

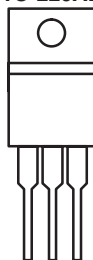
N-Channel 20-V (D-S) 175 °C MOSFET

PRODUCT SUMMARY

$V_{(BR)DSS}$ (V)	$r_{DS(on)}$ (Ω)	I_D (A) ^a
20	0.003 at $V_{GS} = 4.5$ V	85
	0.0034 at $V_{GS} = 2.5$ V	85
	0.0038 at $V_{GS} = 1.8$ V	85

FEATURES

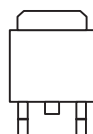
- TrenchFET[®] Power MOSFETs
- 175 °C Rated Maximum Junction Temperature

TO-220AB


Top View

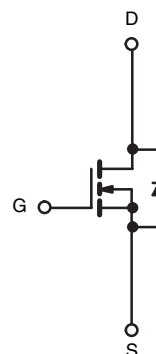
DRAIN connected to TAB

Ordering Information:
SUP85N02-03-E3 (Lead free)

TO-263


Top View

Ordering Information:
SUB85N02-03-E3 (Lead (Pb)-free)



N-Channel MOSFET

ABSOLUTE MAXIMUM RATINGS $T_C = 25$ °C, unless otherwise noted

Parameter	Symbol	Limit	Unit
Drain-Source Voltage	V_{DS}	20	V
Gate-Source Voltage	V_{GS}	± 8	
Continuous Drain Current ($T_J = 175$ °C) ^a	I_D	85	A
		85	
Pulsed Drain Current	I_{DM}	240	
Avalanche Current	I_{AR}	30	
Repetitive Avalanche Energy ^b	E_{AR}	45	mJ
Power Dissipation ^a	P_D	250	W
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}	40	°C/W
		62.5	
Junction-to-Case	R_{thJC}	0.6	

Notes:

a. See SOA curve for voltage derating.

b. Duty cycle ≤ 1 %.

c. When mounted on 1" square PCB (FR-4 material).

MOSFET SPECIFICATIONS $T_J = 25\text{ }^{\circ}\text{C}$, unless otherwise noted						
Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
Static						
Drain-Source Breakdown Voltage	$V_{(BR)DSS}$	$V_{GS} = 0\text{ V}$, $I_D = 2\text{ mA}$	20			V
Gate Threshold Voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}$, $I_{DS} = 2\text{ mA}$	0.45			
Gate-Body Leakage	I_{GSS}	$V_{DS} = 0\text{ V}$, $V_{GS} = \pm 8\text{ V}$			± 100	nA
Zero Gate Voltage Drain Current	I_{DSS}	$V_{DS} = 20\text{ V}$, $V_{GS} = 0\text{ V}$			1	μA
		$V_{DS} = 20\text{ V}$, $V_{GS} = 0\text{ V}$, $T_J = 125\text{ }^{\circ}\text{C}$			250	
On-State Drain Current ^a	$I_{D(on)}$	$V_{DS} = 5\text{ V}$, $V_{GS} = 4.5\text{ V}$	120			A
Drain-Source On-State Resistance ^a	$r_{DS(on)}$	$V_{GS} = 4.5\text{ V}$, $I_D = 30\text{ A}$		0.0025	0.003	Ω
		$V_{GS} = 4.5\text{ V}$, $I_D = 30\text{ A}$, $T_J = 125\text{ }^{\circ}\text{C}$			0.0042	
		$V_{GS} = 4.5\text{ V}$, $I_D = 30\text{ A}$, $T_J = 175\text{ }^{\circ}\text{C}$			0.005	
		$V_{GS} = 2.5\text{ V}$, $I_D = 30\text{ A}$		0.0027	0.0034	
		$V_{GS} = 1.8\text{ V}$, $I_D = 30\text{ A}$		0.003	0.0038	
Forward Transconductance ^a	g_{fs}	$V_{DS} = 5\text{ V}$, $I_D = 30\text{ A}$	30			S
Dynamic ^b						
Input Capacitance	C_{iss}	$V_{GS} = 0\text{ V}$, $V_{DS} = 20\text{ V}$, $f = 1\text{ MHz}$		21250		pF
Output Capacitance	C_{oss}			2350		
Reversen Transfer Capacitance	C_{rss}			1520		
Total Gate Charge ^c	Q_g	$V_{DS} = 10\text{ V}$, $V_{GS} = 4.5\text{ V}$, $I_D = 85\text{ A}$		140	200	nC
Gate-Source Charge ^c	Q_{gs}			18		
Gate-Drain Charge ^c	Q_{gd}			24		
Turn-On Delay Time ^c	$t_{d(on)}$	$V_{DD} = 10\text{ V}$, $R_L = 0.12\text{ }\Omega$ $I_D \cong 85\text{ A}$, $V_{GEN} = 4.5\text{ V}$, $R_g = 2.5\text{ }\Omega$		20	30	ns
Rise Time ^c	t_r			200	300	
Turn-Off Delay Time ^c	$t_{d(off)}$			450	670	
Fall Time ^c	t_f			320	480	
Source-Drain Diode Ratings and Characteristics $(T_C = 25\text{ }^{\circ}\text{C})^b$						
Pulsed Current	I_{SM}				240	A
Forward Voltage ^a	V_{SD}	$I_F = 100\text{ A}$, $V_{GS} = 0\text{ V}$		1.2	1.5	V
Reverse Recovery Time	t_{rr}	$I_F = 50\text{ A}$, $di/dt = 100\text{ A}/\mu\text{s}$		75	150	ns

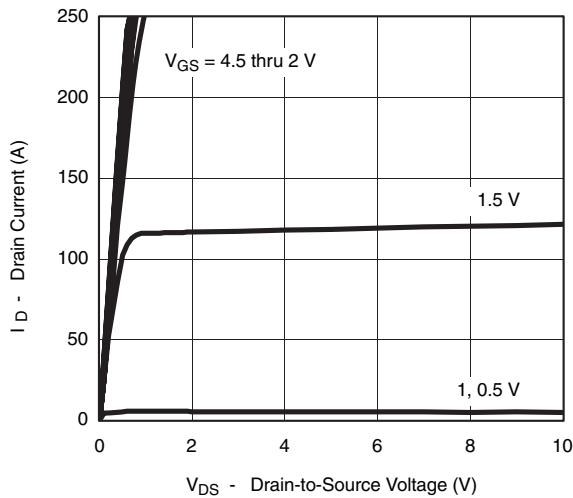
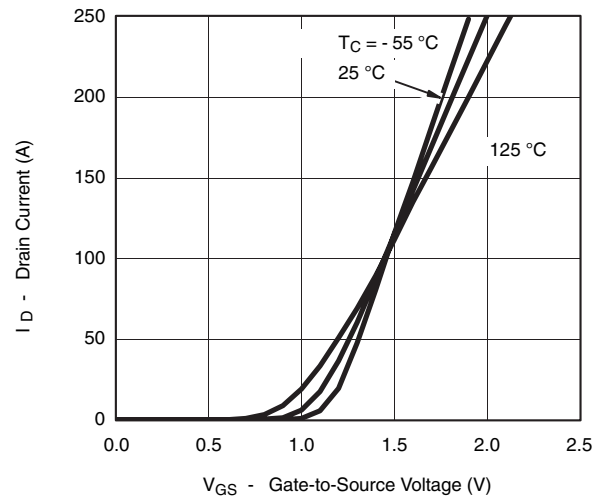
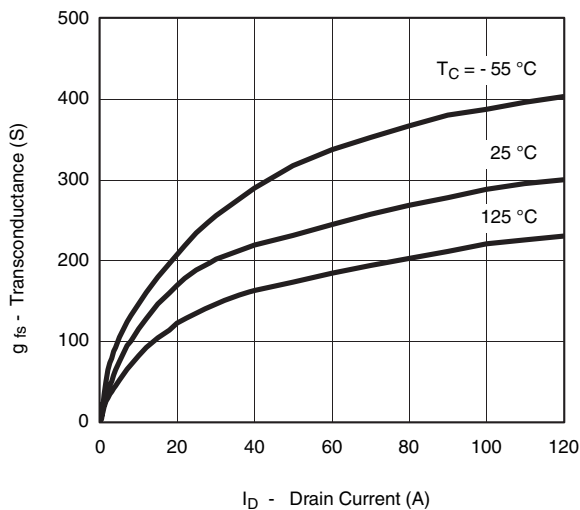
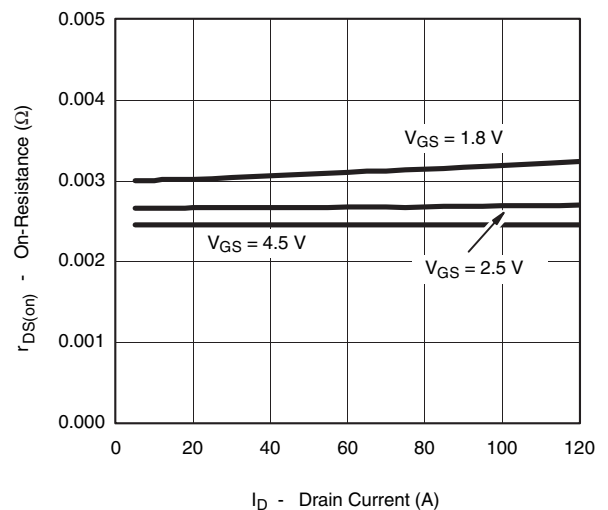
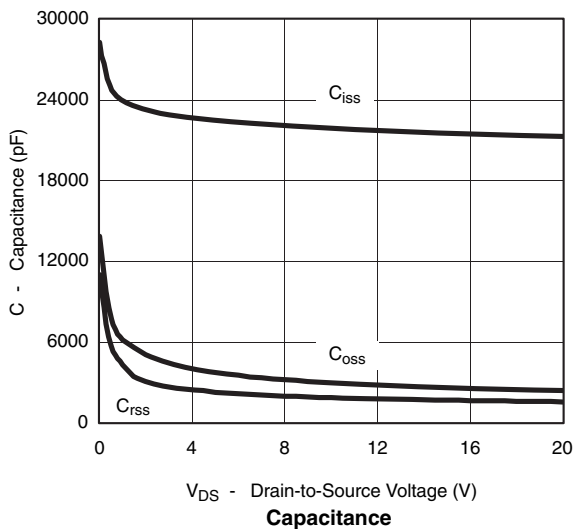
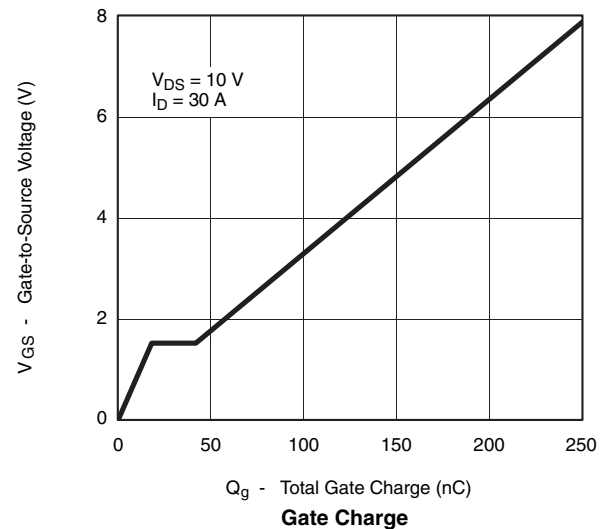
Notes:

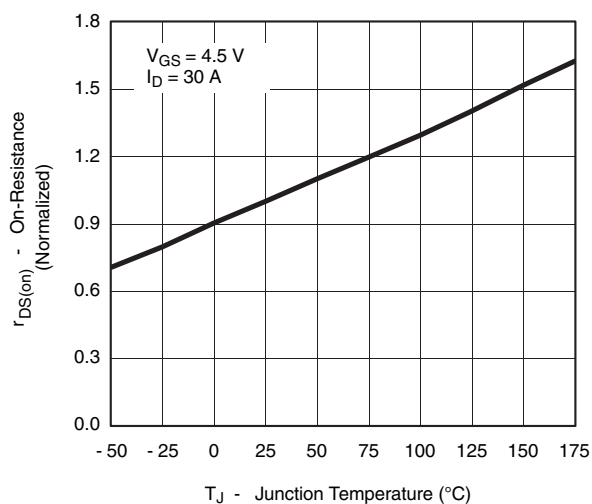
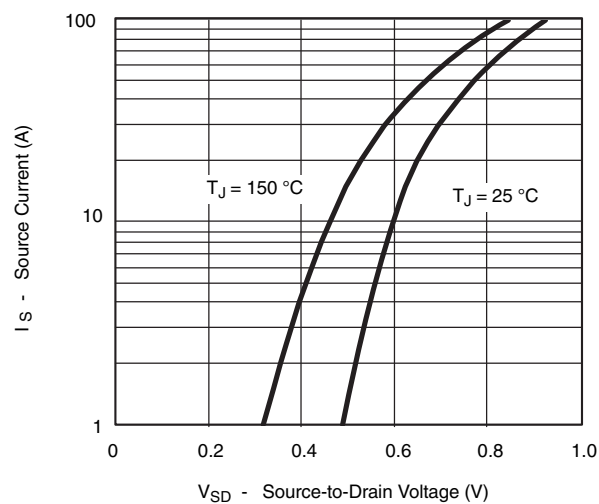
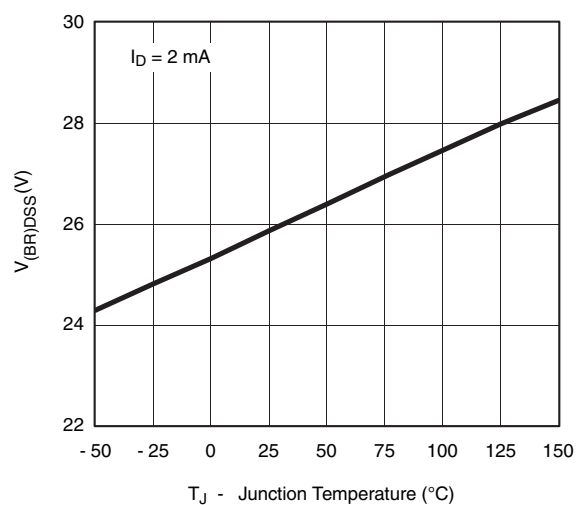
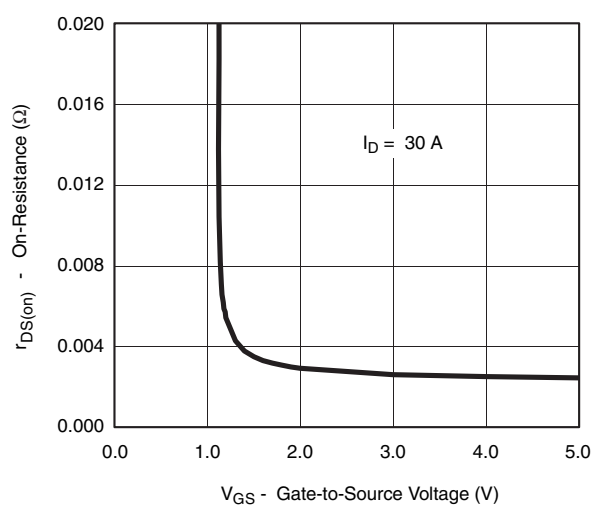
a. Pulse test; pulse width $\leq 300\text{ }\mu\text{s}$, duty cycle $\leq 2\%$.

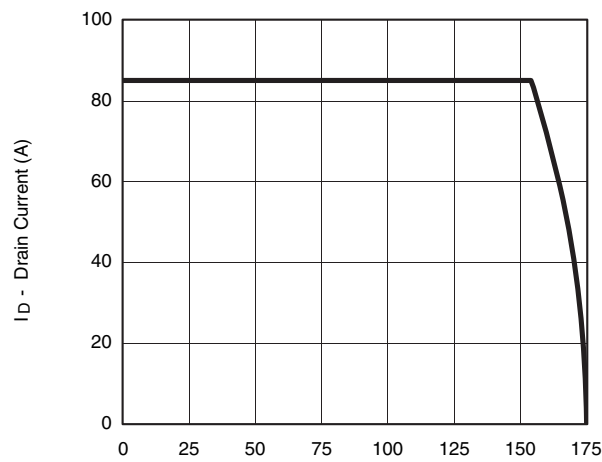
b. Guaranteed by design, not subject to production testing.

c. Independent of operating temperature.

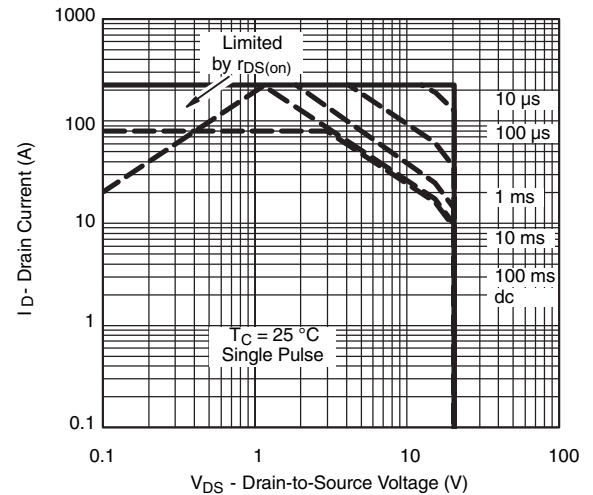
Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

**TYPICAL CHARACTERISTICS** 25 °C, unless noted**Output Characteristics****Transfer Characteristics****Transconductance****On-Resistance vs. Drain Current****Capacitance****Gate Charge**

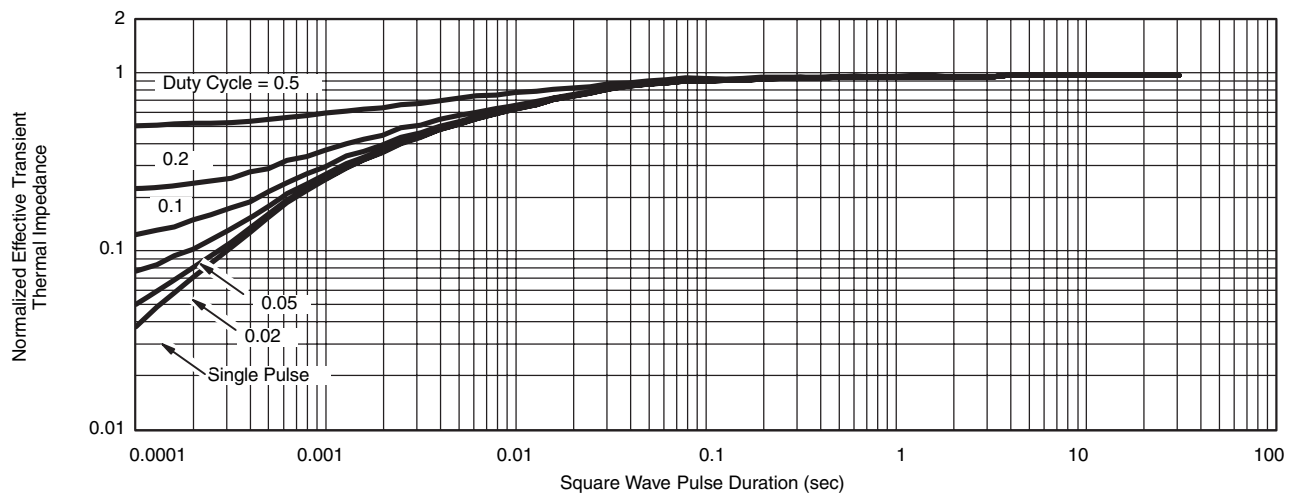
TYPICAL CHARACTERISTICS 25 °C, unless noted**On-Resistance vs. Junction Temperature****Source-Drain Diode Forward Voltage****Drain-Source Voltage Breakdown vs. Junction Temperature****On-Resistance vs. Gate-to-Source Voltage**

**THERMAL RATINGS**

**Maximum Drain Current
vs. Case Temperature**



Safe Operating Area



Normalized Thermal Transient Impedance, Junction-to-Case

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