

#### PHD16N03LT-VB Datasheet

# N-Channel 30-V (D-S) MOSFET

PRODUCT SUMMARY						
V <sub>DS</sub> (V)	$R_{DS(on)}$ ( $\Omega$ )	I <sub>D</sub> (A) <sup>a, e</sup>	Q <sub>g</sub> (Typ)			
30	0.007 at V <sub>GS</sub> = 10 V	70	25 nC			
	$0.009 \text{ at V}_{GS} = 4.5 \text{ V}$	60	23110			

# TO-252

N-Channel MOSFET

#### **FEATURES**

- Trench Power MOSFET
- 100 %  $R_g$  and UIS Tested
- Compliant to RoHS Directive 2011/65/EU



#### **APPLICATIONS**

- OR-ing
- Server
- DC/DC

Parameter		Symbol	Limit	Unit
Drain-Source Voltage	V <sub>DS</sub>	30	V	
Gate-Source Voltage		V <sub>GS</sub>	± 20	V
	T <sub>C</sub> = 25 °C		70	
Continuous Drain Current (T <sub>.1</sub> = 175 °C)	T <sub>C</sub> = 70 °C		50	
Continuous Diam Current (1 j = 173 C)	T <sub>A</sub> = 25 °C	I <sub>D</sub>	21.8 <sup>b, c</sup>	A
	T <sub>A</sub> = 70 °C		18 <sup>b, c</sup>	_ ^
Pulsed Drain Current	I <sub>DM</sub>	200		
Avalanche Current Pulse	lanche Current Pulse L = 0.1 mH		39	
Single Pulse Avalanche Energy	L = U.1 IIII	E <sub>AS</sub>	94.8	mJ
Continuous Source-Drain Diode Current	T <sub>C</sub> = 25 °C	l.	50 <sup>a, e</sup>	A
Continuous Source-Diam blode Current	T <sub>A</sub> = 25 °C	I <sub>S</sub>	3.13 <sup>b, c</sup>	A
	T <sub>C</sub> = 25 °C		100 <sup>a</sup>	
Mariana Barra Birainata	T <sub>C</sub> = 70 °C		75	107
Maximum Power Dissipation	T <sub>A</sub> = 25 °C	P <sub>D</sub> —	3.25 <sup>b, c</sup>	W
	T <sub>A</sub> = 70 °C		2.33 <sup>b, c</sup>	
Operating Junction and Storage Temperature Ra	T <sub>J</sub> , T <sub>stg</sub>	- 55 to 175	°C	

THERMAL RESISTANCE RATINGS							
Parameter	Symbol	Тур.	Max.	Unit			
Maximum Junction-to-Ambient <sup>b, d</sup>	t ≤ 10 sec	$R_{thJA}$	32	40	°C/W		
Maximum Junction-to-Case	Steady State	R <sub>thJC</sub>	0.5	0.6	1 10/00		

#### Notes:

- a. Based on T<sub>C</sub> = 25 °C.
  b. Surface mounted on 1" x 1" FR4 board.

Top View

- b. Surface in the first policy.

  c. t = 10 sec.

  d. Maximum under steady state conditions is 90 °C/W.

  e. Calculated based on maximum junction temperature. Package limitation current is 90 A.



Parameter	Symbol	Test Conditions	Min.	Тур.	Max.	Unit
Static					l	
Drain-Source Breakdown Voltage	V <sub>DS</sub>	$V_{GS} = 0 \text{ V}, I_D = 250 \mu\text{A}$	30			V
V <sub>DS</sub> Temperature Coefficient	$\Delta V_{DS}/T_{J}$	J 250 \		35		mV/°C
V <sub>GS(th)</sub> Temperature Coefficient	$\Delta V_{GS(th)}/T_J$	I <sub>D</sub> = 250 μA		- 7.5		
Gate-Source Threshold Voltage	V <sub>GS(th)</sub>	$V_{DS} = V_{GS}, I_D = 250 \mu A$	1.5		2.0	V
Gate-Source Leakage	I <sub>GSS</sub>	$V_{DS} = 0 \text{ V}, V_{GS} = \pm 20 \text{ V}$			± 100	nA
Zana Oata Valtana Basis Oursest		$V_{DS} = 30 \text{ V}, V_{GS} = 0 \text{ V}$			1	4
Zero Gate Voltage Drain Current	IDSS	V <sub>DS</sub> = 30 V, V <sub>GS</sub> = 0 V, T <sub>J</sub> = 55 °C			10	μA
On-State Drain Current <sup>a</sup>	I <sub>D(on)</sub>	$V_{DS} \ge 5 \text{ V}, V_{GS} = 10 \text{ V}$	90			Α
		$V_{GS} = 10 \text{ V}, I_D = 21.8 \text{ A}$		0.007		Ω
Drain-Source On-State Resistance <sup>a</sup>	R <sub>DS(on)</sub>	$V_{GS} = 4.5 \text{ V}, I_D = 18A$		0.009		
Forward Transconductance <sup>a</sup>	9 <sub>fs</sub>	V <sub>DS</sub> = 15 V, I <sub>D</sub> = 21.8 A		160		S
Dynamic <sup>b</sup>				•		
Input Capacitance	C <sub>iss</sub>			2201		pF
Output Capacitance	C <sub>oss</sub>	$V_{DS} = 15 \text{ V}, V_{GS} = 0 \text{ V}, f = 1 \text{ MHz}$		525		
Reverse Transfer Capacitance	C <sub>rss</sub>			370		
Total Gate Charge	0	$V_{DS} = 15 \text{ V}, V_{GS} = 10 \text{ V}, I_D = 21.8 \text{ A}$		35 4	45	nC
	$Q_g$			25	35	
Gate-Source Charge	$Q_{gs}$	$V_{DS} = 15 \text{ V}, V_{GS} = 4.5 \text{ V}, I_{D} = 21.8 \text{ A}$		15		
Gate-Drain Charge	$Q_{gd}$			20		
Gate Resistance	R <sub>g</sub>	f = 1 MHz		1.4	2.1	Ω
Turn-On Delay Time	t <sub>d(on)</sub>			18	27	
Rise Time	t <sub>r</sub>	$V_{DD}$ = 15 V, $R_L$ = 0.625 $\Omega$		11	17	ns
Turn-Off Delay Time	t <sub>d(off)</sub>	$I_D\cong 24$ A, $V_{GEN}=10$ V, $R_g=1$ $\Omega$		70	105	
Fall Time	t <sub>f</sub>			10	15	
Turn-On Delay Time	t <sub>d(on)</sub>			55	83	
Rise Time	t <sub>r</sub>	$V_{DD}$ = 15 V, $R_L$ = 0.67 $\Omega$		180	270	
Turn-Off Delay Time	t <sub>d(off)</sub>	$I_D \cong 22.5 \text{ A}, V_{GEN} = 4.5 \text{ V}, R_g = 1 \Omega$		55	83	
Fall Time	t <sub>f</sub>			12	18	
<b>Drain-Source Body Diode Characteristic</b>	cs					
Continuous Source-Drain Diode Current	I <sub>S</sub>	$T_C = 25  ^{\circ}C$			120	Α
Pulse Diode Forward Current <sup>a</sup>	I <sub>SM</sub>				120	
Body Diode Voltage	V <sub>SD</sub>	I <sub>S</sub> = 22 A		0.8	1.2	V
Body Diode Reverse Recovery Time	t <sub>rr</sub>			52	78	ns
Body Diode Reverse Recovery Charge	Q <sub>rr</sub>	I <sub>F</sub> = 20 A, di/dt = 100 A/µs, T <sub>J</sub> = 25 °C		70.2	105	nC
Reverse Recovery Fall Time	t <sub>a</sub>	$t_a$ $t_b$ $t_F = 20 \text{ A, di/dt} = 100 \text{ A/}\mu\text{s, } t_J = 25 \text{ C}$		27		nc
Reverse Recovery Rise Time	t <sub>b</sub>			25		ns

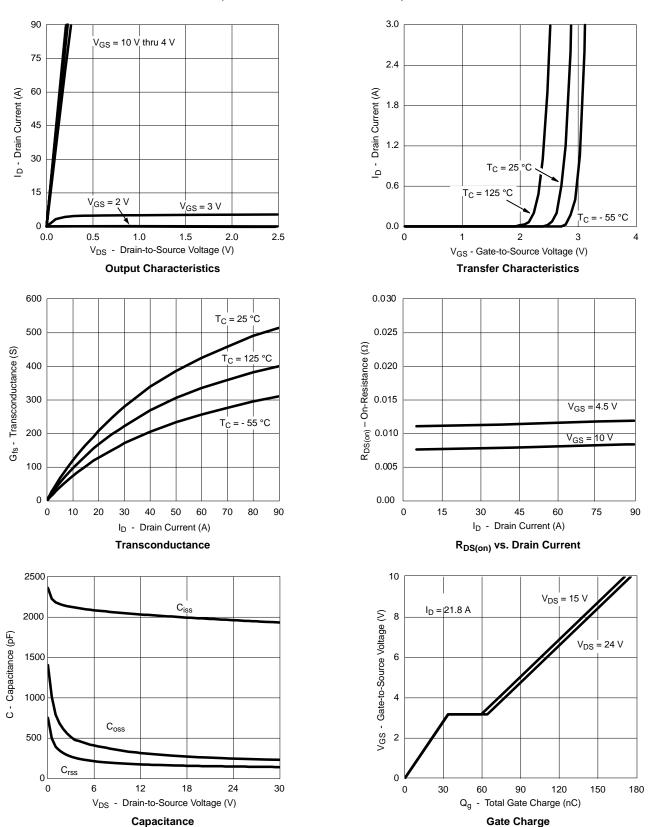
#### Notes:

- a. Pulse test; pulse width  $\leq 300~\mu s,$  duty cycle  $\leq 2~\%.$
- b. Guaranteed by design, not subject to production testing.

Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

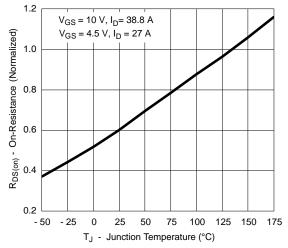


#### TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)





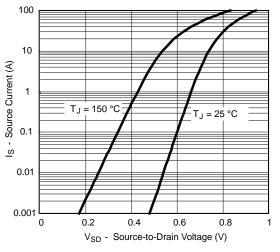
#### TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



On-Resistance vs. Junction Temperature



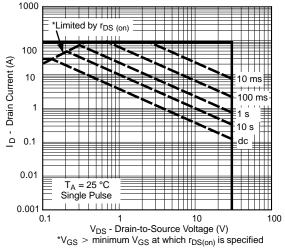
 $\rm R_{\rm DS(on)}$  vs.  $\rm V_{\rm GS}$  vs. Temperature



Forward Diode Voltage vs. Temperature



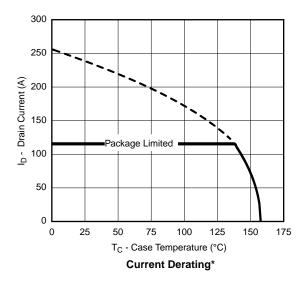
Threshold Voltage

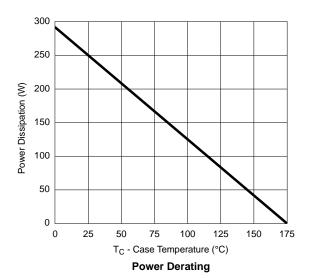


Safe Operating Area, Junction-to-Ambient



#### TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)





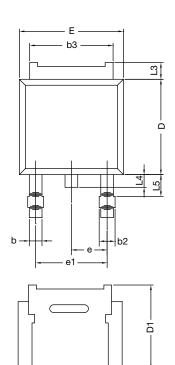
\*The power dissipation  $P_D$  is based on  $T_{J(max)}$  = 175 °C, using junction-to-case thermal resistance, and is more useful in settling the upper dissipation limit for cases where additional heatsinking is used. It is used to determine the current rating, when this rating falls below the package limit.

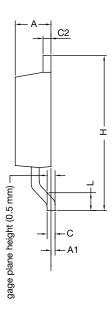


Normalized Thermal Transient Impedance, Junction-to-Case



# **TO-252AA CASE OUTLINE**





	MILLIMETERS		INC	HES	
DIM.	MIN.	MAX.	MIN.	MAX.	
Α	2.18	2.38	0.086	0.094	
A1	-	0.127	=	0.005	
b	0.64	0.88	0.025	0.035	
b2	0.76	1.14	0.030	0.045	
b3	4.95	5.46	0.195	0.215	
С	0.46	0.61	0.018	0.024	
C2	0.46	0.89	0.018	0.035	
D	5.97	6.22	0.235	0.245	
D1	5.21	-	0.205	-	
Е	6.35	6.73	0.250	0.265	
E1	4.32	-	0.170	=	
Н	9.40	10.41	0.370	0.410	
е	2.28	2.28 BSC		BSC	
e1	4.56 BSC		0.180 BSC		
L	1.40	1.78	0.055	0.070	
L3	0.89	1.27	0.035	0.050	
L4	-	1.02	-	0.040	
L5	1.14	1.52	0.045	0.060	
ECN: X12-0247-Rev. M, 24-Dec-12					

ECN: X12-0247-Rev. M, 24-Dec-12 DWG: 5347

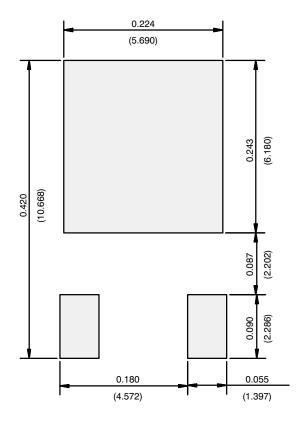
#### Note

• Dimension L3 is for reference only.



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#### **RECOMMENDED MINIMUM PADS FOR DPAK (TO-252)**



Recommended Minimum Pads Dimensions in Inches/(mm)



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