

## 60V 175°C DUAL N-CHANNEL ENHANCEMENT MODE MOSFET

## **Product Summary**

BV <sub>DSS</sub>	R <sub>DS(ON)</sub> Max	I <sub>D</sub> Max T <sub>C</sub> = +25°C		
60V	$19m\Omega$ @ $V_{GS} = 10V$	33.2A		
	$28m\Omega$ @ VGS = 4.5V	28A		

## **Features and Benefits**

- Rated to +175°C Ideal for High Ambient Temperature **Environments**
- 100% Unclamped Inductive Switching (UIS) Test in Production -Ensures More Reliable and Robust End Application
- High Conversion Efficiency
- 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)

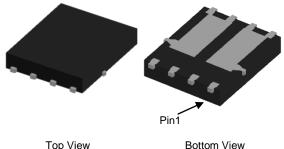
# **Description and Applications**

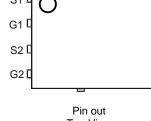
This MOSFET is designed to meet the stringent requirements of Automotive applications. It is qualified to AEC-Q101, supported by a PPAP and is ideal for use in:

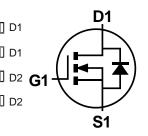
- **Engine Management Systems**
- **Body Control Electronics**
- DC-DC Converters

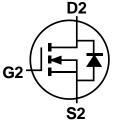
## **Mechanical Data**

- 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
- Terminals: Finish Matte Tin Annealed over Copper Leadframe. Solderable per MIL-STD-202, Method 208 @3
- Weight: 0.097 grams (Approximate)









**Bottom View** Top View

**Equivalent Circuit** 

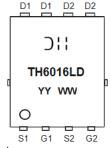
# Ordering Information (Note 5)

Part Number	Case	Packaging
DMTH6016LPDQ-13	PowerDI5060-8 (Type C)	2,500/Tape & Reel

Notes:

- 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 http://www.diodes.com/product\_compliance\_definitions.html.
- 5. For packaging details, go to our website at http://www.diodes.com/products/packages.html.

# Marking Information



);; = Manufacturer's Marking TH6016LD = Product Type Marking Code YYWW = Date Code Marking YY = Year (ex: 16 = 2016) WW = Week (01 to 53)



# **Maximum Ratings** (@ $T_A = +25^{\circ}C$ , unless otherwise specified.)

Characteristic	Symbol	Value	Units	
Drain-Source Voltage	$V_{DSS}$	60	V	
Gate-Source Voltage	$V_{GSS}$	±20	V	
Continuous Drain Current (Note 7) $ T_C = +25^{\circ}C $ $T_C = +100^{\circ}C $		Ι <sub>D</sub>	33.2 23.7	А
Continuous Drain Current (Note 6)	ID	9.2 6.5	А	
Pulsed Drain Current (10µs Pulse, Duty Cycle = 1%)	I <sub>DM</sub>	50	Α	
Maximum Continuous Body Diode Forward Current (Note 6)	Is	31	А	
Pulsed Body Diode Forward Current (Note 6)	I <sub>SM</sub>	50	А	
Avalanche Current, L = 0.1mH	I <sub>AS</sub>	15.3	А	
Avalanche Energy, L = 0.1mH	E <sub>AS</sub>	11.7	mJ	

# **Thermal Characteristics**

Characteristic	Symbol	Value	Unit
Total Power Dissipation (Note 6)	$P_{D}$	2.5	W
Thermal Resistance, Junction to Ambient (Note 6)	R <sub>⊝JA</sub>	58	°C/W
Total Power Dissipation (Note 7)	P <sub>D</sub>	37.5	W
Thermal Resistance, Junction to Case (Note 7)	R <sub>⊝JC</sub>	4	°C/W
Operating and Storage Temperature Range	$T_{J_i}T_{STG}$	-55 to +175	°C

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

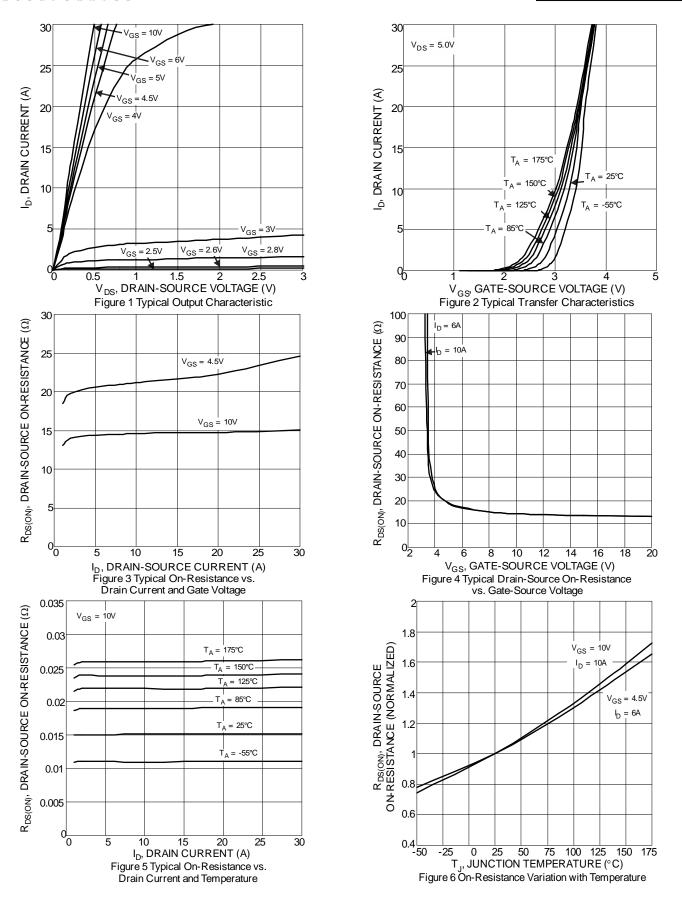
Characteristic	Symbol	Min	Тур	Max	Unit	Test Condition	
OFF CHARACTERISTICS (Note 8)							
Drain-Source Breakdown Voltage	BV <sub>DSS</sub>	60	_	_	V	$V_{GS} = 0V, I_D = 250\mu A$	
Zero Gate Voltage Drain Current	I <sub>DSS</sub>	_	_	1	μA	V <sub>DS</sub> = 48V, V <sub>GS</sub> = 0V	
Gate-Source Leakage			_	±100	nA	$V_{GS} = \pm 20V, V_{DS} = 0V$	
ON CHARACTERISTICS (Note 8)							
Gate Threshold Voltage	V <sub>GS(TH)</sub>	1	_	2.5	V	$V_{DS} = V_{GS}, I_{D} = 250 \mu A$	
Static Drain-Source On-Resistance	<b>D</b>		14.5	19	mΩ	V <sub>GS</sub> = 10V, I <sub>D</sub> = 10A	
Static Drain-Source On-Resistance	R <sub>DS(ON)</sub>		20.9	28	11177	$V_{GS} = 4.5V, I_D = 6A$	
Diode Forward Voltage	$V_{SD}$	_	0.7	1.2	V	$V_{GS} = 0V, I_{S} = 20A$	
DYNAMIC CHARACTERISTICS (Note 9)							
Input Capacitance	C <sub>ISS</sub>	_	864	_	pF		
Output Capacitance	Coss	_	282	_	pF	$V_{DS} = 30V, V_{GS} = 0V,$ f = 1MHz	
Reverse Transfer Capacitance	C <sub>RSS</sub>	_	27	_	pF	1 = 1101112	
Gate Resistance	Rg	_	1.3	_	Ω	$V_{DS} = 0V$ , $V_{GS} = 0V$ , $f = 1MHz$	
Total Gate Charge (V <sub>GS</sub> = 4.5V)	Q <sub>G</sub>	_	8.4	_	nC		
Total Gate Charge (V <sub>GS</sub> = 10V)	$Q_{G}$	_	17	_	nC	1	
Gate-Source Charge	Q <sub>GS</sub>	_	3.1	_	nC	$V_{DS} = 30V, I_{D} = 10A$	
Gate-Drain Charge	$Q_{GD}$	_	4.3	_	nC	1	
Turn-On Delay Time	t <sub>D(ON)</sub>	_	3.4	-	ns		
Turn-On Rise Time	t <sub>R</sub>	_	5.2	_	ns	$V_{DD} = 30V, V_{GS} = 10V,$	
Turn-Off Delay Time	t <sub>D(OFF)</sub>	_	13	-	ns	$I_D = 10A, R_G = 6\Omega$	
Turn-Off Fall Time	t <sub>F</sub>	_	7	_	ns		
Body Diode Reverse Recovery Time	t <sub>RR</sub>	_	22	_	ns	104 11/11 1004/	
Body Diode Reverse Recovery Charge	$Q_{RR}$	_	11	_	nC	$I_F = 10A$ , di/dt = 100A/ $\mu$ s	

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

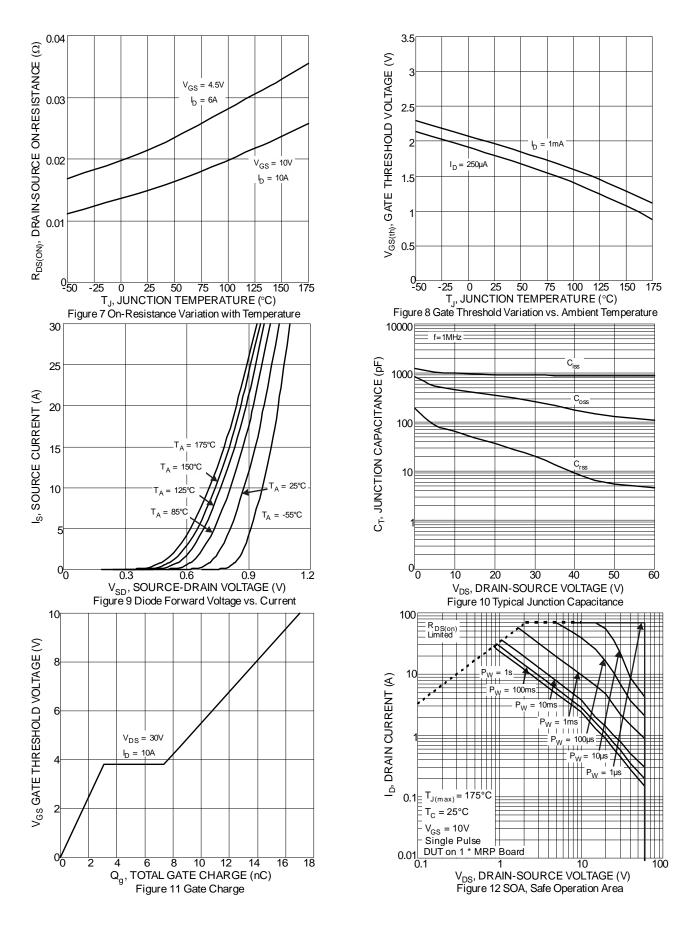
<sup>7.</sup> Thermal resistance from junction to soldering point (on the exposed drain pad).8. Short duration pulse test used to minimize self-heating effect.

<sup>9.</sup> Guaranteed by design. Not subject to product testing.

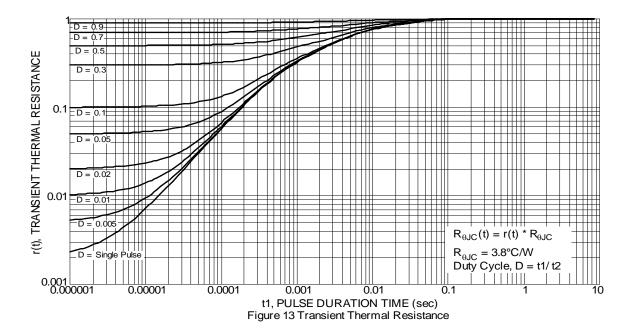










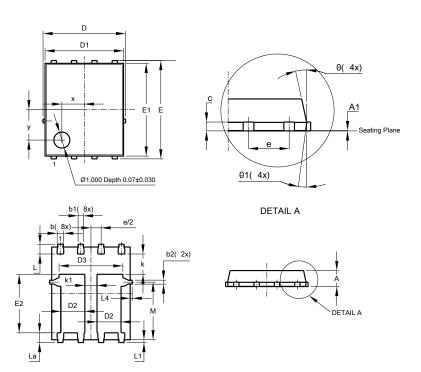




# **Package Outline Dimensions**

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

## PowerDI5060-8 (Type C)

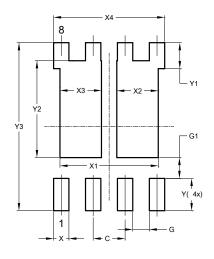


PowerDI5060-8 (Type C)					
Dim	Min	Max	Тур		
Α	0.90	1.10	1.00		
A1	0	0.05	0.02		
b	0.33	0.51	0.41		
b1	0.300	0.366	0.333		
b2	0.20	0.35	0.25		
С	0.23	0.33	0.277		
D		5.15 BSC	;		
D1	4.85	4.95	4.90		
D2	1.40	1.60	1.50		
D3	-	-	3.98		
Е	(	6.15 BSC	;		
E1	5.75	5.85	5.80		
E2	3.56	3.76	3.66		
е		1.27BSC	;		
k	-	-	1.27		
k1	0.56	-	-		
L	0.51	0.71	0.61		
La	0.51	0.71	0.61		
L1	0.05	0.20	0.175		
L4	-	-	0.125		
М	3.50	3.71	3.605		
Х	-	-	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		
Dilliensions	(in mm)		
С	1.270		
G	0.660		
G1	0.820		
Χ	0.610		
X1	3.910		
X2	1.650		
Х3	1.650		
X4	4.420		
Y	1.270		
Y1	1.020		
Y2	3.810		
Y3	6.610		



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## Офис по работе с юридическими лицами:

105318, г. Москва, ул. Щербаковская д. 3, офис 1107, 1118, ДЦ «Щербаковский»

Телефон: +7 495 668-12-70 (многоканальный)

Факс: +7 495 668-12-70 (доб.304)

E-mail: info@moschip.ru

Skype отдела продаж:

moschip.ru moschip.ru\_6 moschip.ru 4 moschip.ru 9