

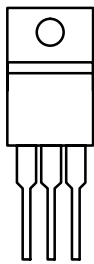


## N-Channel 20-V (D-S) 175°C MOSFET

**175°C Rated**  
Maximum Junction Temperature  
**TrenchFET®**  
Power MOSFETs

PRODUCT SUMMARY		
$V_{(BR)DSS}$ (V)	$r_{DS(on)}$ ( $\Omega$ )	$I_D$ (A) <sup>a</sup>
20	0.003 @ $V_{GS} = 4.5$ V	85
	0.0034 @ $V_{GS} = 2.5$ V	85
	0.0038 @ $V_{GS} = 1.8$ V	85

TO-220AB

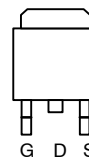


Top View

Ordering Information:  
SUP85N02-03—E3 (Lead Free)

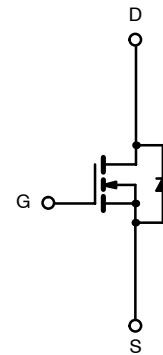
DRAIN connected to TAB

TO-263



Top View

Ordering Information:  
SUB85N02-03—E3 (Lead Free)



N-Channel MOSFET

ABSOLUTE MAXIMUM RATINGS ( $T_C = 25^\circ\text{C}$ UNLESS OTHERWISE NOTED)			
Parameter	Symbol	Limit	Unit
Drain-Source Voltage	$V_{DS}$	20	V
Gate-Source Voltage	$V_{GS}$	$\pm 8$	
Continuous Drain Current ( $T_J = 175^\circ\text{C}$ ) <sup>a</sup>	$I_D$	$T_C = 25^\circ\text{C}$	A
		$T_C = 100^\circ\text{C}$	
Pulsed Drain Current	$I_{DM}$	240	A
Avalanche Current	$I_{AR}$	30	
Repetitive Avalanche Energy <sup>b</sup>	$E_{AR}$	L = 0.1 mH	mJ
Power Dissipation <sup>a</sup>			
Operating Junction and Storage Temperature Range	$T_J, T_{stg}$	-55 to 175	$^\circ\text{C}$

THERMAL RESISTANCE RATINGS			
Parameter	Symbol	Limit	Unit
Junction-to-Ambient	$R_{thJA}$	PCB Mount (TO-263) <sup>c</sup>	$^\circ\text{C}/\text{W}$
		Free Air (TO-220AB)	
Junction-to-Case	$R_{thJC}$	0.6	

Notes:

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



MOSFET SPECIFICATIONS (T <sub>J</sub> = 25 °C UNLESS OTHERWISE NOTED)						
Parameter	Symbol	Test Condition	Min	Typ	Max	Unit
<b>Static</b>						
Drain-Source Breakdown Voltage	V <sub>(BR)DSS</sub>	V <sub>GS</sub> = 0 V, I <sub>D</sub> = 2 mA	20			V
Gate Threshold Voltage	V <sub>GS(th)</sub>	V <sub>DS</sub> = V <sub>GS</sub> , I <sub>DS</sub> = 2 mA	0.45			
Gate-Body Leakage	I <sub>GSS</sub>	V <sub>DS</sub> = 0 V, V <sub>GS</sub> = ± 8 V			± 100	nA
Zero Gate Voltage Drain Current	I <sub>DSS</sub>	V <sub>DS</sub> = 20 V, V <sub>GS</sub> = 0 V			1	μA
		V <sub>DS</sub> = 20 V, V <sub>GS</sub> = 0 V, T <sub>J</sub> = 125 °C			250	
On-State Drain Current <sup>a</sup>	I <sub>D(on)</sub>	V <sub>DS</sub> = 5 V, V <sub>GS</sub> = 4.5 V	120			A
Drain-Source On-State Resistance <sup>a</sup>	r <sub>DS(on)</sub>	V <sub>GS</sub> = 4.5 V, I <sub>D</sub> = 30 A		0.0025	0.003	Ω
		V <sub>GS</sub> = 4.5 V, I <sub>D</sub> = 30 A, T <sub>J</sub> = 125 °C			0.0042	
		V <sub>GS</sub> = 4.5 V, I <sub>D</sub> = 30 A, T <sub>J</sub> = 175 °C			0.005	
		V <sub>GS</sub> = 2.5 V, I <sub>D</sub> = 30 A		0.0027	0.0034	
		V <sub>GS</sub> = 1.8 V, I <sub>D</sub> = 30 A		0.003	0.0038	
Forward Transconductance <sup>a</sup>	g <sub>fs</sub>	V <sub>DS</sub> = 5 V, I <sub>D</sub> = 30 A	30			S
<b>Dynamic<sup>b</sup></b>						
Input Capacitance	C <sub>iss</sub>	V <sub>GS</sub> = 0 V, V <sub>DS</sub> = 20 V, f = 1 MHz		21250		pF
Output Capacitance	C <sub>oss</sub>			2350		
Reverse Transfer Capacitance	C <sub>rss</sub>			1520		
Total Gate Charge <sup>c</sup>	Q <sub>g</sub>	V <sub>DS</sub> = 10 V, V <sub>GS</sub> = 4.5 V, I <sub>D</sub> = 85 A		140	200	nC
Gate-Source Charge <sup>c</sup>	Q <sub>gs</sub>			18		
Gate-Drain Charge <sup>c</sup>	Q <sub>gd</sub>			24		
Turn-On Delay Time <sup>c</sup>	t <sub>d(on)</sub>	V <sub>DD</sub> = 10 V, R <sub>L</sub> = 0.12 Ω I <sub>D</sub> = 85 A, V <sub>GEN</sub> = 4.5 V, R <sub>g</sub> = 2.5 Ω		20	30	ns
Rise Time <sup>c</sup>	t <sub>r</sub>			200	300	
Turn-Off Delay Time <sup>c</sup>	t <sub>d(off)</sub>			450	670	
Fall Time <sup>c</sup>	t <sub>f</sub>			320	480	
<b>Source-Drain Diode Ratings and Characteristics (T<sub>C</sub> = 25 °C)<sup>b</sup></b>						
Pulsed Current	I <sub>SM</sub>				240	A
Forward Voltage <sup>a</sup>	V <sub>SD</sub>	I <sub>F</sub> = 100 A, V <sub>GS</sub> = 0 V		1.2	1.5	V
Reverse Recovery Time	t <sub>rr</sub>	I <sub>F</sub> = 50 A, di/dt = 100 A/μs		75	150	ns

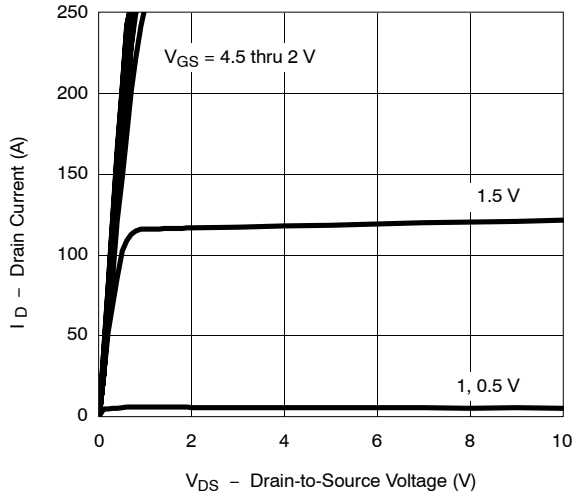
Notes:

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

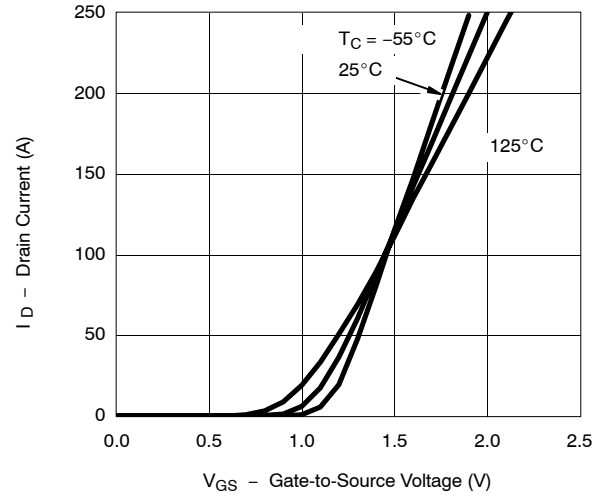


**TYPICAL CHARACTERISTICS (25°C UNLESS NOTED)**

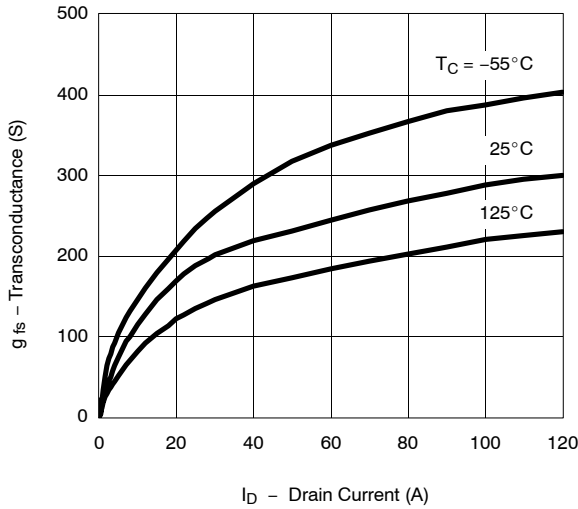
**Output Characteristics**



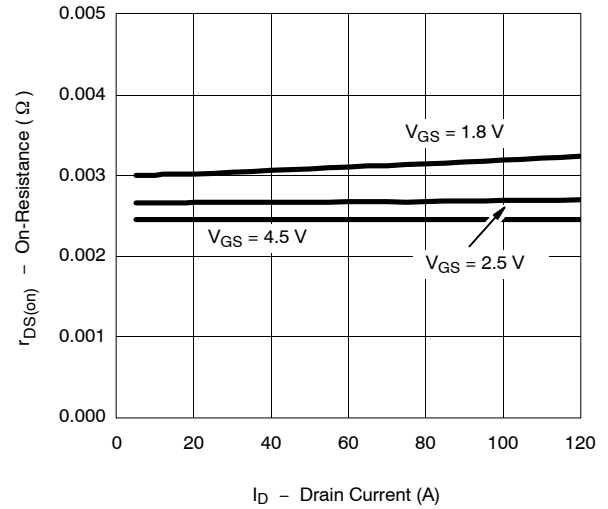
**Transfer Characteristics**



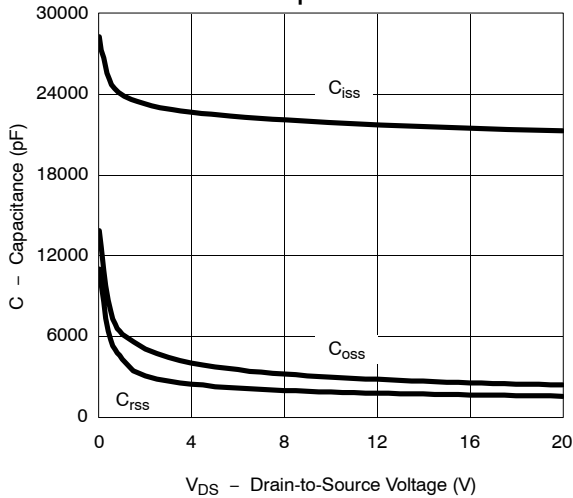
**Transconductance**



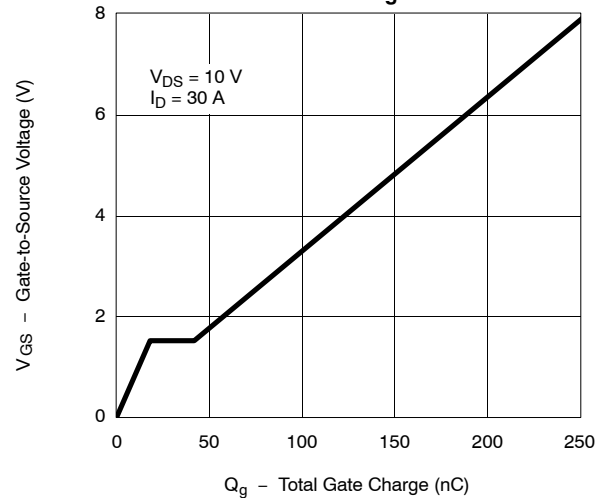
**On-Resistance vs. Drain Current**



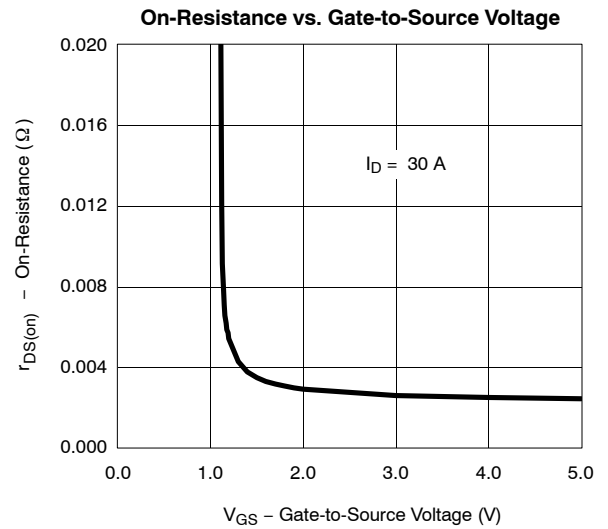
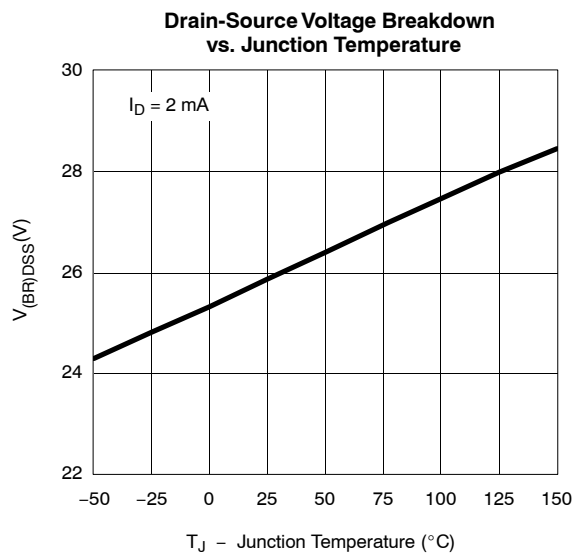
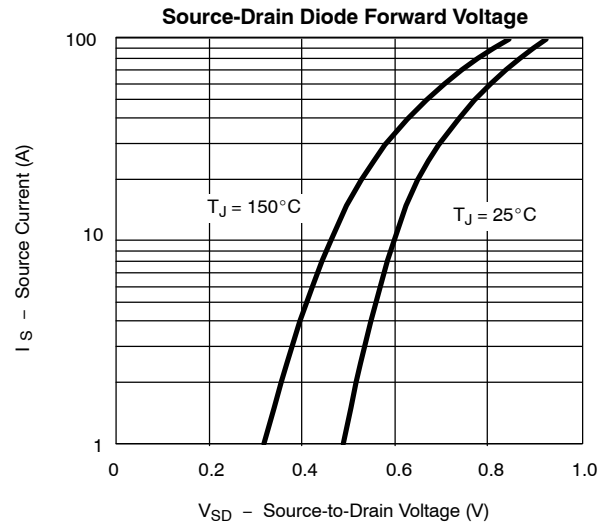
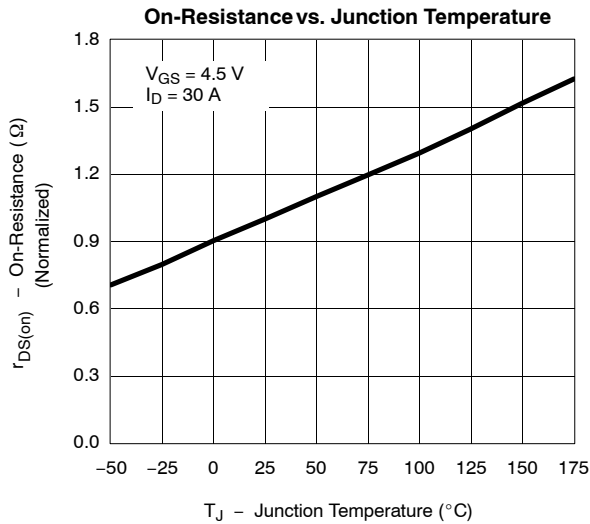
**Capacitance**



**Gate Charge**



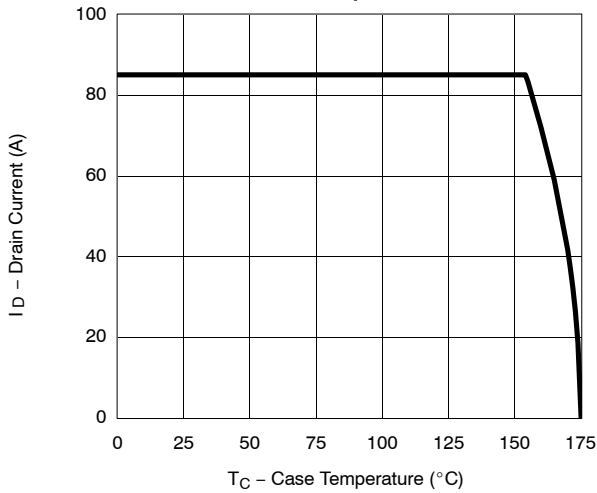
**TYPICAL CHARACTERISTICS (25 °C UNLESS NOTED)**



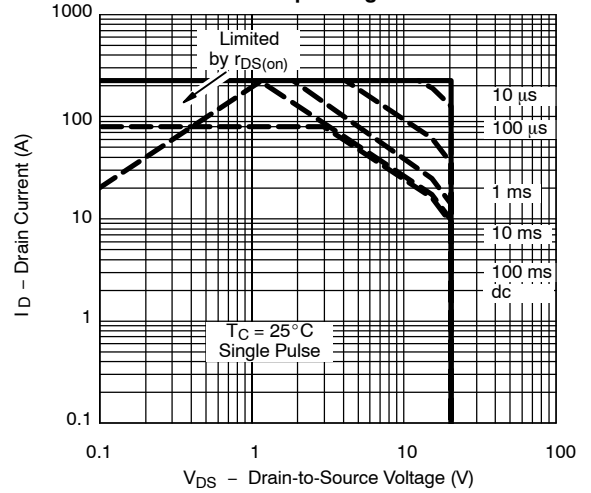


**THERMAL RATINGS**

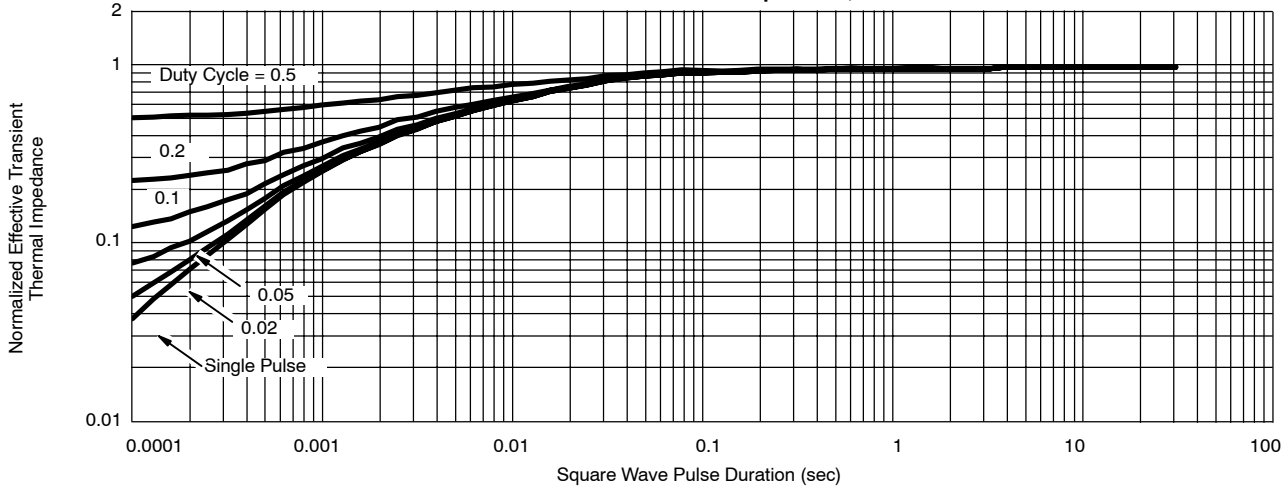
**Maximum Drain Current vs. Case Temperature**



**Safe Operating Area**



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





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