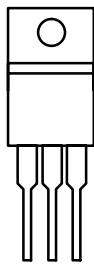


N-Channel 40-V (D-S) 175°C MOSFET

PRODUCT SUMMARY

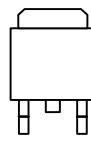
$V_{(BR)DSS}$ (V)	$r_{DS(on)}$ (Ω)	I_D (A)
40	0.004 @ $V_{GS} = 10$ V	85 ^a

175°C Rated
Maximum Junction Temperature
TrenchFET®
Power MOSFETS

TO-220AB

 G D S
Top View

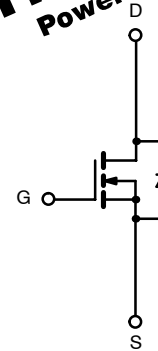
Ordering Information
SUP85N04-04
SUP85N04-04—E3 (Lead (Pb)-Free)

DRAIN connected to TAB

TO-263


Top View

Ordering Information
SUP85N04-04
SUP85N04-04—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}	40	V	
Gate-Source Voltage	V_{GS}	20		
Continuous Drain Current ($T_J = 175^\circ\text{C}$)	I_D	$T_C = 25^\circ\text{C}$	85 ^a	A
		$T_C = 125^\circ\text{C}$	85 ^a	
Pulsed Drain Current	I_{DM}	240		
Avalanche Current	I_{AR}	70		
Repetitive Avalanche Energy ^b	E_{AR}	L = 0.1 mH	211	mJ
Maximum Power Dissipation ^b			$T_C = 25^\circ\text{C}$ (TO-220AB and TO-263)	250 ^c
	$T_A = 25^\circ\text{C}$ (TO-263) ^d	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) ^d	40	°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).

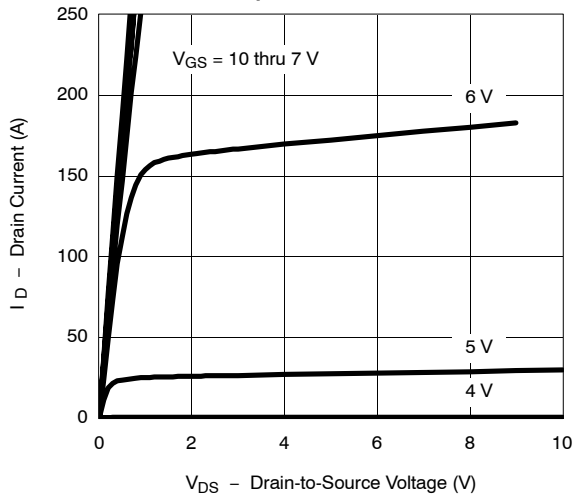
SPECIFICATIONS (T _J = 25 °C UNLESS OTHERWISE NOTED)						
Parameter	Symbol	Test Condition	Min	Typ	Max	Unit
Static						
Drain-Source Breakdown Voltage	V _{(BR)DSS}	V _{DS} = 0 V, I _D = 250 μA	40			V
Gate-Threshold Voltage	V _{GS(th)}	V _{DS} = V _{GS} , I _D = 250 μA	2		4	
Gate-Body Leakage	I _{GSS}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

Notes

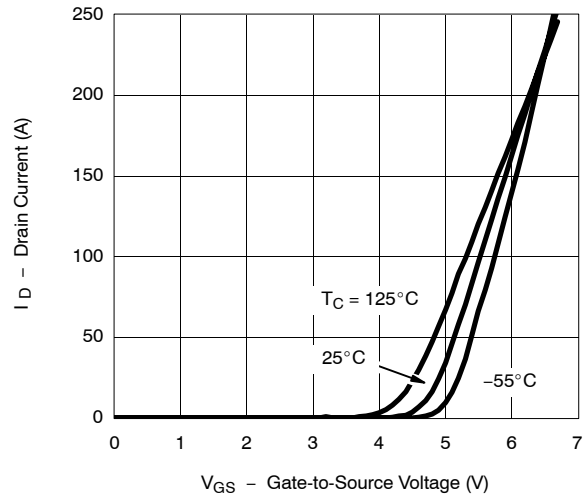
- a. Pulse test; pulse width ≤ 300 μs, duty cycle ≤ 2%.
- b. Guaranteed by design, not subject to production testing.
- c. Independent of operating temperature.

TYPICAL CHARACTERISTICS (25°C UNLESS NOTED)

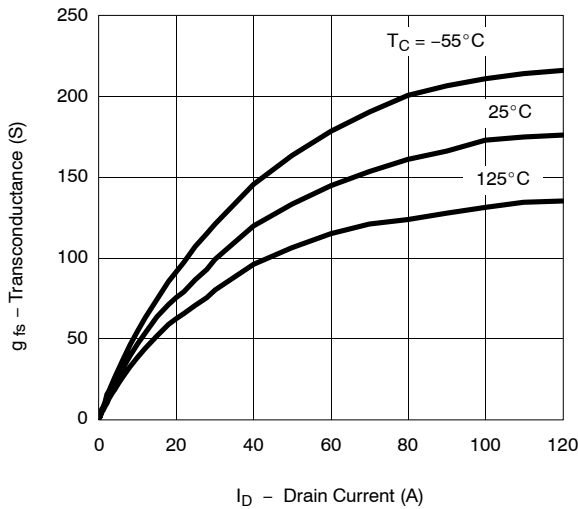
Output Characteristics



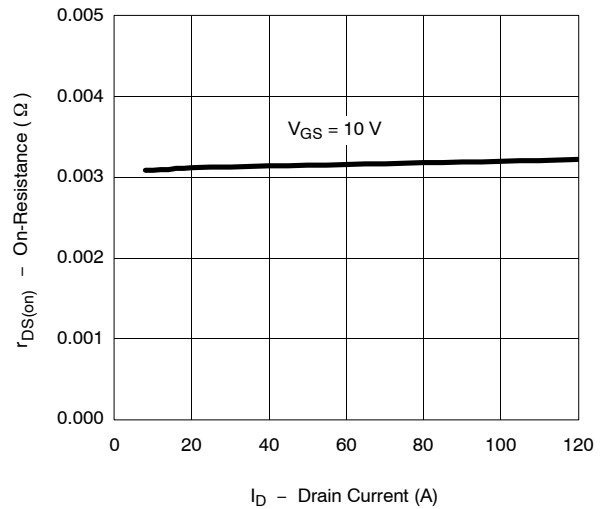
Transfer Characteristics



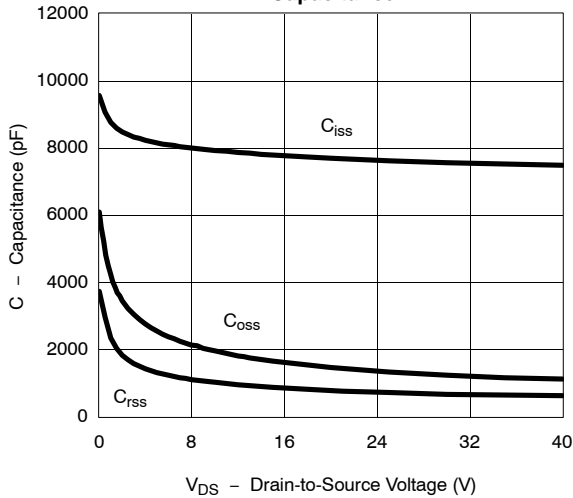
Transconductance



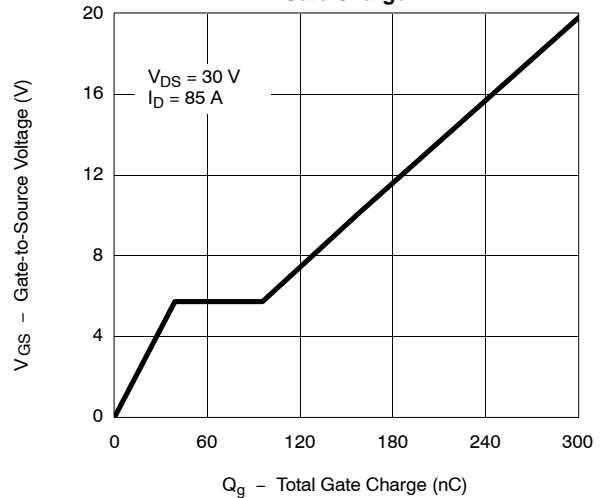
On-Resistance vs. Drain Current



Capacitance



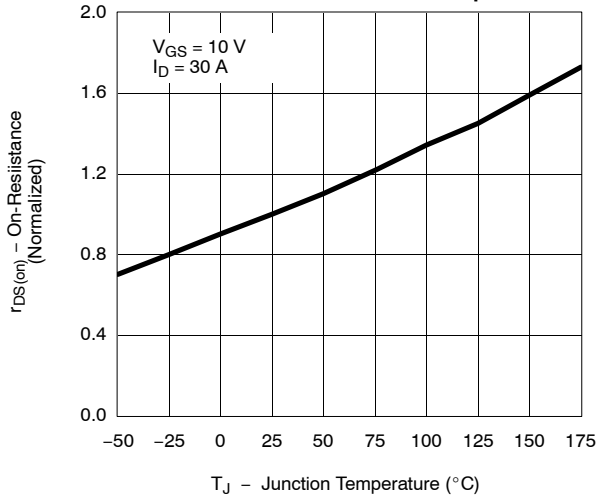
Gate Charge



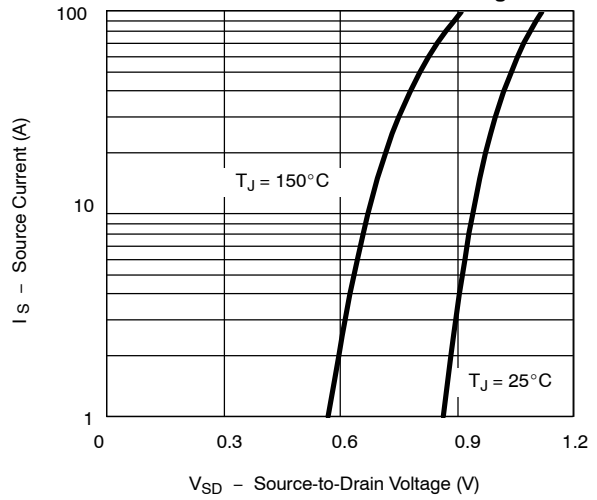


TYPICAL CHARACTERISTICS (25 °C UNLESS NOTED)

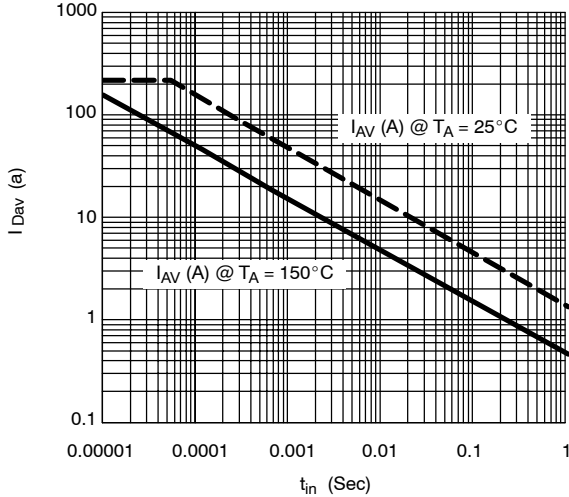
On-Resistance vs. Junction Temperature



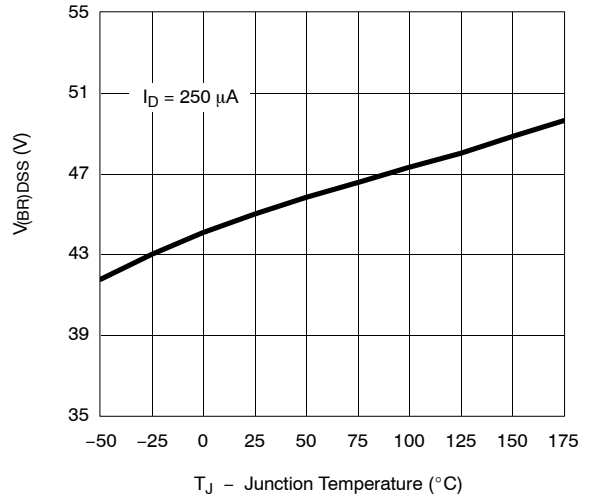
Source-Drain Diode Forward Voltage



Avalanche Current vs. Time

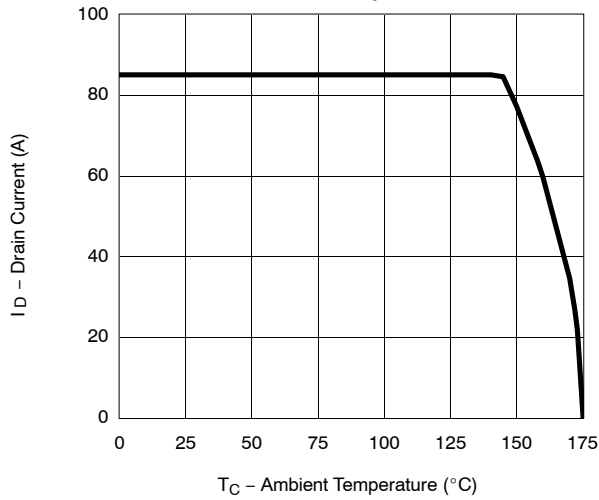


Drain Source Breakdown vs. Junction Temperature

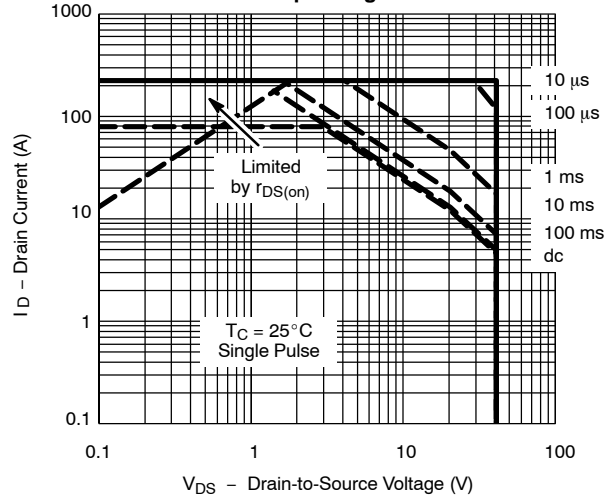


THERMAL RATINGS

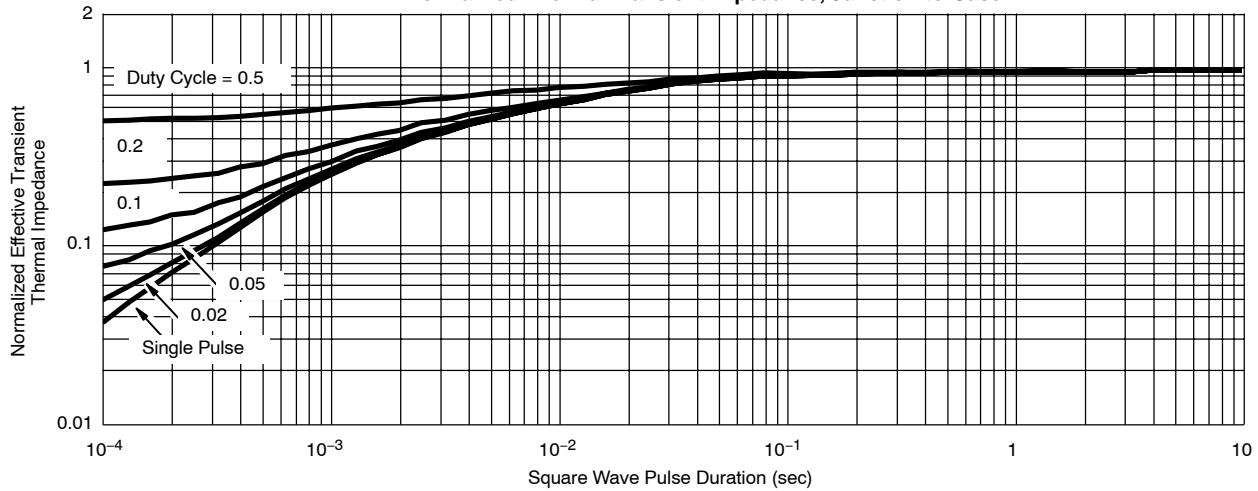
Maximum Avalanche and Drain Current vs. Case Temperature



Safe Operating Area



Normalized Thermal Transient Impedance, Junction-to-Case





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