

# P90N03TA-VB Datasheet N-Channel 30-V (D-S) MOSFET

PRODUCT SUMMARY					
V <sub>DS</sub> (V)	30				
$R_{DS(on)}(\Omega)$ at $V_{GS} = 10 \text{ V}$	0. 003				
$R_{DS(on)}(\Omega)$ at $V_{GS} = 4.5 \text{ V}$	0. 004				
I <sub>D</sub> (A)	120				
Configuration	Single				

#### **FEATURES**

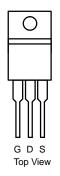
- Trench Power MOSFET
   100 % R<sub>g</sub> and UIS Tested
- Compliant to RoHS Directive 2011/65/EU

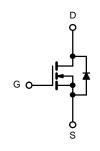


#### **APPLICATIONS**

- OR-ing
- Server
- DC/DC







N-Channel MOSFET

Parameter	Symbol	Limit	Unit		
Drain-Source Voltage		V <sub>DS</sub>	30	V	
Gate-Source Voltage		V <sub>GS</sub>	± 20	v	
Continuous Drain Current (T <sub>J</sub> = 175 °C)	T <sub>C</sub> = 25 °C		120	A	
	T <sub>C</sub> = 70 °C		60 <sup>e</sup>		
	T <sub>A</sub> = 25 °C	I <sub>D</sub>	28.8 <sup>b, c</sup>		
	T <sub>A</sub> = 70 °C		19 <sup>b, c</sup>		
Pulsed Drain Current		I <sub>DM</sub>	380		
Avalanche Current Pulse	L = 0.1 mH	I <sub>AS</sub>	36		
Single Pulse Avalanche Energy	L = 0.1 IIII	E <sub>AS</sub>	64.8	V	
Ocationary Course Breits Binds Course	T <sub>C</sub> = 25 °C	I-	90 <sup>a, e</sup>	Δ.	
Continuous Source-Drain Diode Current	T <sub>A</sub> = 25 °C	I <sub>S</sub>	3.13 <sup>b, c</sup>	Α	
	T <sub>C</sub> = 25 °C		250 <sup>a</sup>		
Maximum Power Dissipation	T <sub>C</sub> = 70 °C	В	175	10/	
	T <sub>A</sub> = 25 °C	P <sub>D</sub>	3.75 <sup>b, c</sup>	W	
	T <sub>A</sub> = 70 °C		2.63 <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 <sub>thJA</sub>	32	40	°C/W		
Maximum Junction-to-Case	Steady State	R <sub>thJC</sub>	0.5	0.6	- 10/00		

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

- d. 1 = 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.

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Parameter	Symbol	Test Conditions	Min.	Тур.	Max.	Unit	
Static			•		•		
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	$\Delta V_{DS}/T_{J}$	I <sub>D</sub> = 250 μA		35		mV/°C	
V <sub>GS(th)</sub> Temperature Coefficient	$\Delta V_{GS(th)}/T_J$	ι <sub>D</sub> = 250 μΑ		- 7.5			
Gate-Source Threshold Voltage	V <sub>GS(th)</sub>	$V_{DS} = V_{GS}, I_D = 250 \mu A$	1.0		2.5	V	
Gate-Source Leakage	I <sub>GSS</sub>	$V_{DS} = 0 \text{ V}, V_{GS} = \pm 20 \text{ V}$			± 100	nA	
Zero Gate Voltage Drain Current		$V_{DS} = 30 \text{ V}, V_{GS} = 0 \text{ V}$			1	μΑ	
	IDSS	$V_{DS} = 30 \text{ V}, V_{GS} = 0 \text{ V}, T_{J} = 55 ^{\circ}\text{C}$			10		
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	
		$V_{GS} = 10 \text{ V}, I_D = 28.8 \text{ A}$		0.003		Ω	
Drain-Source On-State Resistance <sup>a</sup>	R <sub>DS(on)</sub>	$V_{GS} = 4.5 \text{ V}, I_D = 27 \text{ A}$		0.004			
Forward Transconductance <sup>a</sup>	9 <sub>fs</sub>	V <sub>DS</sub> = 15 V, I <sub>D</sub> = 28.8 A		160		S	
Dynamic <sup>b</sup>							
Input Capacitance	C <sub>iss</sub>			3100		pF	
Output Capacitance	C <sub>oss</sub>	$V_{DS} = 15 \text{ V}, V_{GS} = 0 \text{ V}, f = 1 \text{ MHz}$		725			
Reverse Transfer Capacitance	C <sub>rss</sub>			370			
Total Gate Charge Q <sub>g</sub>	0	$V_{DS} = 15 \text{ V}, V_{GS} = 10 \text{ V}, I_D = 28.8 \text{ A}$		171	257	nC	
	Qg			81.5	123		
Gate-Source Charge	$Q_{gs}$	$V_{DS} = 15 \text{ V}, V_{GS} = 4.5 \text{ V}, I_{D} = 28.8 \text{ A}$		34			
Gate-Drain Charge	$Q_{gd}$			29			
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	ns	
Rise Time	t <sub>r</sub>	$V_{DD}$ = 15 V, $R_L$ = 0.625 $\Omega$		11	17		
Turn-Off Delay Time	t <sub>d(off)</sub>	$I_D \cong 24 \text{ A}, V_{GEN} = 10 \text{ V}, R_g = 1 \Omega$		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>	$I_D\cong 22.5$ A, $V_{GEN}=4.5$ V, $R_g=1$ $\Omega$		55	83		
Fall Time	t <sub>f</sub>			12	18		
<b>Drain-Source Body Diode Characteristic</b>	es		•	•	•		
Continuous Source-Drain Diode Current	I <sub>S</sub>	$T_C = 25  ^{\circ}C$			90	۸	
Pulse Diode Forward Current <sup>a</sup>	I <sub>SM</sub>				90	A	
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>	L_ = 20 A di/dt = 100 A/vo T = 25 °C		70.2	105	nC	
Reverse Recovery Fall Time	t <sub>a</sub>	$I_F = 20 \text{ A}, \text{ di/dt} = 100 \text{ A/}\mu\text{s}, T_J = 25 \text{ °C}$		27		25	
Reverse Recovery Rise Time	t <sub>b</sub>			25		ns	

#### Notes:

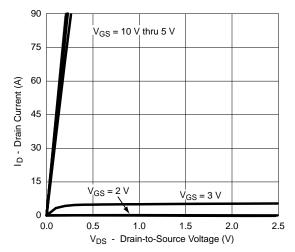
- a. Pulse test; pulse width  $\leq 300~\mu s,$  duty cycle  $\leq 2~\%.$
- b. Guaranteed by design, not subject to production testing.

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.

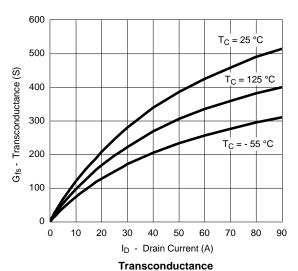
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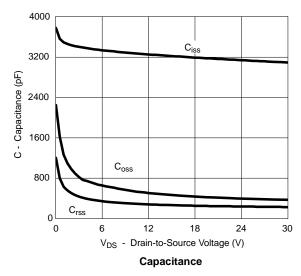
### TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)

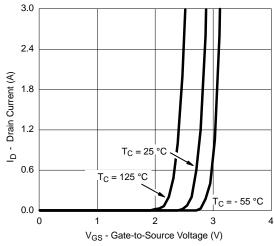


#### **Output Characteristics**

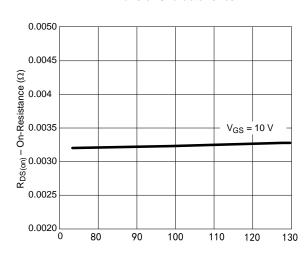


Transconductions.

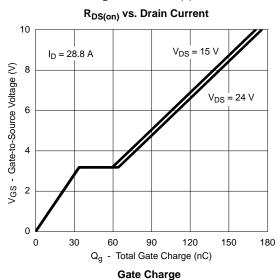




**Transfer Characteristics** 



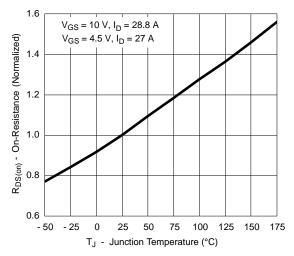
I<sub>D</sub> - Drain Current (A)



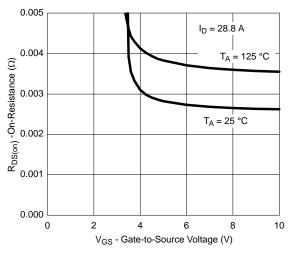
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#### TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



On-Resistance vs. Junction Temperature



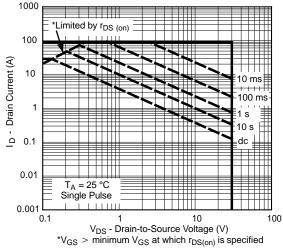
 $R_{DS(on)}$  vs.  $V_{GS}$  vs. Temperature



Forward Diode Voltage vs. Temperature



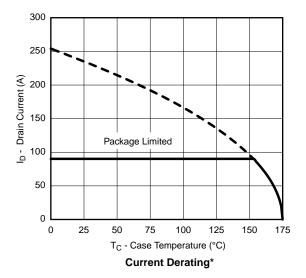
Threshold Voltage



Safe Operating Area, Junction-to-Ambient

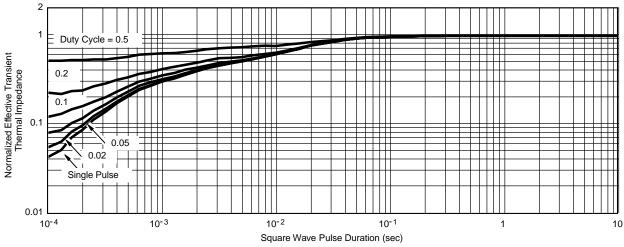


#### TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)





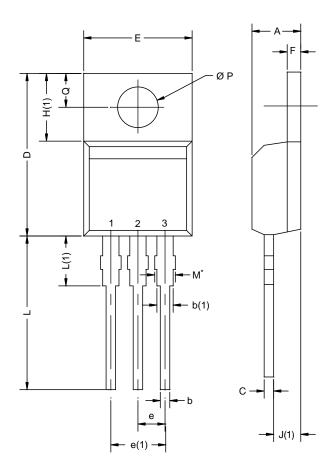
\*The power dissipation  $P_D$  is based on  $T_{J(max)}$  = 175 °C, using junction-to-case thermal resistance, and is more useful in settling the upper dissipation limit for cases where additional heatsinking is used. It is used to determine the current rating, when this rating falls below the package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



Normalized Thermal Transient Impedance, Junction-to-Case



## **TO-220AB**



	MILLIM	IETERS	INC	HES	
DIM.	MIN.	MAX.	MIN.	MAX.	
Α	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	
С	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	
е	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	
ØΡ	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

 $<sup>^{\</sup>star}$  M = 1.32 mm to 1.62 mm (dimension including protrusion) Heatsink hole for HVM



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