P-Channel 40-V (D-S), 175°C MOSFET

PRODUCT SUMMARY		
V_{DS} (V)	$r_{DS(on)}$ (Ω)	I_D (A)[d]
-40	0.0094 @ V_{GS} = -10 V	-50
	0.0145 @ V_{GS} = -4.5 V	-50

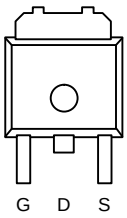
FEATURES

- TrenchFET® Power MOSFET
- 175°C Junction Temperature

APPLICATIONS

- Automotive 12-V Boardnet

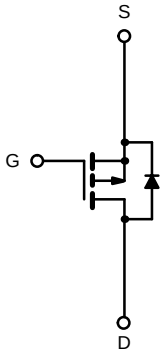
TO-252



Drain Connected to Tab

Top View

Ordering Information: SUD50P04-09L



P-Channel MOSFET

ABSOLUTE MAXIMUM RATINGS (T_A = 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°C)	T_C = 25°C	I_D	-50[d]	A
	T_C = 125°C		-50[d]	
Pulsed Drain Current		I_{DM}	-100	
Avalanche Current		I_{AR}	-50	
Repetitive Avalanche Energy[a]	L = 0.1 mH	E_{AR}	125	mJ
Power Dissipation	T_C = 25°C	P_D	136[c]	W
	T_A = 25°C		3[b, c]	
Operating Junction and Storage Temperature Range		T_J, T_{stg}	-55 to 175	°C

THERMAL RESISTANCE RATINGS					
Parameter		Symbol	Typical	Maximum	Unit
Junction-to-Ambient[b]	t ≤ 10 sec	R_{thJA}	15	18	°C/W
	Steady State		40	50	
Junction-to-Case		R_{thJC}	0.82	1.1	

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

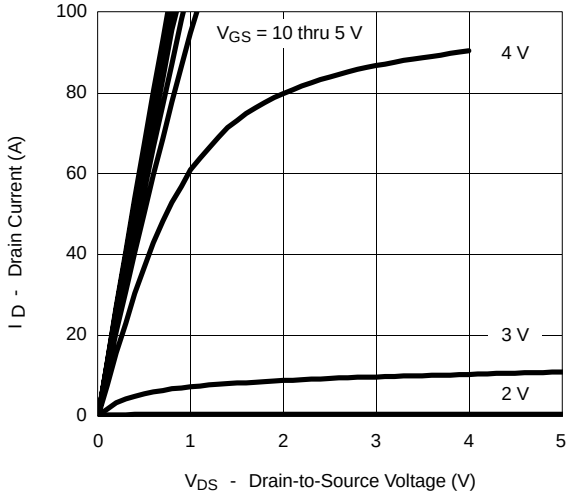
SPECIFICATIONS (T_J = 25°C UNLESS OTHERWISE NOTED)

Parameter	Symbol	Test Condition	Min	Typ	Max	Unit
Static						
Drain-Source Breakdown Voltage	$V_{(BR)DSS}$	V_{GS} = 0 V, I_D = -250 µA	-40			V
Gate Threshold Voltage	$V_{GS(th)}$	V_{DS} = V_{GS}, I_D = -250 µA	-1		-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} = -32 V, V_{GS} = 0 V			-1	µA
		V_{DS} = -32 V, V_{GS} = 0 V, T_J = 125°C			-50	
		V_{DS} = -32 V, V_{GS} = 0 V, T_J = 175°C			-150	
On-State Drain Current[a]	$I_{D(on)}$	V_{DS} = -5 V, V_{GS} = -10 V	-50			A
Drain-Source On-State Resistance[a]	$r_{DS(on)}$	V_{GS} = -10 V, I_D = -24 A		0.0075	0.0094	Ω
		V_{GS} = -10 V, I_D = -50 A, T_J = 125°C			0.014	
		V_{GS} = -10 V, I_D = -50 A, T_J = 175°C			0.017	
		V_{GS} = -4.5 V, I_D = -18 A		0.0115	0.0145	
Forward Transconductance[a]	g_{fs}	V_{DS} = -5 V, I_D = -24 A		73		S
Dynamic[b]						
Input Capacitance	C_{iss}	V_{GS} = 0 V, V_{DS} = -25 V, f = 1 MHz		4800		pF
Output Capacitance	C_{oss}			700		
Reversen Transfer Capacitance	C_{rss}			550		
Total Gate Charge[c]	Q_g	V_{DS} = -20 V, V_{GS} = -10 V, I_D = -50 A		102	150	nC
Gate-Source Charge[c]	Q_{gs}			18.5		
Gate-Drain Charge[c]	Q_{gd}			27		
Turn-On Delay Time[c]	$t_{d(on)}$	V_{DD} = -20 V, R_L = 0.4 Ω I_D ≃ -50 A, V_{GEN} = -10 V, R_G = 6 Ω		10	15	ns
Rise Time[c]	t_r			60	90	
Turn-Off Delay Time[c]	$t_{d(off)}$			145	220	
Fall Time[c]	t_f			140	220	
Source-Drain Diode Ratings and Characteristics (T_C = 25°C)[b]						
Continuous Current	I_s				-50	A
Pulsed Current	I_{SM}				-100	
Forward Voltage[a]	V_{SD}	I_F = -50 A, V_{GS} = 0 V		-1.0	-1.5	V
Reverse Recovery Time	t_{rr}	I_F = -50 A, di/dt = 100 A/µs		55	85	ns

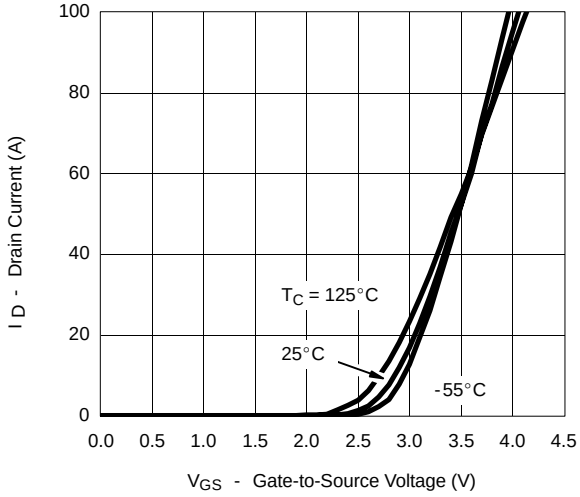
Notes:
a. Pulse test; pulse width ≤ 300 µs, duty cycle ≤ 2%.
b. Guaranteed by design, not subject to production testing.
c. Independent of operating temperature.

TYPICAL CHARACTERISTICS (25°C UNLESS NOTED)

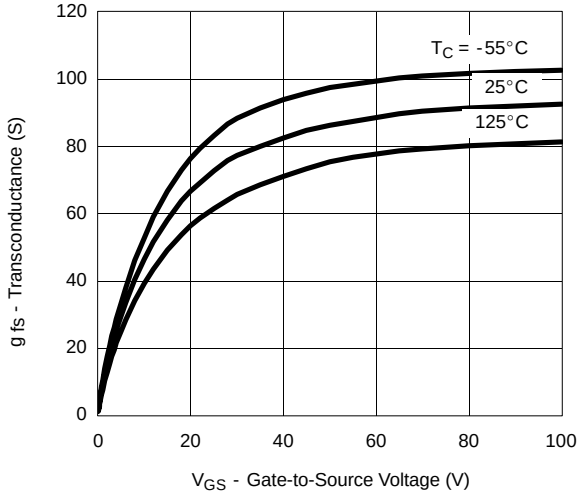
Output Characteristics



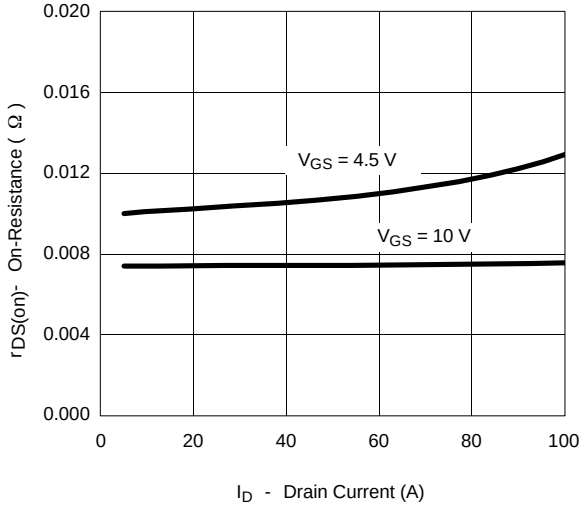
Transfer Characteristics



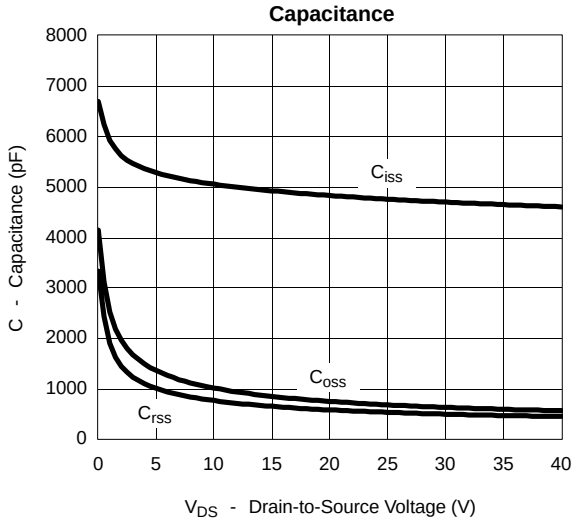
Transconductance



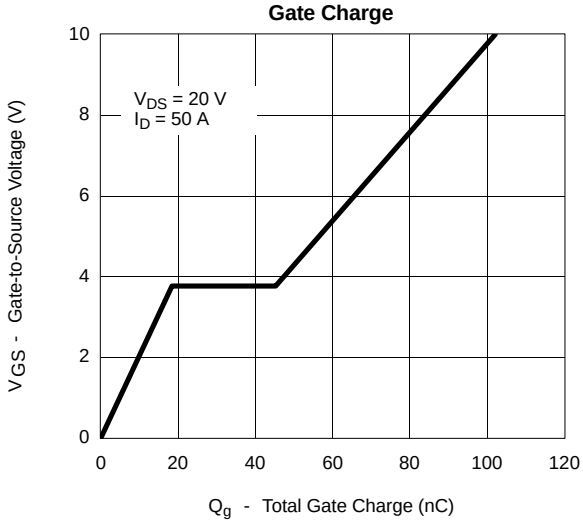
On-Resistance vs. Drain Current



Capacitance

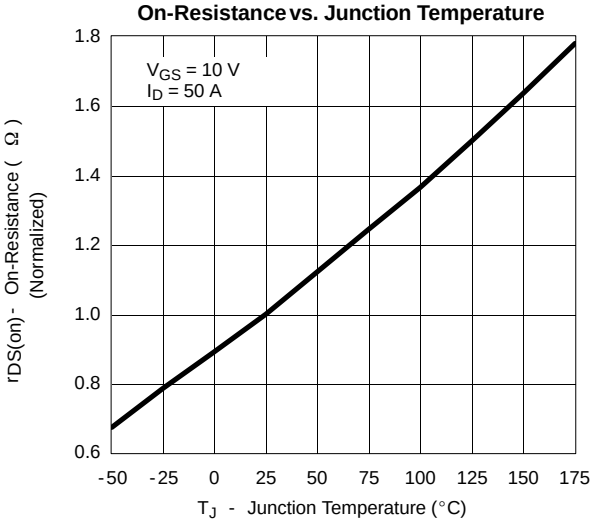


Gate Charge

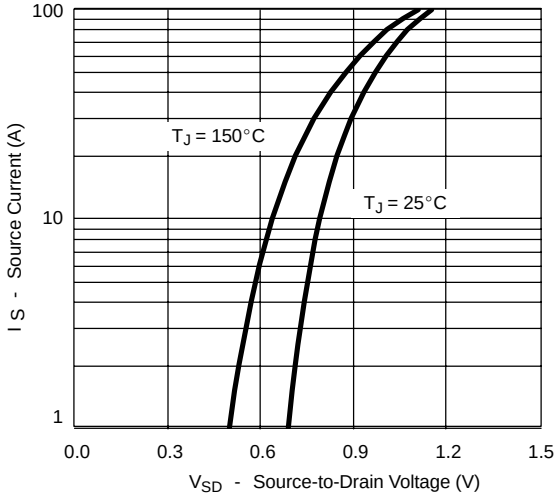


TYPICAL CHARACTERISTICS (25°C UNLESS NOTED)

On-Resistance vs. Junction Temperature

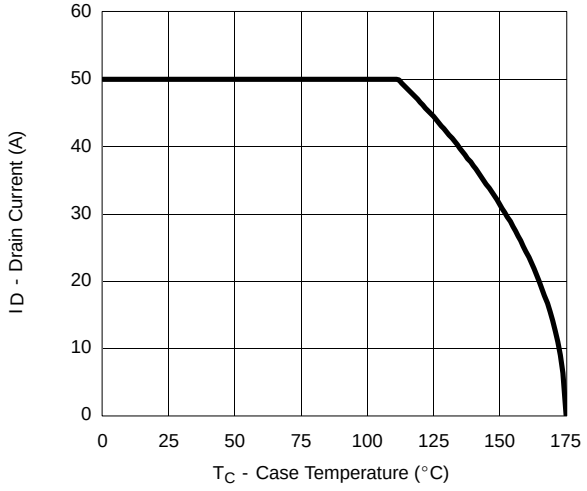


Source-Drain Diode Forward Voltage

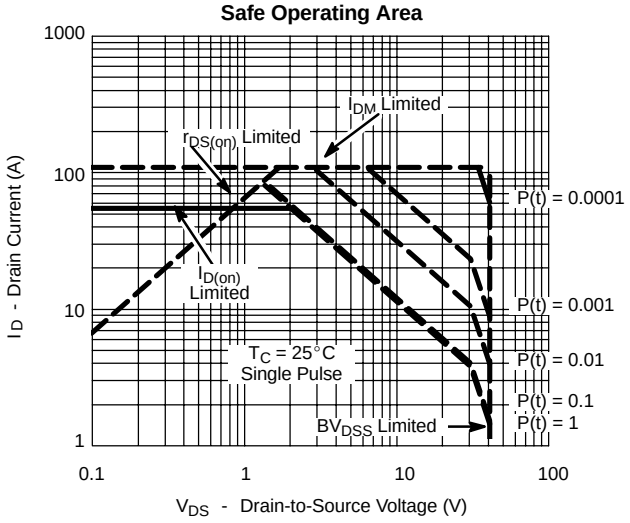


THERMAL RATINGS

Maximum Avalanche and Drain Current vs. Case Temperature



Safe Operating Area



Normalized Thermal Transient Impedance, Junction-to-Case