

# TSM85N10CZ-VB Datasheet

## N-Channel 100-V (D-S) 175 °C MOSFET

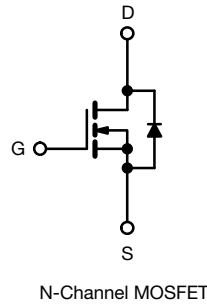
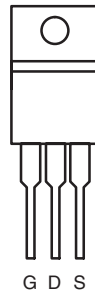
PRODUCT SUMMARY	
$V_{DS}$ (V)	100
$R_{DS(on)}$ ( $\Omega$ ) at $V_{GS} = 10$ V	0.009
$R_{DS(on)}$ ( $\Omega$ ) at $V_{GS} = 4.5$ V	0.020
$I_D$ (A)	100
Configuration	Single

### FEATURES

- TrenchFET® Power MOSFET
- 175 °C Maximum Junction Temperature
- Compliant to RoHS Directive 2002/95/EC



TO-220AB



ABSOLUTE MAXIMUM RATINGS $T_A = 25$ °C, unless otherwise noted				
Parameter	Symbol	Limit	Unit	
Drain-Source Voltage	$V_{DS}$	100	V	
Gate-Source Voltage	$V_{GS}$	$\pm 20$		
Continuous Drain Current ( $T_J = 150$ °C)	$I_D$	$T_C = 25$ °C	100	A
		$T_C = 125$ °C	75 <sup>a</sup>	
Pulsed Drain Current	$I_{DM}$	300		
Avalanche Current	$I_{AS}$	75		
Single Pulse Avalanche Energy <sup>b</sup>	$E_{AS}$	280	mJ	
Maximum Power Dissipation <sup>b</sup>	$P_D$	$T_C = 25$ °C (TO-220AB and TO-263)	250 <sup>c</sup>	W
		$T_A = 25$ °C (TO-263) <sup>d</sup>	3.75	
Operating Junction and Storage Temperature Range	$T_J, T_{stg}$	- 55 to 175	°C	

THERMAL RESISTANCE RATINGS				
Parameter	Symbol	Limit	Unit	
Junction-to-Ambient	$R_{thJA}$	PCB Mount (TO-263) <sup>d</sup>	40	°C/W
		Free Air (TO-220AB)	62.5	
Junction-to-Case	$R_{thJC}$	0.6		

Notes:

- a. Pulse test; pulse width  $\leq 300$   $\mu$ s, duty cycle  $\leq 2$  %.  
 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.

SPECIFICATIONS $T_J = 25\text{ }^{\circ}\text{C}$ , unless otherwise noted						
Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Unit
Static						
Drain-Source Breakdown Voltage	$V_{DS}$	$V_{GS} = 0\text{ V}$ , $I_D = 250\text{ }\mu\text{A}$	100			V
Gate-Threshold Voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}$ , $I_D = 250\text{ }\mu\text{A}$	2		4	
Gate-Body Leakage	$I_{GSS}$	$V_{DS} = 0\text{ V}$ , $V_{GS} = \pm 20\text{ V}$			$\pm 100$	nA
Zero Gate Voltage Drain Current	$I_{DSS}$	$V_{DS} = 100\text{ V}$ , $V_{GS} = 0\text{ V}$			1	$\mu\text{A}$
		$V_{DS} = 100\text{ V}$ , $V_{GS} = 0\text{ V}$ , $T_J = 125\text{ }^{\circ}\text{C}$			50	
		$V_{DS} = 100\text{ V}$ , $V_{GS} = 0\text{ V}$ , $T_J = 175\text{ }^{\circ}\text{C}$			250	
On-State Drain Current <sup>a</sup>	$I_{D(on)}$	$V_{DS} = \geq 5\text{ V}$ , $V_{GS} = 10\text{ V}$	120			A
Drain-Source On-State Resistance <sup>a</sup>	$R_{DS(on)}$	$V_{GS} = 10\text{ V}$ , $I_D = 30\text{ A}$		0.009		$\Omega$
		$V_{GS} = 4.5\text{ V}$ , $I_D = 20\text{ A}$		0.020		
		$V_{GS} = 10\text{ V}$ , $I_D = 30\text{ A}$ , $T_J = 125\text{ }^{\circ}\text{C}$		0.023		
		$V_{GS} = 10\text{ V}$ , $I_D = 30\text{ A}$ , $T_J = 175\text{ }^{\circ}\text{C}$		0.030		
Forward Transconductance <sup>a</sup>	$g_{fs}$	$V_{DS} = 15\text{ V}$ , $I_D = 30\text{ A}$	25			S
Dynamic <sup>b</sup>						
Input Capacitance	$C_{iss}$	$V_{GS} = 0\text{ V}$ , $V_{DS} = 25\text{ V}$ , $f = 1\text{ MHz}$		4700		pF
Output Capacitance	$C_{oss}$			665		
Reverse Transfer Capacitance	$C_{rss}$			265		
Total Gate Charge <sup>c</sup>	$Q_g$	$V_{DS} = 50\text{ V}$ , $V_{GS} = 10\text{ V}$ , $I_D = 85\text{ A}$		105	160	nC
Gate-Source Charge <sup>c</sup>	$Q_{gs}$			17		
Gate-Drain Charge <sup>c</sup>	$Q_{gd}$			23		
Turn-On Delay Time <sup>c</sup>	$t_{d(on)}$	$V_{DD} = 50\text{ V}$ , $R_L = 0.6\text{ }\Omega$ $I_D \cong 85\text{ A}$ , $V_{GEN} = 10\text{ V}$ , $R_g = 2.5\text{ }\Omega$		12	25	ns
Rise Time <sup>c</sup>	$t_r$			90	135	
Turn-Off DelayTime <sup>c</sup>	$t_{d(off)}$			55	85	
Fall Time <sup>c</sup>	$t_f$			130	195	
Source-Drain Diode Ratings and Characteristics $T_C = 25\text{ }^{\circ}\text{C}$ <sup>b</sup>						
Continuous Current	$I_S$				85	A
Pulsed Current	$I_{SM}$				240	
Forward Voltage <sup>a</sup>	$V_{SD}$	$I_F = 85\text{ A}$ , $V_{GS} = 0\text{ V}$		1.0	1.5	V
Reverse Recovery Time	$t_{rr}$	$I_F = 50\text{ A}$ , $dI/dt = 100\text{ A}/\mu\text{s}$		85	140	ns
Peak Reverse Recovery Current	$I_{RM(REC)}$			4.5	7	A
Reverse Recovery Charge	$Q_{rr}$			0.17	0.35	$\mu\text{C}$

Notes:

- a. Pulse test; pulse width  $\leq 300\text{ }\mu\text{s}$ , duty cycle  $\leq 2\%$ .  
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 c. Independent of operating temperature.

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



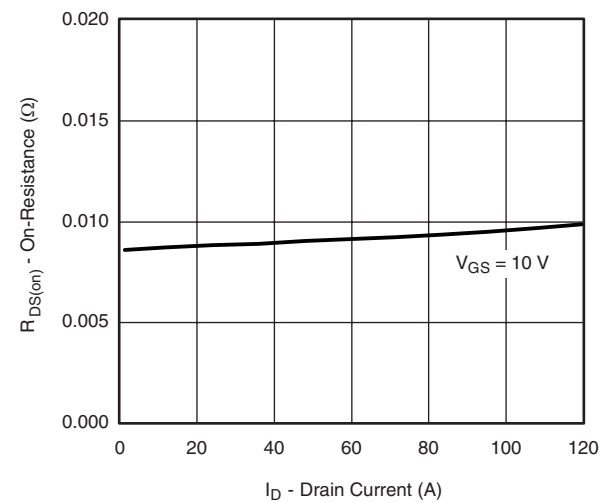
**Output Characteristics**



**Transfer Characteristics**



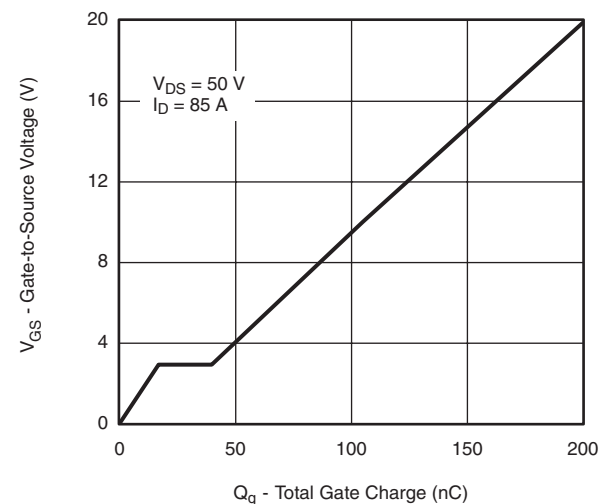
**Transconductance**



**On-Resistance vs. Drain Current**



**Capacitance**



**Gate Charge**

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



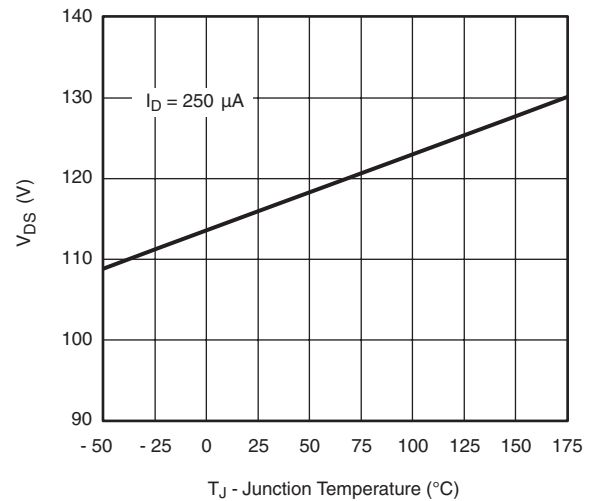
**On-Resistance vs. Junction Temperature**



**Source-Drain Diode Forward Voltage**



**Avalanche Current vs. Time**



**$T_J$  - Drain-Source Breakdown vs. Junction-Temperature**

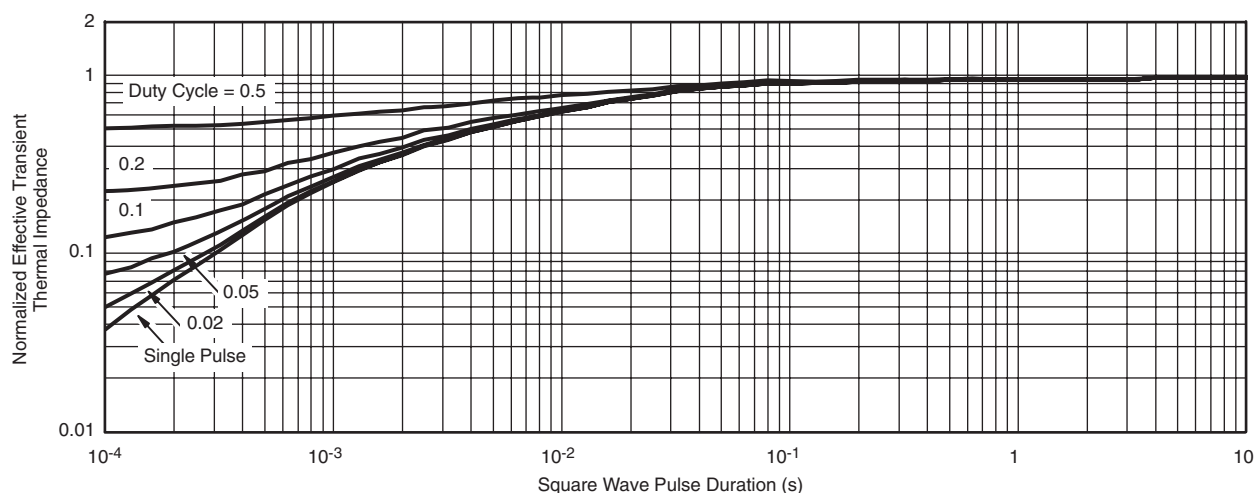
## THERMAL RATINGS



**Maximum Avalanche and Drain Current  
vs. Case Temperature**



**Safe Operating Area**  
 $* V_{GS} > \text{minimum } V_{GS} \text{ at which } R_{DS(on)} \text{ is specified}$



**Normalized Thermal Transient Impedance, Junction-to-Case**

## 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
D2	12.19	12.70	0.480	0.500
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: T14-0413-Rev. P, 16-Jun-14  
 DWG: 5471

**Note**

\*  $M = 1.32 \text{ mm to } 1.62 \text{ mm}$  (dimension including protrusion)  
 Heatsink hole for HVM



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