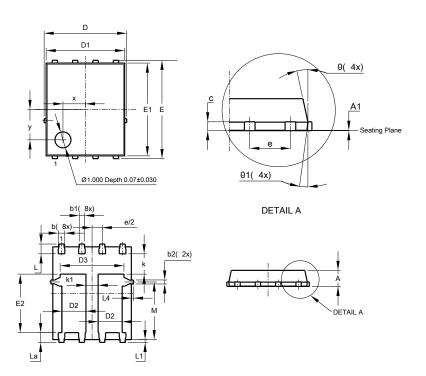
Figure 13. Transient Thermal Resistance



Package Outline Dimensions

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

PowerDI5060-8 (Type C)

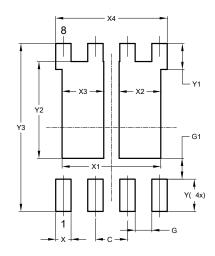


PowerDI5060-8 (Type C)					
Dim	Min	Тур			
Α	0.90	1.10	1.00		
A1	0	0.05	0.02		
b	0.33	0.51	0.41		
b1	0.300	0.366	0.333		
b2	0.20	0.35	0.25		
С	0.23	0.33	0.277		
D	ţ	5.15 BSC	;		
D1	4.85	4.95	4.90		
D2	1.40 1.60 1.50				
D3	-	-	3.98		
Е	(6.15 BSC)		
E1	5.75	5.85	5.80		
E2	3.56	3.76	3.66		
е		1.27BSC	,		
k	-	-	1.27		
k1	0.56	-	-		
L	0.51	0.71	0.61		
La	0.51 0.71 0.6				
L1	0.05 0.20 0.17		0.175		
L4	-	- 0.12			
М	3.50	3.71	3.605		
X	-	-	1.400		
у	-	-	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)		
С	1.270		
G	0.660		
G1	0.820		
Х	0.610		
X1	3.910		
X2	1.650		
Х3	1.650		
X4	4.420		
Υ	1.270		
Y1	1.020		
Y2	3.810		
Y3	6.610		



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