



#### 60V 175°C P-CHANNEL ENHANCEMENT MODE MOSFET

#### **Product Summary**

V <sub>(BR)DSS</sub>	R <sub>DS(ON)</sub> max	I <sub>D</sub> max T <sub>C</sub> = +25°C
2017	$50m\Omega$ @ $V_{GS} = -10V$	-23.6A
-60V	$70m\Omega @ V_{GS} = -4.5V$	-20A

#### **Features**

- Rated to +175°C Ideal for High Ambient Temperature Environments
- 100% Unclamped Inductive Switching Ensures More Reliable and Robust End Application
- Low Q<sub>g</sub> Minimizes Switching Loss
- Low R<sub>DS(ON)</sub> Minimizes On State Loss
- Lead-Free Finish; RoHS Compliant (Notes 1 & 2)
- Halogen and Antimony Free. "Green" Device (Note 3)
- Qualified to AEC-Q101 Standards for High Reliability
- An Automotive-Compliant Part is Available Under Separate Datasheet (<u>DMPH6050SK3Q</u>)

### **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:

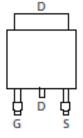
- Engine Management Systems
- Body Control Electronics
- DC-DC Converters

#### **Mechanical Data**

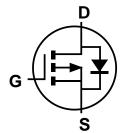
- Case: TO252 (DPAK)
- Case Material: Molded Plastic, "Green" Molding Compound; UL Flammability Classification Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminal Finish Matte Tin Annealed over Copper Leadframe.
   Solderable per MIL-STD-202, Method 208 <sup>23</sup>
- Weight: 0.315 grams (Approximate)







Pin Out Top View



**Equivalent Circuit** 

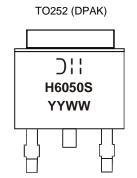
## **Ordering Information** (Note 4)

Part Number	Case	Packaging
DMPH6050SK3-13	TO252 (DPAK)	2,500/Tape & Reel

Notes:

- 1. EU Directive 2002/95/EC (RoHS) & 2011/65/EU (RoHS 2) compliant. All applicable RoHS exemptions applied.
- 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. For packaging details, go to our website at http://www.diodes.com/products/packages.html.

## **Marking Information**



Oll = Manufacturer's Marking H6050S = Product Type Marking Code YYWW = Date Code Marking YY = Last Digit of Year (ex: 15 = 2015) WW = Week Code (01 to 53)



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

Characteristic	Symbol	Value	Unit		
Drain-Source Voltage	V <sub>DSS</sub>	-60	V		
Gate-Source Voltage		V <sub>GSS</sub>	±20	V	
Continuous Durin Courset (Nata C) //	Steady State	$T_C = +25$ °C $T_C = +70$ °C	I <sub>D</sub>	-23.6 -19	А
Continuous Drain Current (Note 6) V <sub>GS</sub> = -10V	Steady State	T <sub>A</sub> = +25°C T <sub>A</sub> = +70°C	I <sub>D</sub>	-7.2 -6.0	А
Pulsed Drain Current (10µs pulse, duty cycle = 1%)	I <sub>DM</sub>	-40	А		
Maximum Continuous Body Diode Forward Current (	I <sub>S</sub>	-3.8	Α		
Avalanche Current (Note 7) L = 0.1mH	I <sub>AS</sub>	-25	А		
Avalanche Energy (Note 7) L = 0.1mH	E <sub>AS</sub>	31	mJ		

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

Characteristic	Symbol	Value	Unit	
Total Power Dissipation (Note 5)	$P_{D}$	1.9	W	
Thermal Resistance, Junction to Ambient (Note 5)	$R_{ heta JA}$	80	°C/W	
Total Power Dissipation (Note 6)	$P_{D}$	3.8	W	
Thermal Resistance, Junction to Ambient (Note 6)  Steady State		$R_{ heta JA}$	39	°C/W
Thermal Resistance, Junction to Case (Note 6)	$R_{ heta JC}$	3	C/VV	
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>	-60	_	_	V	$V_{GS} = 0V, I_D = -250\mu A$	
Zero Gate Voltage Drain Current T <sub>J</sub> = +25°C	I <sub>DSS</sub>			-1	μΑ	$V_{DS} = -60V, V_{GS} = 0V$	
Gate-Source Leakage	I <sub>GSS</sub>		_	±100	nΑ	$V_{GS} = \pm 20V, V_{DS} = 0V$	
ON CHARACTERISTICS (Note 8)							
Gate Threshold Voltage	V <sub>GS(TH)</sub>	-1	_	-3	V	$V_{DS} = V_{GS}, I_{D} = -250 \mu A$	
Static Drain-Source On-Resistance			_	50	mΩ	$V_{GS} = -10V, I_D = -7A$	
Static Dialii-Source Off-Resistance	R <sub>DS(ON)</sub>			70	mt2	$V_{GS} = -4.5V, I_{D} = -7A$	
Diode Forward Voltage	$V_{SD}$		-0.7	-1.2	V	$V_{GS} = 0V, I_{S} = -1A$	
DYNAMIC CHARACTERISTICS (Note 9)							
Input Capacitance	$C_{iss}$		1377	_	pF	V <sub>DS</sub> = -30V, V <sub>GS</sub> = 0V, f = 1MHz	
Output Capacitance	Coss	1	87	_	pF		
Reverse Transfer Capacitance	$C_{rss}$	1	68	_	pF	1 – 1101112	
Gate Resistance	$R_g$		12		Ω	$V_{DS} = 0V$ , $V_{GS} = 0V$ , $f = 1MHz$	
Total Gate Charge (V <sub>GS</sub> = -4.5V),	$Q_g$	1	12	_	nC		
Total Gate Charge (V <sub>GS</sub> = -10V)	$Q_g$		25	_	nC	) )/ 20\/   5A	
Gate-Source Charge	Qgs	l	3.8	_	nC	$V_{DS} = -30V, I_{D} = -5A$	
Gate-Drain Charge	$Q_{gd}$	_	4.9	_	nC	1	
Turn-On Delay Time	t <sub>D(ON)</sub>	1	5.3	_	ns	$V_{DS} = -30V, V_{GS} = -10V,$ $R_G = 3\Omega, I_D = -5A$	
Turn-On Rise Time	t <sub>R</sub>		8.6	_	ns		
Turn-Off Delay Time	t <sub>D(OFF)</sub>		49.4	_	ns		
Turn-Off Fall Time	t <sub>F</sub>		29.7	_	ns		
Body Diode Reverse Recovery Time	t <sub>RR</sub>	_	14.2	_	ns	-I <sub>F</sub> = -5A, di/dt = 100A/μs	
Body Diode Reverse Recovery Charge	Q <sub>RR</sub>	_	7.9	_	nC		

Notes: 5. Device mounted on FR-4 substrate PC board, 2oz copper, with minimum recommended pad layout.

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

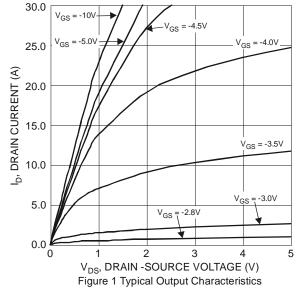
<sup>7.</sup>  $I_{AS}$  and  $E_{AS}$  rating are based on low frequency and duty cycles to keep  $T_J$  = +25°C.

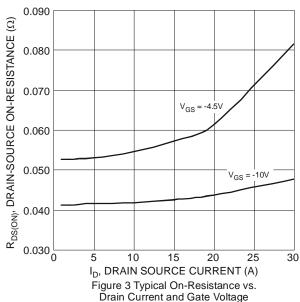
<sup>8.</sup> Short duration pulse test used to minimize self-heating effect.

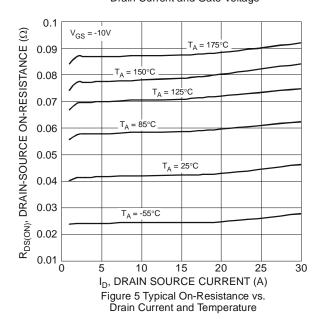
<sup>9.</sup> Guaranteed by design. Not subject to product testing.

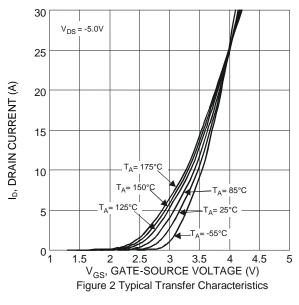


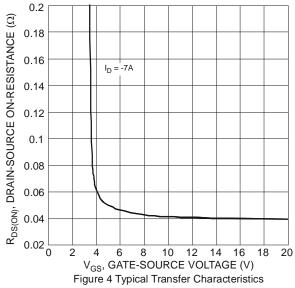












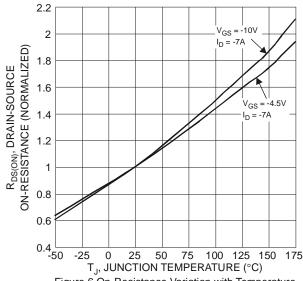
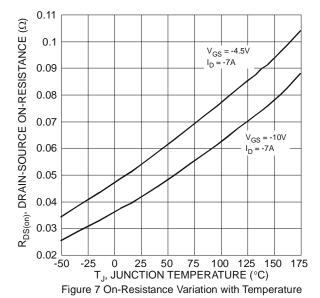
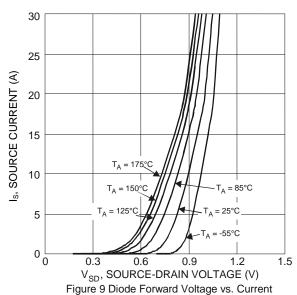


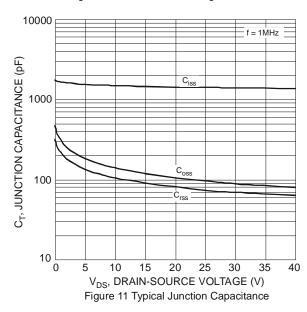
Figure 6 On-Resistance Variation with Temperature

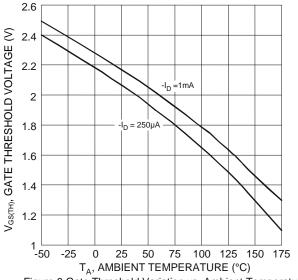


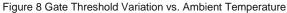












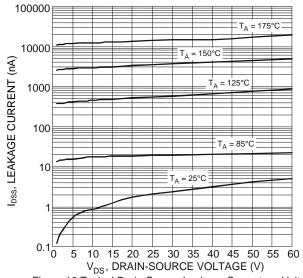
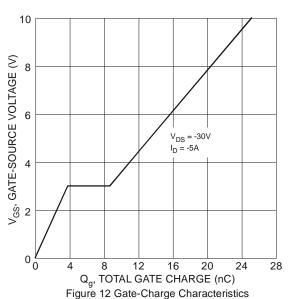
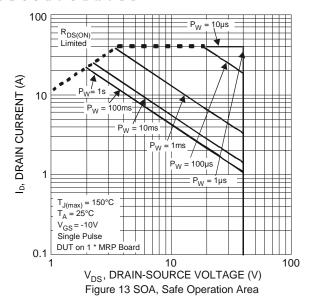


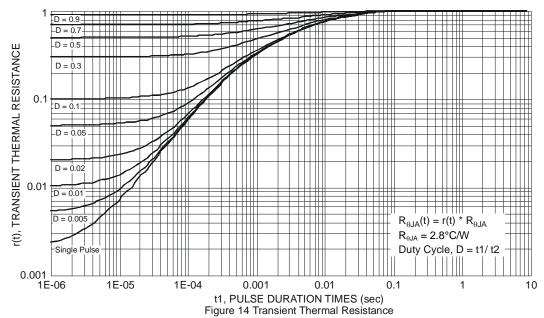
Figure 10 Typical Drain-Source Leakage Current vs. Voltage



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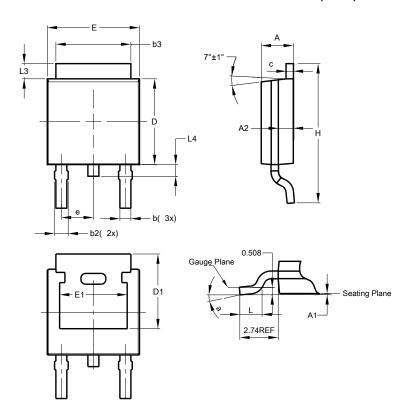




## **Package Outline Dimensions**

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

#### TO252 (DPAK)

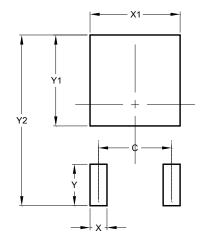


TO252 (DPAK)						
Dim	Min	Max	Тур			
Α	2.19	2.39	2.29			
<b>A1</b>	0.00	0.13	0.08			
A2	0.97	1.17	1.07			
þ	0.64	0.88	0.783			
b2	0.76	1.14	0.95			
b3	5.21	5.46	5.33			
С	0.45	0.58	0.531			
D	6.00	6.20	6.10			
D1	5.21	-	-			
е	-	-	2.286			
Е	6.45	6.70	6.58			
E1	4.32	-	-			
H	9.40	10.41	9.91			
L	1.40	1.78	1.59			
L3	0.88	1.27	1.08			
L4	0.64	1.02	0.83			
а	0°	10°				
All Dimensions in mm						

## **Suggested Pad Layout**

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

#### TO252 (DPAK)



Dimensions	Value (in mm)				
С	4.572				
Х	1.060				
X1	5.632				
Y	2.600				
Y1	5.700				
Y2	10.700				



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многоканальный

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