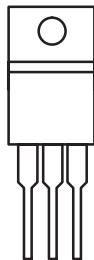


## N-Channel 100-V (D-S) 175 °C MOSFET

PRODUCT SUMMARY		
$V_{DS}$ (V)	$R_{DS(on)}$ ( $\Omega$ )	$I_D$ (A)
100	0.0105 at $V_{GS} = 10$ V	85 <sup>a</sup>
	0.012 at $V_{GS} = 4.5$ V	

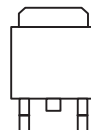
**FEATURES**

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

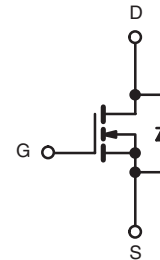

**RoHS  
COMPLIANT**
**TO-220AB**

 G D S  
Top View

SUP85N10-10

DRAIN connected to TAB

**TO-263**

 G D S  
Top View

SUB85N10-10



N-Channel MOSFET

**ORDERING INFORMATION**

Package	Lead (Pb)-free
TO-220AB	SUP85N10-10-E3
TO-263	SUB85N10-10-E3

**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	85 <sup>a</sup>
		$T_C = 125$ °C	60 <sup>a</sup>
Pulsed Drain Current	$I_{DM}$	240	A
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>
		$T_A = 25$ °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
		Free Air (TO-220AB)	62.5
Junction-to-Case	$R_{thJC}$	0.6	°C/W

**Notes:**

- Package limited.
- Duty cycle  $\leq 1$  %.
- See SOA curve for voltage derating.
- When mounted on 1" square PCB (FR-4 material).

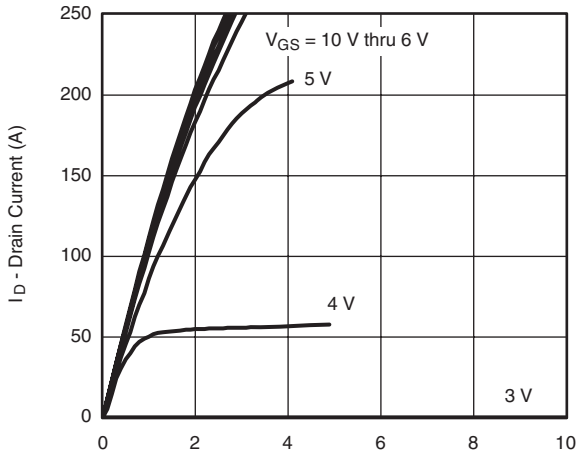
<b>SPECIFICATIONS</b> $T_J = 25\text{ }^\circ\text{C}$ , unless otherwise noted						
Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Unit
<b>Static</b>						
Drain-Source Breakdown Voltage	$V_{DS}$	$V_{GS} = 0\text{ V}, I_D = 250\text{ }\mu\text{A}$	100			V
Gate-Threshold Voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}, I_D = 250\text{ }\mu\text{A}$	1		3	
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>	$R_{DS(on)}$	$V_{GS} = 10\text{ V}, I_D = 30\text{ A}$		0.0085	0.0105	$\Omega$
		$V_{GS} = 4.5\text{ V}, I_D = 20\text{ A}$		0.010	0.012	
		$V_{GS} = 10\text{ V}, I_D = 30\text{ A}, T_J = 125\text{ }^\circ\text{C}$			0.017	
		$V_{GS} = 10\text{ V}, I_D = 30\text{ A}, T_J = 175\text{ }^\circ\text{C}$			0.022	
Forward Transconductance <sup>a</sup>	$g_{fs}$	$V_{DS} = 15\text{ V}, I_D = 30\text{ A}$	25			S
<b>Dynamic<sup>b</sup></b>						
Input Capacitance	$C_{iss}$	$V_{GS} = 0\text{ V}, V_{DS} = 25\text{ V}, f = 1\text{ MHz}$		6550		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 Delay Time <sup>c</sup>	$t_{d(off)}$			55	85	
Fall Time <sup>c</sup>	$t_f$			130	195	
<b>Source-Drain Diode Ratings and Characteristics</b> $T_C = 25\text{ }^\circ\text{C}$ <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:**

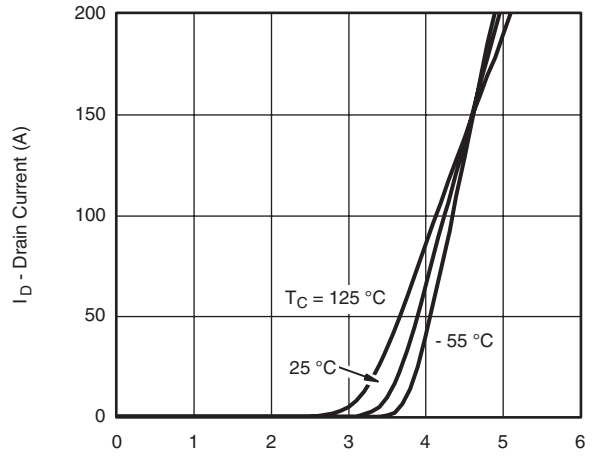
- Pulse test; pulse width  $\leq 300\text{ }\mu\text{s}$ , duty cycle  $\leq 2\%$ .
- Guaranteed by design, not subject to production testing.
- Independent of operating temperature.

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.

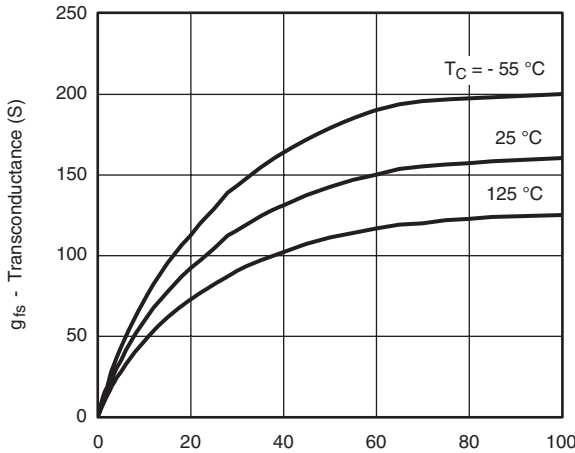
**TYPICAL CHARACTERISTICS**  $T_A = 25\text{ }^\circ\text{C}$ , unless otherwise noted



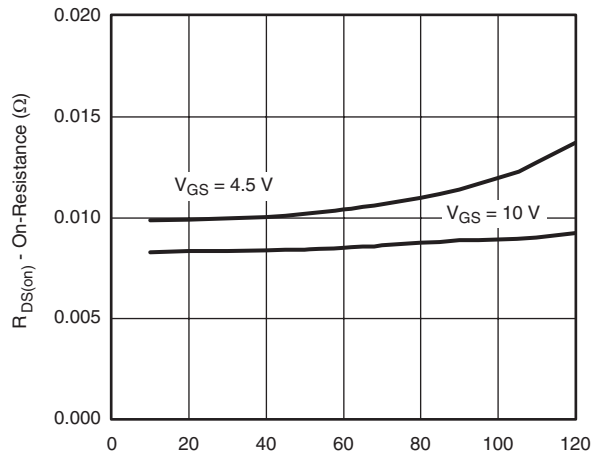
$V_{GS} = 10\text{ V thru } 6\text{ V}$   
**Output Characteristics**



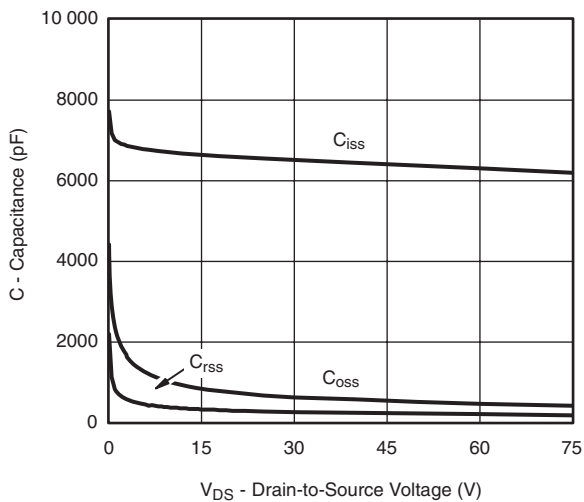
$T_C = 125\text{ }^\circ\text{C}$   
 $25\text{ }^\circ\text{C}$   
 $-55\text{ }^\circ\text{C}$   
**Transfer Characteristics**



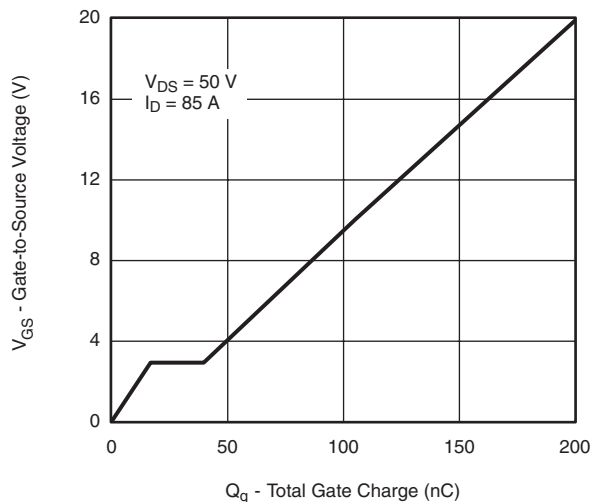
$T_C = -55\text{ }^\circ\text{C}$   
 $25\text{ }^\circ\text{C}$   
 $125\text{ }^\circ\text{C}$   
**Transconductance**



$V_{GS} = 4.5\text{ V}$   
 $V_{GS} = 10\text{ V}$   
**On-Resistance vs. Drain Current**

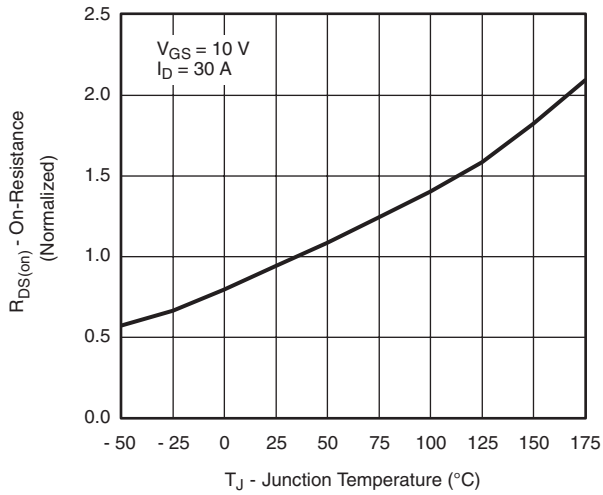


**Capacitance**

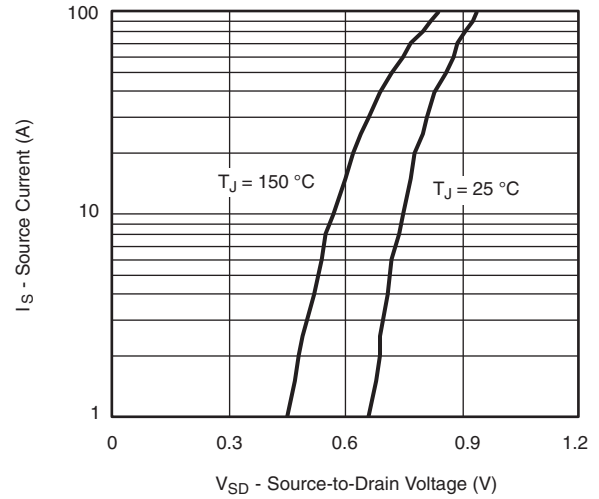


$V_{DS} = 50\text{ V}$   
 $I_D = 85\text{ A}$   
**Gate Charge**

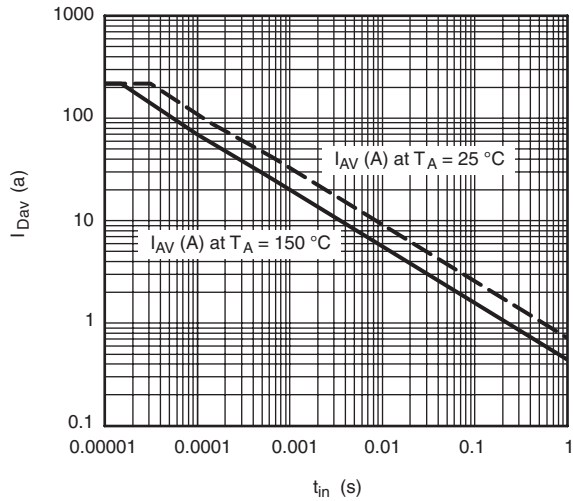
**TYPICAL CHARACTERISTICS**  $T_A = 25\text{ }^\circ\text{C}$ , unless otherwise noted



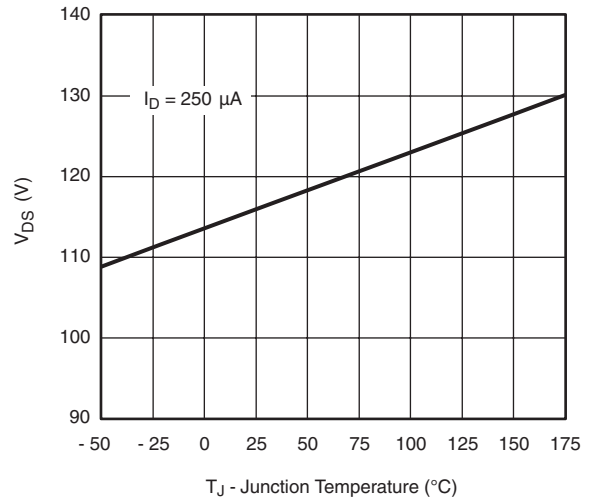
**On-Resistance vs. Junction Temperature**



**Source-Drain Diode Forward Voltage**

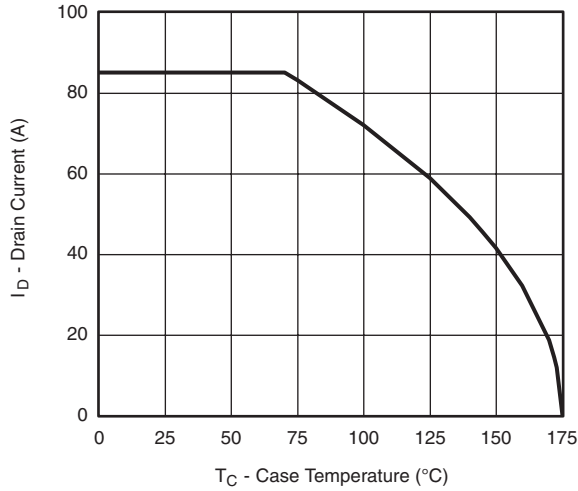


**Avalanche Current vs. Time**

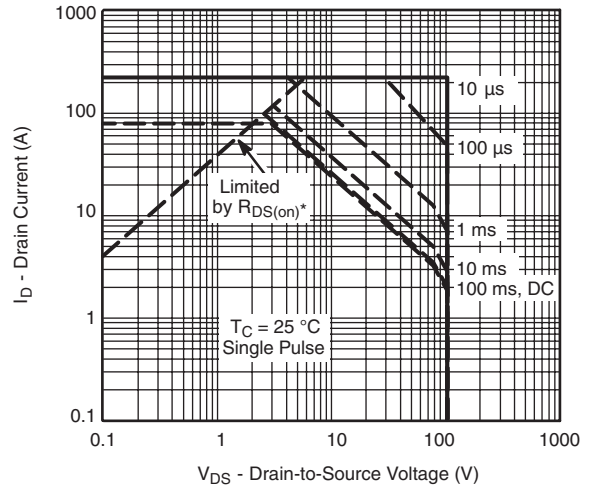


**$T_J$  - Drain-Source Breakdown vs. Junction-Temperature**

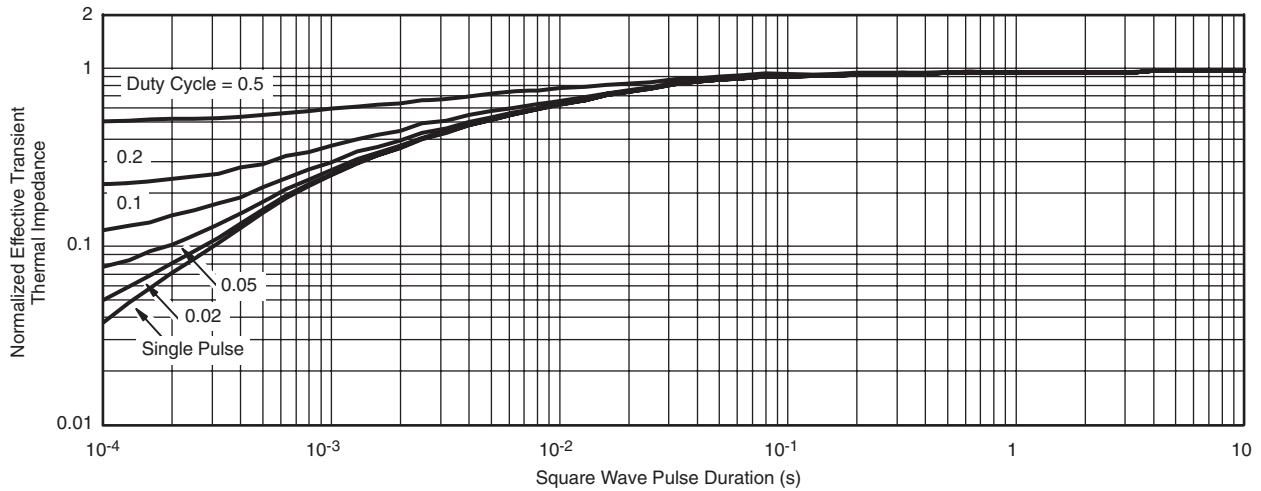
**THERMAL RATINGS**



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



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



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

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### 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
Ø 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 mm to 1.62 mm (dimension including protrusion)  
Heatsink hole for HVM





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