N-Channel 20-V (D-S) 175°C MOSFET

PRODUCT SUMMARY			
$V_{(BR)DSS}$ (V)	$r_{DS(on)}$ (Ω)	I_D (A)[a]	Q_g (Typ)
20	0.012 @ V_{GS} = 10 V	40[a]	7.5
	0.026 @ V_{GS} = 4.5 V	40[a]	

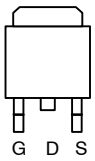
FEATURES

- TrenchFET® Power MOSFET
- 175°C Junction Temperature
- Optimized for High-Side Synchronous Rectifier
- 100% R_g Tested

APPLICATIONS

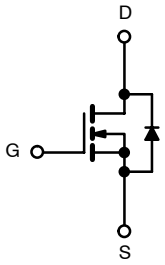
- Desktop or Server CPU Core
- Game Station

TO-263



Top View

DRAIN connected to TAB



N-Channel MOSFET

Ordering Information: SUM40N02-12P
SUM40N02-12P—E3

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)

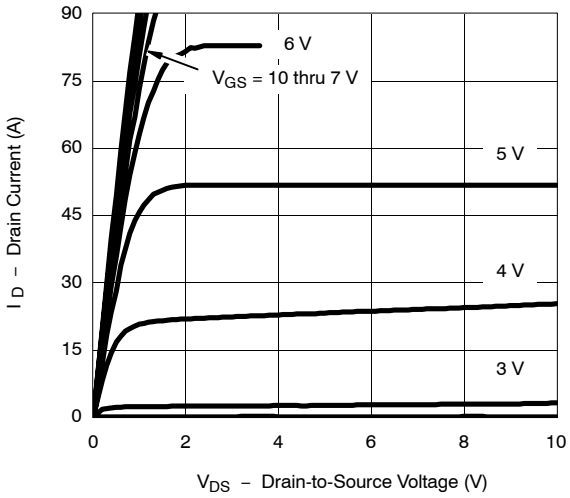
Parameter	Symbol	Test Condition	Min	Typ	Max	Unit
Static						
Drain-Source Breakdown Voltage	$V_{(BR)DSS}$	V_{DS} = 0 V, I_D = 250 μA	20			V
Gate-Threshold Voltage	$V_{GS(th)}$	V_{DS} = V_{GS}, I_D = 250 μA	0.85	2	3	
Gate-Body Leakage	I_{GSS}	V_{DS} = 0 V, V_{GS} = ±20 V			±100	nA
Zero Gate Voltage Drain Current	I_{DSS}	V_{DS} = 20 V, V_{GS} = 0 V			1	μA
		V_{DS} = 20 V, V_{GS} = 0 V, T_J = 125°C			50	
		V_{DS} = 20 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		0.021	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		1.5	3.0	5.1	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.

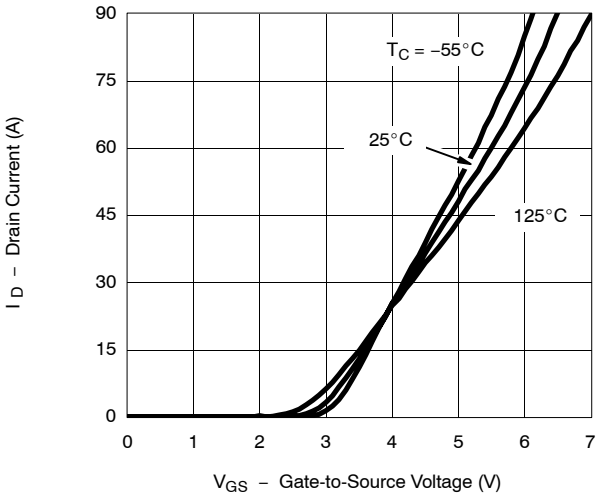
Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure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

TYPICAL CHARACTERISTICS (25°C UNLESS NOTED)

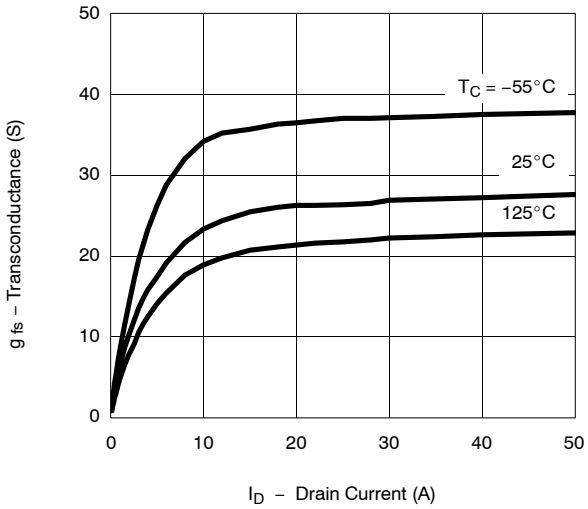
Output Characteristics



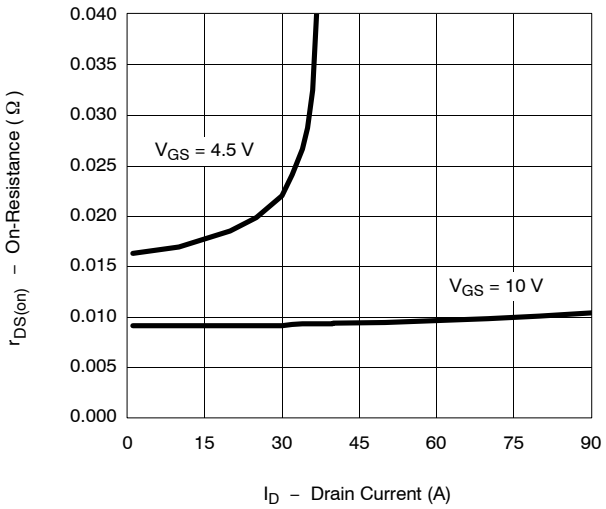
Transfer Characteristics



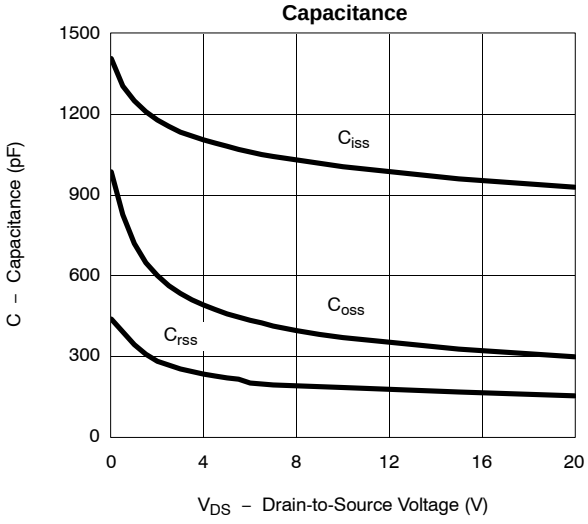
Transconductance



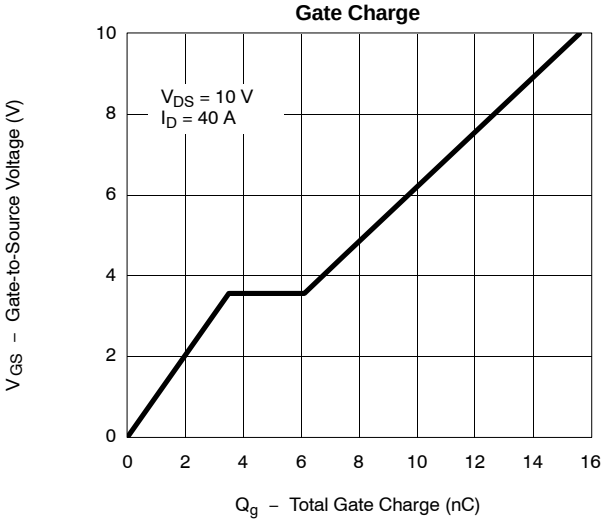
On-Resistance vs. Drain Current



Capacitance

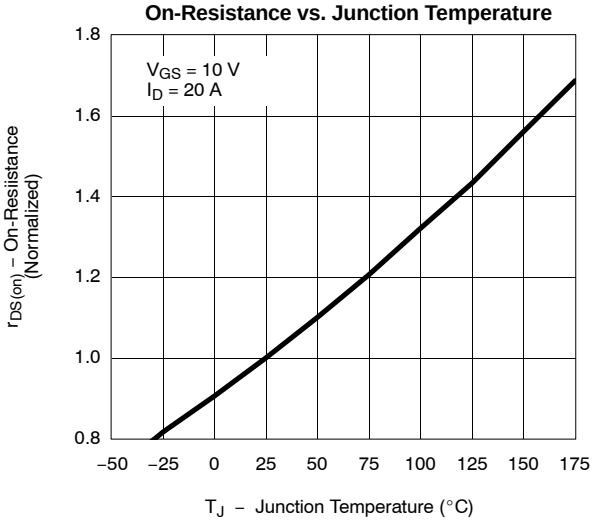


Gate Charge

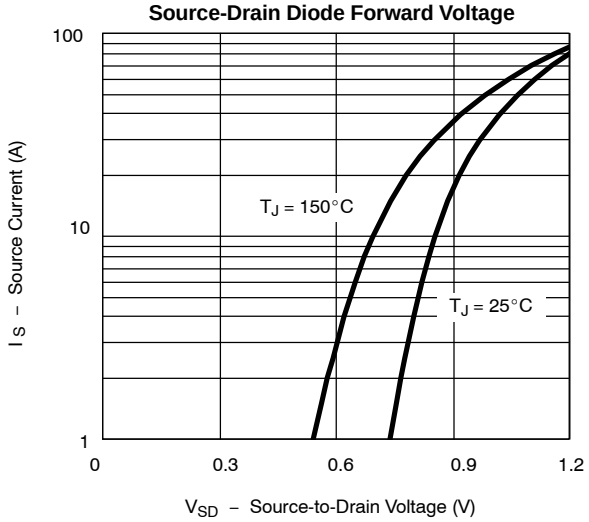


TYPICAL CHARACTERISTICS (25°C UNLESS NOTED)

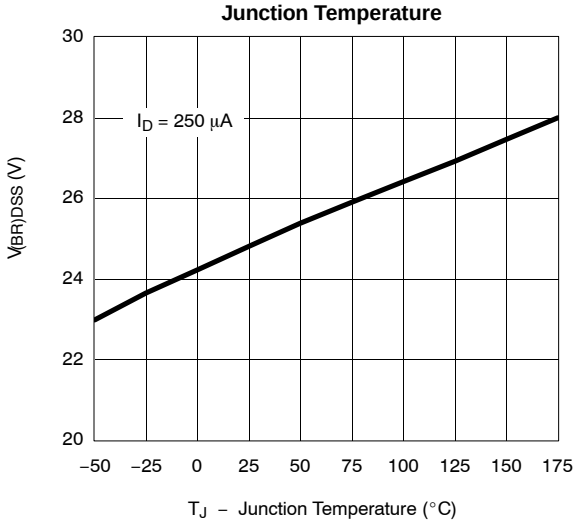
On-Resistance vs. Junction Temperature



Source-Drain Diode Forward Voltage

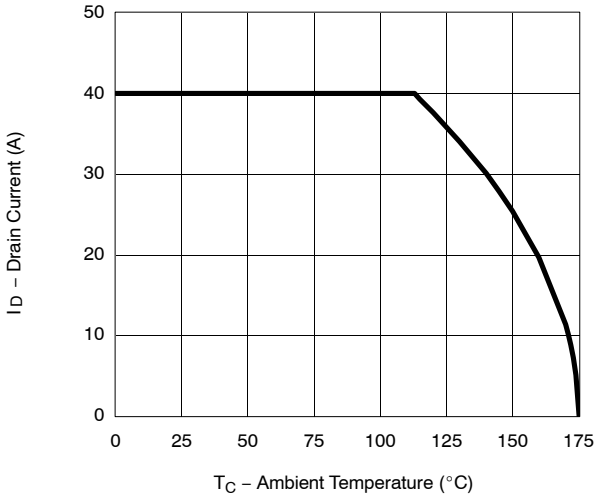


Drain Source Breakdown vs. Junction Temperature

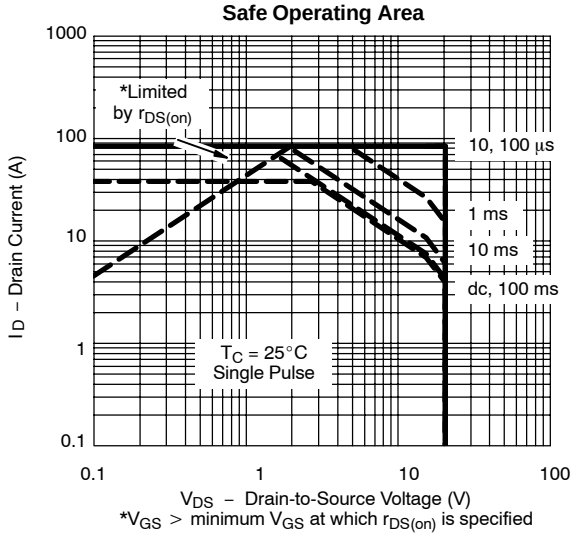


THERMAL RATINGS

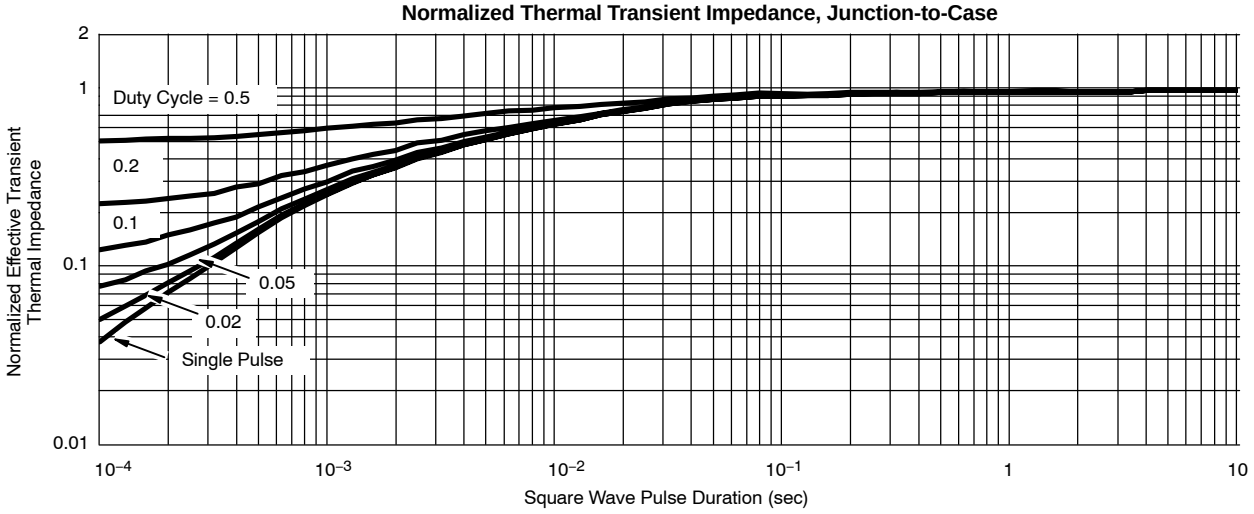
Maximum Avalanche and Drain Current vs. Case Temperature



Safe Operating Area



Normalized Thermal Transient Impedance, Junction-to-Case



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