N-Channel 20-V (D-S) 175°C MOSFET

PRODUCT SUMMARY		
$V_{(BR)DSS}$ (V)	$r_{DS(on)}$ (Ω)	I_D (A)[a]
20	0.012 @ V_{GS} = 10 V	40[a]
	0.026 @ V_{GS} = 4.5 V	40[a]

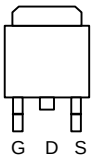
FEATURES

- TrenchFET® Power MOSFET
- 175°C Junction Temperature
- Optimized for High-Side Synchronous Rectifier

APPLICATIONS

- Desktop or Server CPU Core
- Game Station

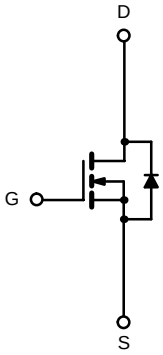
TO-263



Top View

SUM40N02-12P

DRAIN connected to TAB



N-Channel MOSFET

ABSOLUTE MAXIMUM RATINGS (T_A = 25°C UNLESS OTHERWISE NOTED)				
Parameter		Symbol	Limit	Unit
Drain-Source Voltage		V_{DS}	20	V
Gate-Source Voltage		V_{GS}	±20	
Continuous Drain Current (T_J = 175°C)	T_C = 25°C	I_D	40[a]	A
	T_C = 100°C		40[a]	
Pulsed Drain Current		I_{DM}	90	
Maximum Power Dissipation[b]	T_C = 25°C	P_D	83[c]	W
	T_A = 25°C [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 (PCB Mounted)[d]	R_{thJA}	40	°C/W
Junction-to-Case	R_{thJC}	1.8	

Notes
a. Package limited.
b. Duty cycle ≤ 1%.
c. See SOA curve for voltage derating.
d. When mounted on 1" square PCB (FR-4 material).

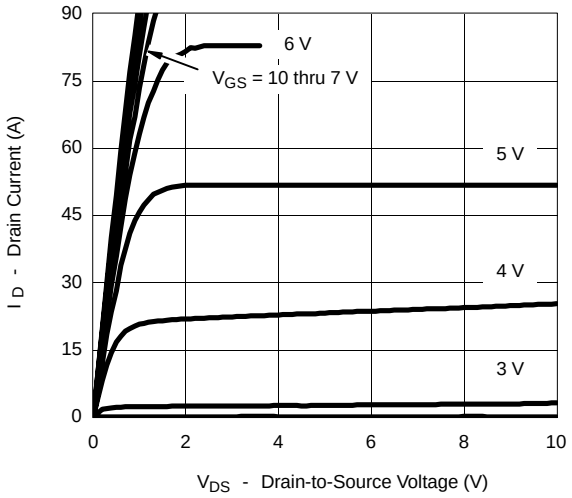
SPECIFICATIONS (T_J =25°C UNLESS OTHERWISE NOTED)

Parameter	Symbol	Test Condition	Min	Typ	Max	Unit
Static						
Drain-Source Breakdown Voltage	$V_{(BR)DSS}$	V_{DS} = 0 V, I_D = 250 µA	20			V
Gate-Threshold Voltage	$V_{GS(th)}$	V_{DS} = V_{GS}, I_D = 250 µA	0.85	2	3	
Gate-Body Leakage	I_{GSS}	V_{DS} = 0 V, V_{GS} = ±20 V			±100	nA
Zero Gate Voltage Drain Current	I_{DSS}	V_{DS} = 16 V, V_{GS} = 0 V			1	µA
		V_{DS} = 16 V, V_{GS} = 0 V, T_J = 125°C			50	
		V_{DS} = 16 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	90			A
Drain-Source On-State Resistance[a]	$r_{DS(on)}$	V_{GS} = 10 V, I_D = 20 A		0.0095	0.012	Ω
		V_{GS} = 10 V, I_D = 20 A, T_J = 125°C			0.0175	
		V_{GS} = 10 V, I_D = 20 A, T_J = 175°C			0.022	
		V_{GS} = 4.5 V, I_D = 15 A		0.0031	0.026	
Forward Transconductance[a]	g_{fs}	V_{DS} = 15 V, I_D = 20 A	10			S
Dynamic[b]						
Input Capacitance	C_{iss}	V_{GS} = 0 V, V_{DS} = 10 V, f = 1 MHz		1000		pF
Output Capacitance	C_{oss}			370		
Reverse Transfer Capacitance	C_{rss}			180		
Total Gate Charge[b]	Q_g	V_{DS} = 10 V, V_{GS} = 4.5 V, I_D = 40 A		7.5	12	nC
Gate-Source Charge[b]	Q_{gs}			3.5		
Gate-Drain Charge[b]	Q_{gd}			2.6		
Gate Resistance	R_G			3.0		Ω
Turn-On Delay Time[b]	$t_{d(on)}$	V_{DD} = 10 V, R_L = 0.25 Ω I_D ≅ 40 A, V_{GEN} = 10 V, R_G = 2.5 Ω		11	20	ns
Rise Time[b]	t_r			10	15	
Turn-Off Delay Time[b]	$t_{d(off)}$			24	35	
Fall Time[b]	t_f			9	15	
Source-Drain Diode Ratings and Characteristics (T_C = 25°C)[c]						
Continuous Current	I_S				40	A
Pulsed Current	I_{SM}				90	
Forward Voltage[a]	V_{SD}	I_F = 40 A, V_{GS} = 0 V		1.1	1.5	V
Reverse Recovery Time	t_{rr}	I_F = 40 A, di/dt = 100 A/µs		20	40	ns
Peak Reverse Recovery Current	I_{RM}			0.7	1.1	A
Reverse Recovery Charge	Q_{rr}			0.007	0.022	µC

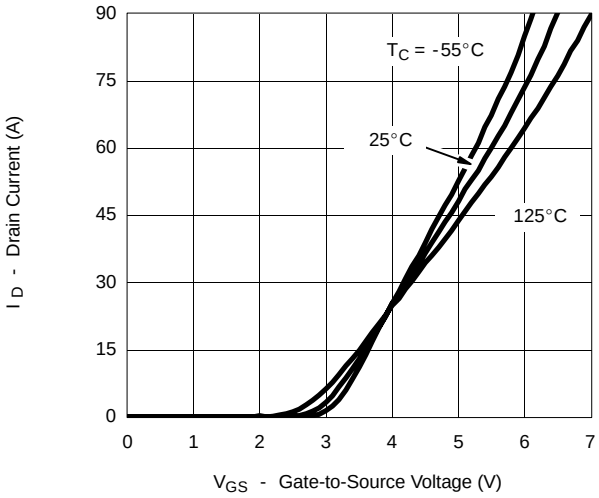
Notes
a. Pulse test; pulse width ≤ 300 µs, duty cycle ≤ 2%.
b. Independent of operating temperature.
c. Guaranteed by design, not subject to production testing.

TYPICAL CHARACTERISTICS (25°C UNLESS NOTED)

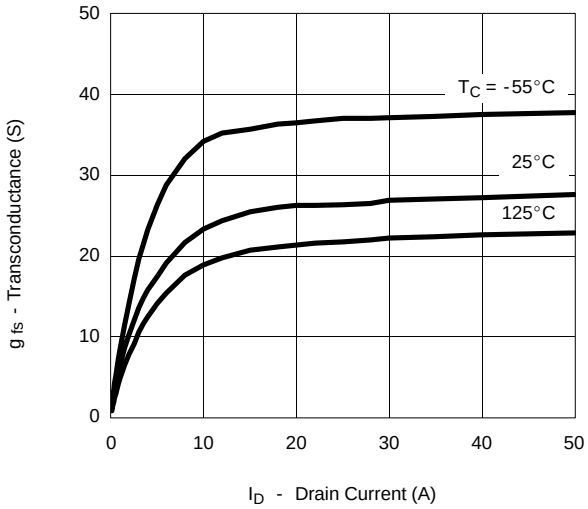
Output Characteristics



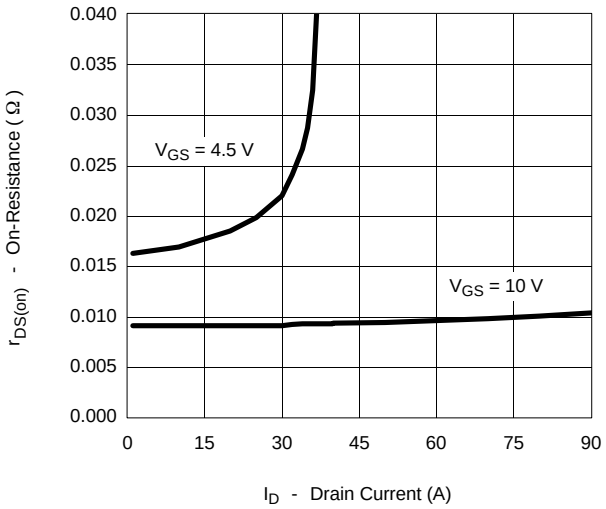
Transfer Characteristics



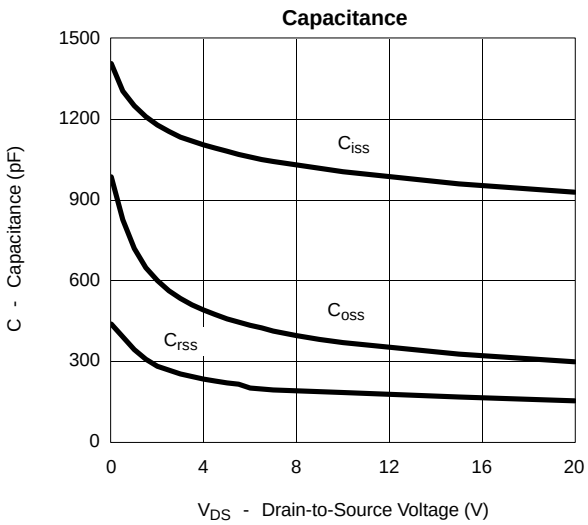
Transconductance



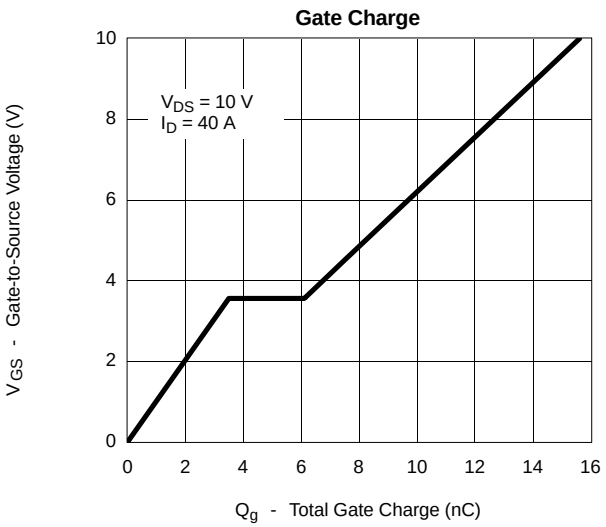
On-Resistance vs. Drain Current



Capacitance

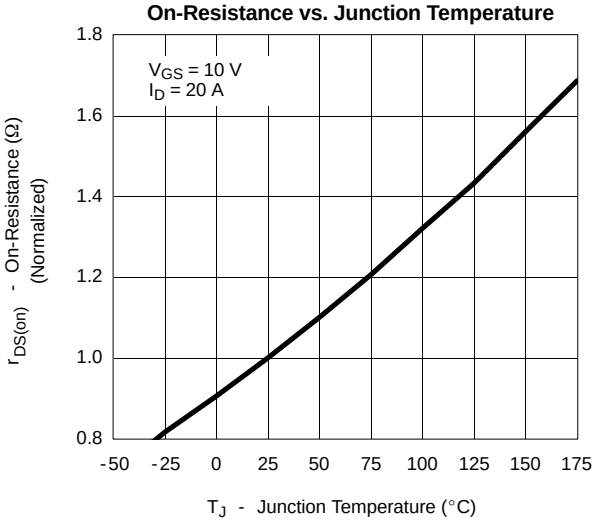


Gate Charge

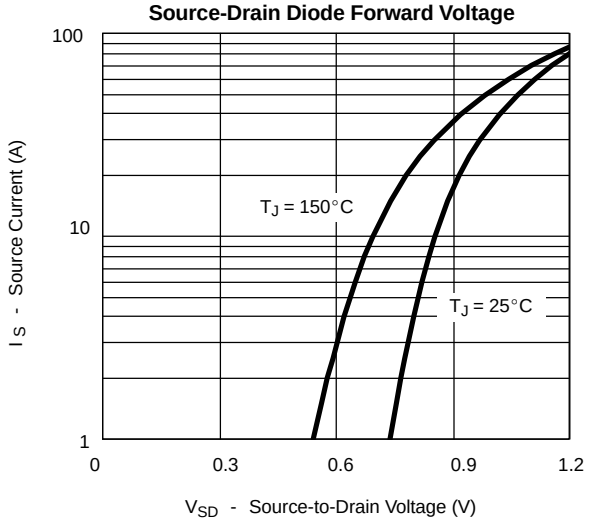


TYPICAL CHARACTERISTICS (25°C UNLESS NOTED)

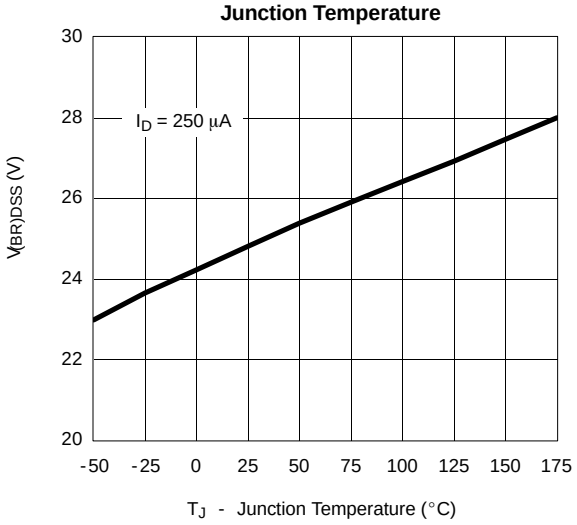
On-Resistance vs. Junction Temperature



Source-Drain Diode Forward Voltage

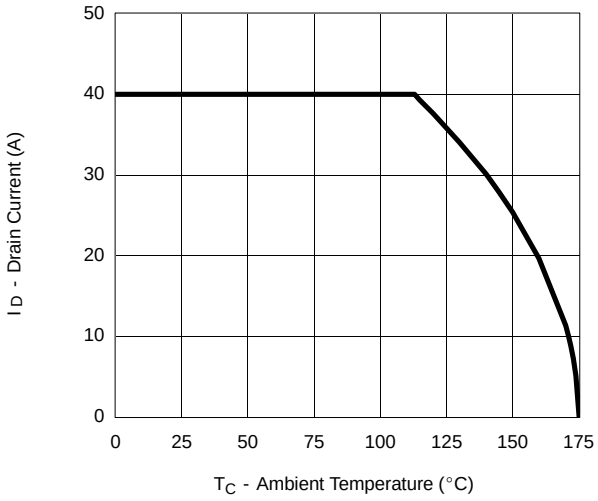


Drain Source Breakdown vs. Junction Temperature

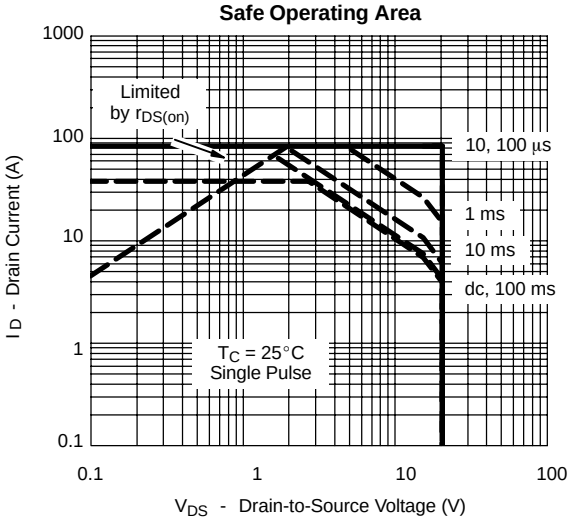


THERMAL RATINGS

Maximum Avalanche and Drain Current vs. Case Temperature



Safe Operating Area



Normalized Thermal Transient Impedance, Junction-to-Case