

PHP39N03T-VB Datasheet

N-Channel 30 V (D-S) MOSFET

PRODUCT SUMMARY	
V_{DS} (V)	30
$R_{DS(on)}$ (Ω) at $V_{GS} = 10$ V	0.007
$R_{DS(on)}$ (Ω) at $V_{GS} = 4.5$ V	0.010
I_D (A)	70
Configuration	Single
Package	TO-220AB

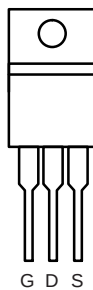
FEATURES

- Trench power MOSFET
- Package with low thermal resistance
- 100 % R_g and UIS tested



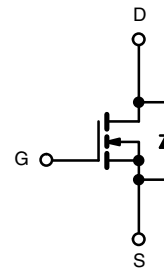
RoHS
COMPLIANT

TO-220AB



G D S

Top View



N-Channel MOSFET

ABSOLUTE MAXIMUM RATINGS ($T_C = 25$ °C, unless otherwise noted)				
PARAMETER		SYMBOL	LIMIT	UNIT
Drain-Source Voltage		V_{DS}	30	V
Gate-Source Voltage		V_{GS}	± 20	
Continuous Drain Current	$T_C = 25$ °C ^a	I_D	70	A
	$T_C = 125$ °C		50	
Continuous Source Current (Diode Conduction) ^a		I_S	70	
Pulsed Drain Current ^b		I_{DM}	250	
Single Pulse Avalanche Current	L = 0.1 mH	I_{AS}	33	mJ
Single Pulse Avalanche Energy		E_{AS}	54	
Maximum Power Dissipation ^b	$T_C = 25$ °C	P_D	71	W
	$T_C = 125$ °C		23	
Operating Junction and Storage Temperature Range		T_J, T_{stg}	-55 to +175	°C

THERMAL RESISTANCE RATINGS				
PARAMETER		SYMBOL	LIMIT	UNIT
Junction-to-Ambient	PCB Mount ^c	R_{thJA}	50	°C/W
Junction-to-Case (Drain)		R_{thJC}	2.1	

Notes

- Package limited.
- Pulse test; pulse width ≤ 300 μ s, duty cycle ≤ 2 %.
- When mounted on 1" square PCB (FR4 material).

SPECIFICATIONS (T _C = 25 °C, unless otherwise noted)							
PARAMETER	SYMBOL	TEST CONDITIONS		MIN.	TYP.	MAX.	UNIT
Static							
Drain-Source Breakdown Voltage	V _{DS}	V _{GS} = 0 V, I _D = 250 μA		30	-	-	V
Gate-Source Threshold Voltage	V _{GS(th)}	V _{DS} = V _{GS} , I _D = 250 μA		1.0		2.5	
Gate-Source Leakage	I _{GSS}	V _{DS} = 0 V, V _{GS} = ± 20 V		-	-	± 100	nA
Zero Gate Voltage Drain Current	I _{DSS}	V _{GS} = 0 V	V _{DS} = 30 V	-	-	1	μA
		V _{GS} = 0 V	V _{DS} = 30 V, T _J = 125 °C	-	-	50	
		V _{GS} = 0 V	V _{DS} = 30 V, T _J = 175 °C	-	-	150	
On-State Drain Current ^a	I _{D(on)}	V _{GS} = 10 V	V _{DS} ≥ 5 V	70	-	-	A
Drain-Source On-State Resistance ^a	R _{DS(on)}	V _{GS} = 10 V	I _D = 20 A	-	0.007	-	Ω
		V _{GS} = 10 V	I _D = 20 A, T _J = 125 °C	-	0.010	-	
		V _{GS} = 10 V	I _D = 20 A, T _J = 175 °C	-	0.014	-	
		V _{GS} = 4.5 V	I _D = 15 A	-	0.010	-	
Forward Transconductance ^b	g _{fs}	V _{DS} = 15 V, I _D = 15 A		-	100	-	S
Dynamic ^b							
Input Capacitance	C _{iss}	V _{GS} = 0 V	V _{DS} = 25 V, f = 1 MHz	-	-	1500	pF
Output Capacitance	C _{oss}			-	-	260	
Reverse Transfer Capacitance	C _{rss}			-	-	95	
Total Gate Charge ^c	Q _g	V _{GS} = 10 V	V _{DS} = 20 V, I _D = 50 A	-	46	75	nC
Gate-Source Charge ^c	Q _{gs}			-	10	-	
Gate-Drain Charge ^c	Q _{gd}			-	8	-	
Gate Resistance	R _g	f = 1 MHz		1.3	2.8	4.5	Ω
Turn-On Delay Time ^c	t _{d(on)}	V _{DD} = 20 V, R _L = 0.4 Ω I _D ≅ 50 A, V _{GEN} = 10 V, R _g = 1 Ω		-	9	15	ns
Rise Time ^c	t _r			-	19	30	
Turn-Off Delay Time ^c	t _{d(off)}			-	26	40	
Fall Time ^c	t _f			-	10	15	
Source-Drain Diode Ratings and Characteristics ^b							
Pulsed Current ^a	I _{SM}			-	-	200	A
Forward Voltage	V _{SD}	I _F = 30 A, V _{GS} = 0 V		-	0.87	1.5	V

Notes

- a. Pulse test; pulse width ≤ 300 μs, duty cycle ≤ 2 %.
b. Guaranteed by design, not subject to production testing.
c. Independent of operating temperature.

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 ($T_A = 25^\circ\text{C}$, unless otherwise noted)



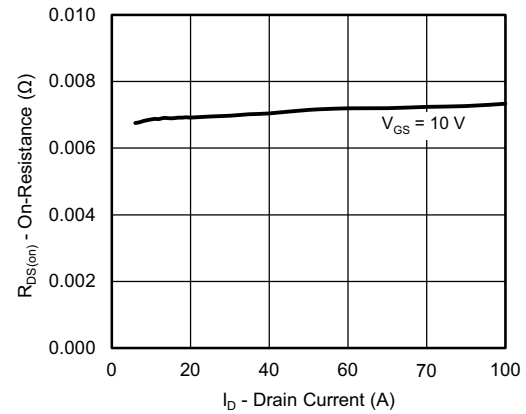
Output Characteristics



Transfer Characteristics



Transconductance



On-Resistance vs. Drain Current



Capacitance



Gate Charge

TYPICAL CHARACTERISTICS ($T_A = 25\text{ }^{\circ}\text{C}$, unless otherwise noted)



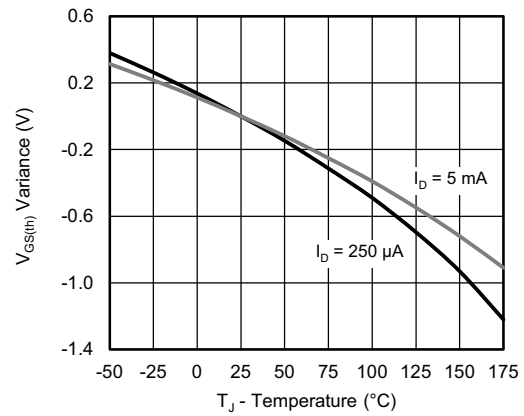
On-Resistance vs. Junction Temperature



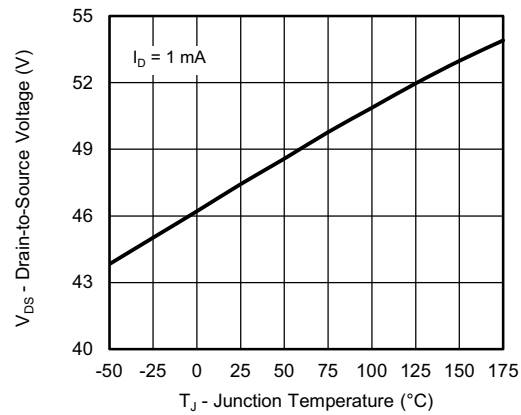
Source Drain Diode Forward Voltage



On-Resistance vs. Gate-to-Source Voltage



Threshold Voltage



Drain Source Breakdown vs. Junction Temperature

THERMAL RATINGS ($T_A = 25^\circ\text{C}$, unless otherwise noted)



Safe Operating Area



Normalized Thermal Transient Impedance, Junction-to-Ambient

THERMAL RATINGS ($T_A = 25\text{ }^{\circ}\text{C}$, unless otherwise noted)



Normalized Thermal Transient Impedance, Junction-to-Case

Note

- The characteristics shown in the two graphs
 - Normalized Transient Thermal Impedance Junction to Ambient ($25\text{ }^{\circ}\text{C}$)
 - Normalized Transient Thermal Impedance Junction to Case ($25\text{ }^{\circ}\text{C}$)
- are given for general guidelines only to enable the user to get a "ball park" indication of part capabilities. The data are extracted from single pulse transient thermal impedance characteristics which are developed from empirical measurements. The latter is valid for the part mounted on printed circuit board - FR4, size 1" x 1" x 0.062", double sided with 2 oz. copper, 100 % on both sides. The part capabilities can widely vary depending on actual application parameters and operating conditions.

TO-220AB



DIM.	MILLIMETERS		INCHES	
	MIN.	MAX.	MIN.	MAX.
A	4.25	4.65	0.167	0.183
b	0.69	1.01	0.027	0.040
b(1)	1.20	1.73	0.047	0.068
c	0.36	0.61	0.014	0.024
D	14.85	15.49	0.585	0.610
E	10.04	10.51	0.395	0.414
e	2.41	2.67	0.095	0.105
e(1)	4.88	5.28	0.192	0.208
F	1.14	1.40	0.045	0.055
H(1)	6.09	6.48	0.240	0.255
J(1)	2.41	2.92	0.095	0.115
L	13.35	14.02	0.526	0.552
L(1)	3.32	3.82	0.131	0.150
$\varnothing P$	3.54	3.94	0.139	0.155
Q	2.60	3.00	0.102	0.118
ECN: X12-0208-Rev. N, 08-Oct-12				
DWG: 5471				

Notes

* M = 1.32 mm to 1.62 mm (dimension including protrusion)
 Heatsink hole for HVM

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