

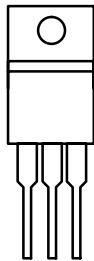


## N-Channel 40-V (D-S) 175°C MOSFET

## PRODUCT SUMMARY

$V_{(BR)DSS}$ (V)	$r_{DS(on)}$ ( $\Omega$ )	$I_D$ (A)
40	0.004 @ $V_{GS} = 10$ V	85 <sup>a</sup>

TO-220AB

G D S  
Top View

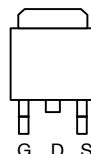
Ordering Information

SUP85N04-04

SUP85N04-04—E3 (Lead (Pb)-Free)

DRAIN connected to TAB

TO-263

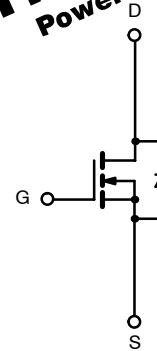
G D S  
Top View

Ordering Information

SUP85N04-04

SUP85N04-04—E3 (Lead (Pb)-Free)

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



N-Channel MOSFET

ABSOLUTE MAXIMUM RATINGS ( $T_C = 25^\circ\text{C}$  UNLESS OTHERWISE NOTED)

Parameter		Symbol	Limit	Unit
Drain-Source Voltage		V <sub>DS</sub>	40	V
Gate-Source Voltage		V <sub>GS</sub>	20	
Continuous Drain Current (T <sub>J</sub> = 175°C)	T <sub>C</sub> = 25°C	I <sub>D</sub>	85 <sup>a</sup>	A
	T <sub>C</sub> = 125°C		85 <sup>a</sup>	
Pulsed Drain Current		I <sub>DM</sub>	240	
Avalanche Current		I <sub>AR</sub>	70	
Repetitive Avalanche Energy <sup>b</sup>	L = 0.1 mH	E <sub>AR</sub>	211	mJ
Maximum Power Dissipation <sup>b</sup>	T <sub>C</sub> = 25°C (TO-220AB and TO-263)	P <sub>D</sub>	250 <sup>c</sup>	W
	T <sub>A</sub> = 25°C (TO-263) <sup>d</sup>		3.75	
Operating Junction and Storage Temperature Range		T <sub>J</sub> , T <sub>stg</sub>	–55 to 175	°C

## THERMAL RESISTANCE RATINGS

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

## Notes

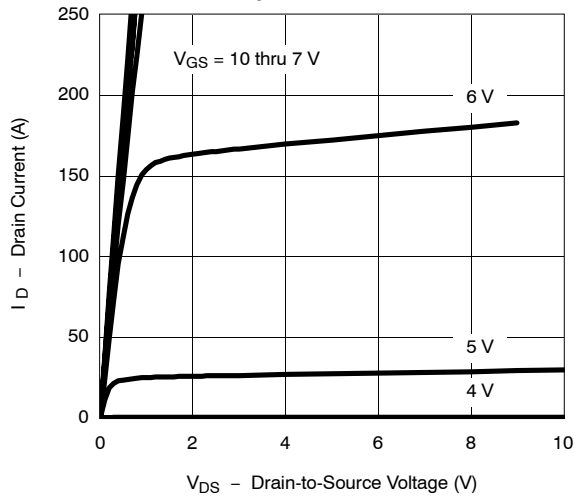
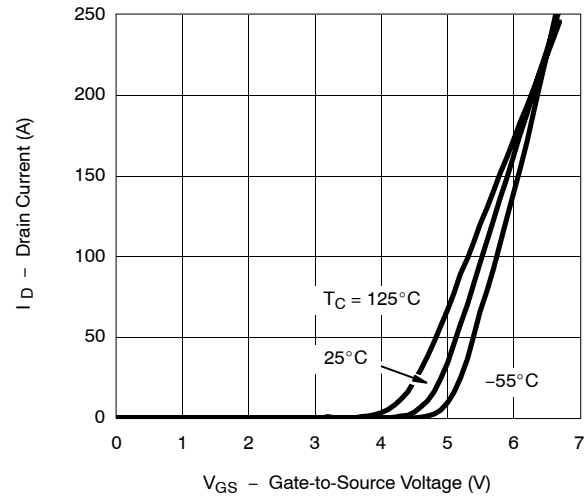
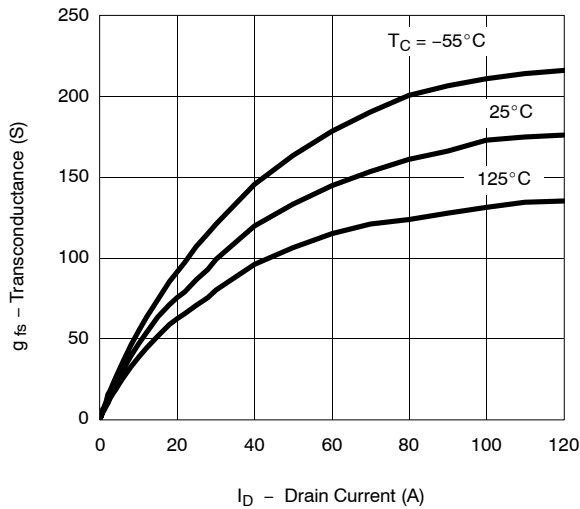
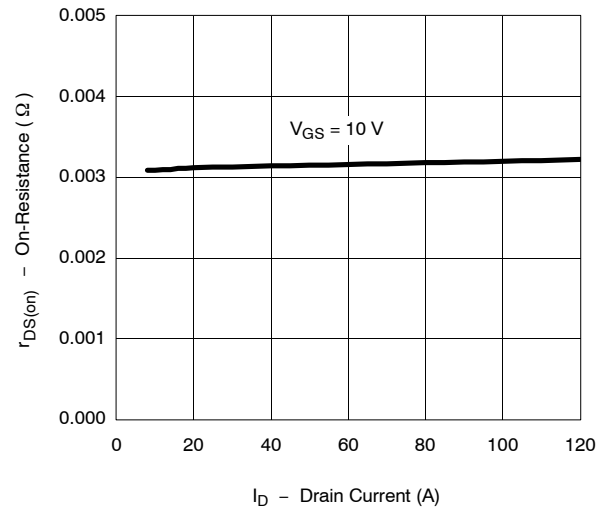
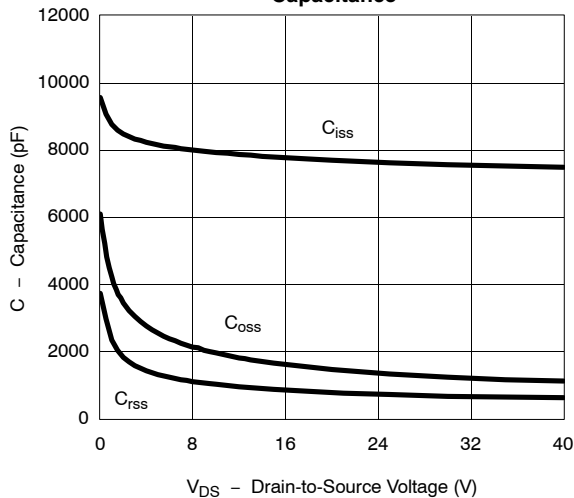
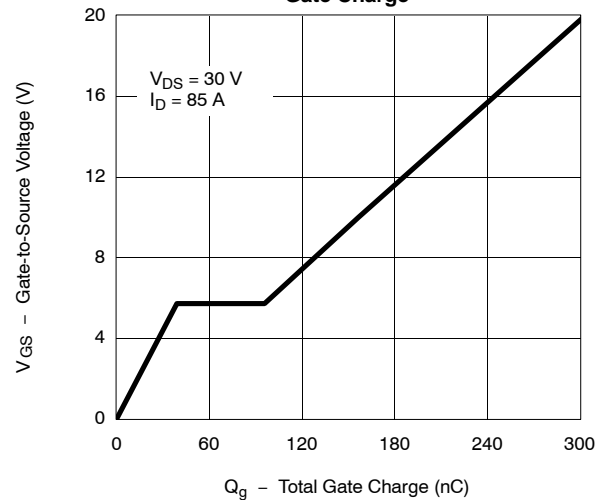
- Package limited.
- Duty cycle  $\leq 1\%$ .
- See SOA curve for voltage derating.
- When mounted on 1" square PCB (FR-4 material).

**SPECIFICATIONS (T<sub>J</sub> = 25 °C UNLESS OTHERWISE NOTED)**

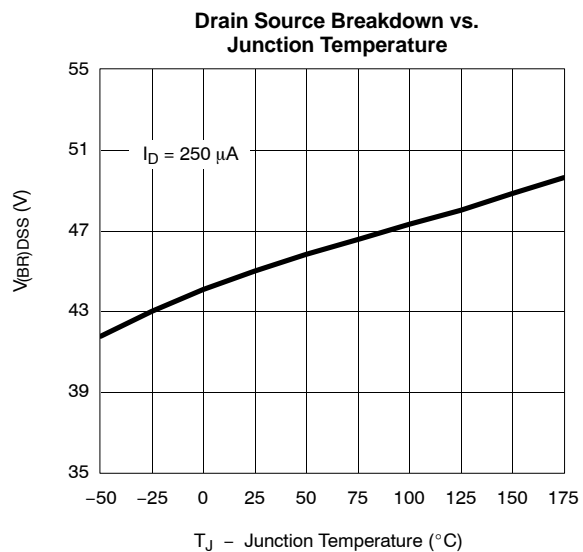
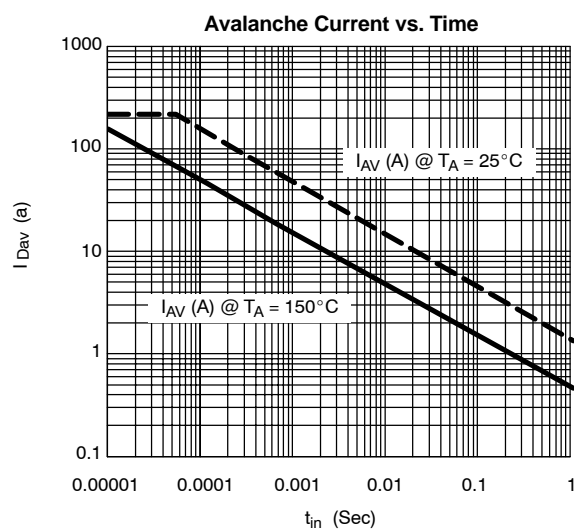
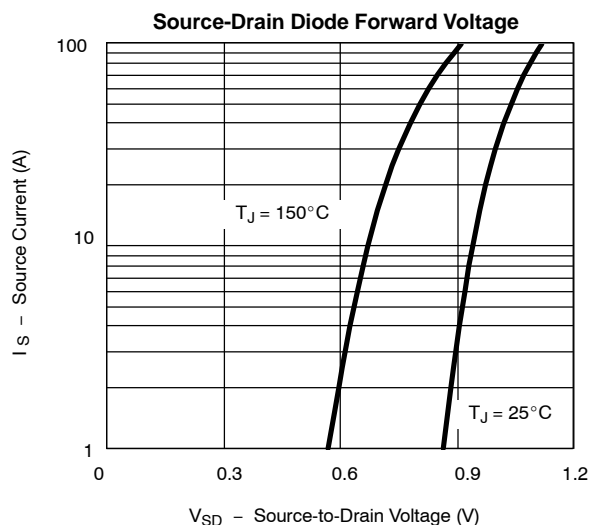
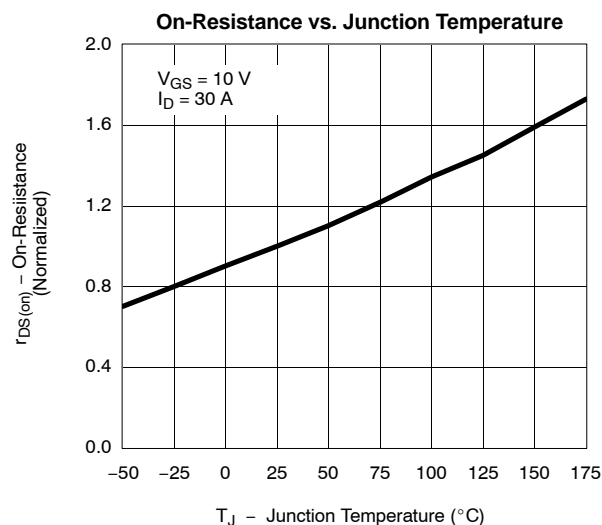
Parameter	Symbol	Test Condition	Min	Typ	Max	Unit
Static						
Drain-Source Breakdown Voltage	V <sub>(BR)DSS</sub>	V <sub>DS</sub> = 0 V, I <sub>D</sub> = 250 μA	40			V
Gate-Threshold Voltage	V <sub>GS(th)</sub>	V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = 250 μA	2		4	
Gate-Body Leakage	I <sub>GSS</sub>	V <sub>DS</sub> = 0 V, V <sub>GS</sub> = 20 V			100	nA
Zero Gate Voltage Drain Current	I <sub>DSS</sub>	V <sub>DS</sub> = 40 V, V <sub>GS</sub> = 0 V			1	μA
		V <sub>DS</sub> = 40 V, V <sub>GS</sub> = 0 V, T <sub>J</sub> = 125°C			50	
		V <sub>DS</sub> = 40 V, V <sub>GS</sub> = 0 V, T <sub>J</sub> = 175°C			250	
On-State Drain Current <sup>a</sup>	I <sub>D(on)</sub>	V <sub>DS</sub> ≥ 5 V, V <sub>GS</sub> = 10 V	120			A
Drain-Source On-State Resistance <sup>a</sup>	r <sub>DS(on)</sub>	V <sub>GS</sub> = 10 V, I <sub>D</sub> = 30 A		0.0031	0.004	Ω
		V <sub>GS</sub> = 10 V, I <sub>D</sub> = 30 A, T <sub>J</sub> = 125°C			0.0055	
		V <sub>GS</sub> = 10 V, I <sub>D</sub> = 30 A, T <sub>J</sub> = 175°C			0.007	
Forward Transconductance <sup>a</sup>	g <sub>fs</sub>	V <sub>DS</sub> = 15 V, I <sub>D</sub> = 30 A	30			S
Dynamic <sup>b</sup>						
Input Capacitance	C <sub>iss</sub>	V <sub>GS</sub> = 0 V, V <sub>DS</sub> = 25 V, f = 1 MHz		7620		pF
Output Capacitance	C <sub>oss</sub>			1325		
Reverse Transfer Capacitance	C <sub>rss</sub>			710		
Total Gate Charge <sup>c</sup>	Q <sub>g</sub>	V <sub>DS</sub> = 30 V, V <sub>GS</sub> = 10 V, I <sub>D</sub> = 85 A		160	250	nC
Gate-Source Charge <sup>c</sup>	Q <sub>gs</sub>			40		
Gate-Drain Charge <sup>c</sup>	Q <sub>gd</sub>			55		
Turn-On Delay Time <sup>c</sup>	t <sub>d(on)</sub>	V <sub>DD</sub> = 30 V, R <sub>L</sub> = 0.47 Ω I <sub>D</sub> ≅ 85 A, V <sub>GEN</sub> = 10 V, R <sub>g</sub> = 2.5 Ω		20	35	ns
Rise Time <sup>c</sup>	t <sub>r</sub>			115	175	
Turn-Off Delay Time <sup>c</sup>	t <sub>d(off)</sub>			75	115	
Fall Time <sup>c</sup>	t <sub>f</sub>			85	130	
Source-Drain Diode Ratings and Characteristics (T <sub>C</sub> = 25°C) <sup>b</sup>						
Continuous Current	I <sub>S</sub>				85	A
Pulsed Current	I <sub>SM</sub>				240	
Forward Voltage <sup>a</sup>	V <sub>SD</sub>	I <sub>F</sub> = 85 A, V <sub>GS</sub> = 0 V		1.1	1.4	V
Reverse Recovery Time	t <sub>rr</sub>	I <sub>F</sub> = 85 A, di/dt = 100 A/μs		60	90	ns
Peak Reverse Recovery Current	I <sub>RM(REC)</sub>			2.6	4	A
Reverse Recovery Charge	Q <sub>rr</sub>			0.08	0.15	μC

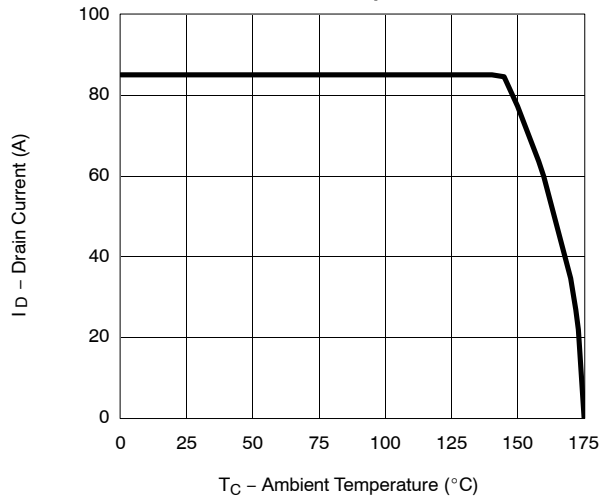
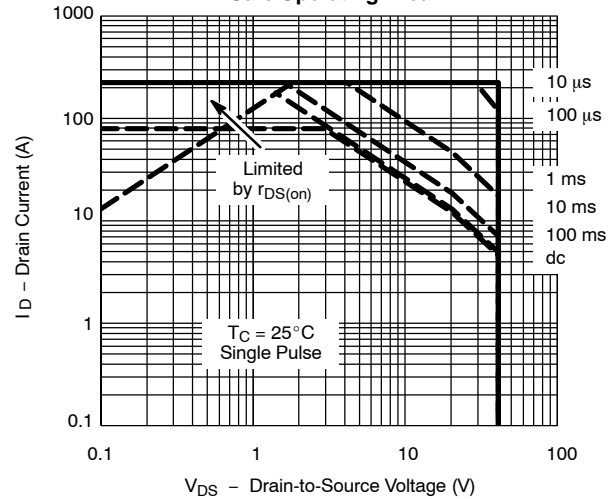
**Notes**

- 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 Avalanche and Drain Current  
vs. Case Temperature****Safe Operating Area****Normalized Thermal Transient Impedance, Junction-to-Case**