P-Channel 40-V (D-S), 175°C MOSFET

PRODUCT SUMMARY		
V_{DS} (V)	$r_{DS(on)}$ (Ω)	I_D (A)
−40	0.013 @ V_{GS} = −10 V	−60[c]
	0.022 @ V_{GS} = −4.5 V	−48

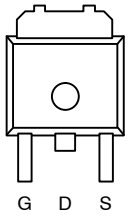
FEATURES

- TrenchFET® Power MOSFET
- 175°C Maximum Junction Temperature

APPLICATIONS

- Automotive Such As:
  - High-Side Switch
  - Motor Drive
  - 12-V Boardnet

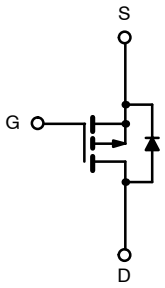
TO-252



Top View

Drain Connected to Tab

Order Number:
SUD50P04-13L—E3



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[b]	T_C = 25°C	I_D	−60[c]	A
	T_C = 100°C		−43	
Pulsed Drain Current		I_{DM}	−100	
Continuous Source Current (Diode Conduction)		I_S	−60[c]	
Avalanche Current		I_{AS}	−40	
Avalanche Energy		E_{AS}	80	mJ
Maximum Power Dissipation[b]	T_C = 25°C	P_D	93.7[b]	W
	T_A = 25°C		3[a]	
Operating Junction and Storage Temperature Range		T_J, T_{stg}	−55 to 175	°C

THERMAL RESISTANCE RATINGS

Parameter		Symbol	Typical	Maximum	Unit
Maximum Junction-to-Ambient[a]	t ≤ 10 sec.	R_{thJA}	15	18	°C/W
	Steady State		40	50	
Maximum Junction-to-Case		R_{thJC}	1.3	1.6	

Notes
a. Surface Mounted on 1" x 1" FR4 Board.
b. See SOA curve for voltage derating.
c. Calculated based on maximum allowable Junction Temperature. Package limitation current is 50 A.

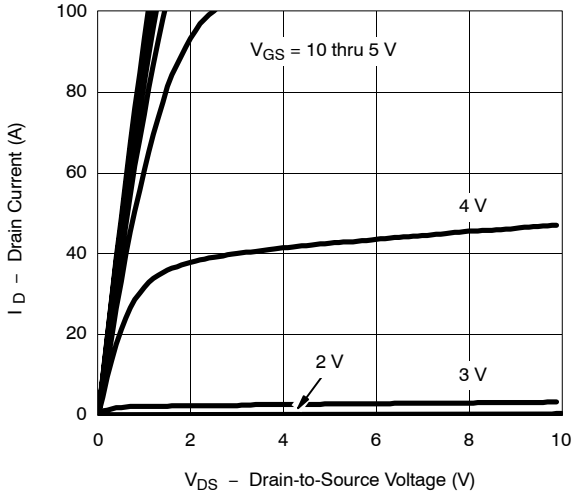
SPECIFICATIONS (T_J = 25°C UNLESS OTHERWISE NOTED)

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	−1.0		−3.0	
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	
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 = −30 A		0.0105	0.013	Ω
		V_{GS} = −10 V, I_D = −30 A, T_J = 125°C			0.020	
		V_{GS} = −4.5 V, I_D = −20 A		0.017	0.022	
Forward Transconductance[a]	g_{fs}	V_{DS} = −15 V, I_D = −30 A	15			S
Dynamic[b]						
Input Capacitance	C_{iss}	V_{GS} = 0 V, V_{DS} = −25 V, f = 1 MHz		3120		pF
Output Capacitance	C_{oss}			440		
Reverse Transfer Capacitance	C_{rss}			320		
Gate Resistance	R_g	f = 1.0 MHz		4.3		Ω
Total Gate Charge[c]	Q_g	V_{DS} = −20 V, V_{GS} = −10 V, I_D = −50 A		63	95	nC
Gate-Source Charge[c]	Q_{gs}			13		
Gate-Drain Charge[c]	Q_{gd}			16		
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 = 2.5 Ω		15	25	ns
Rise Time[c]	t_r			18	30	
Turn-Off Delay Time[c]	$t_{d(off)}$			60	90	
Fall Time[c]	t_f			47	70	
Source-Drain Diode Ratings and Characteristic (T_C = 25°C)						
Pulsed Current	I_{SM}				−100	A
Diode Forward Voltage[a]	V_{SD}	I_F = −50 A, V_{GS} = 0 V		−1.0	−1.5	V
Source-Drain Reverse Recovery Time	t_{rr}	I_F = −50 A, di/dt = 100 A/μs		36	55	ns

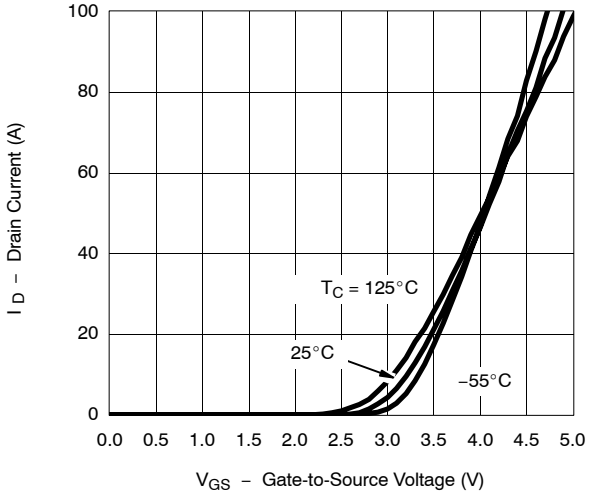
Notes
a. Pulse test; pulse width ≤ 300 μs, duty cycle ≤ 2%.
b. Guaranteed by design, not subject to production testing.
c. Independent of operating temperature.

TYPICAL CHARACTERISTICS (25°C UNLESS NOTED)

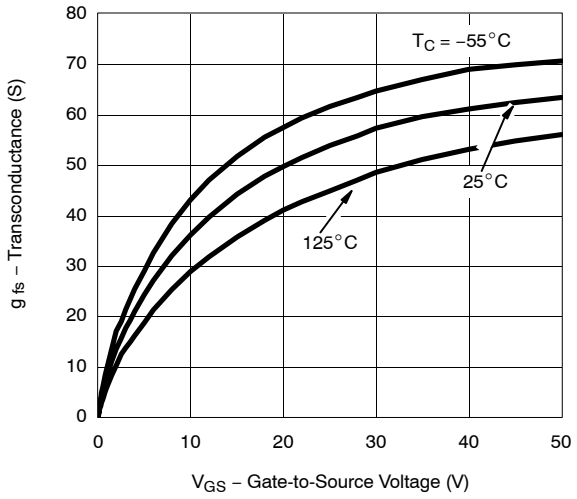
Output Characteristics



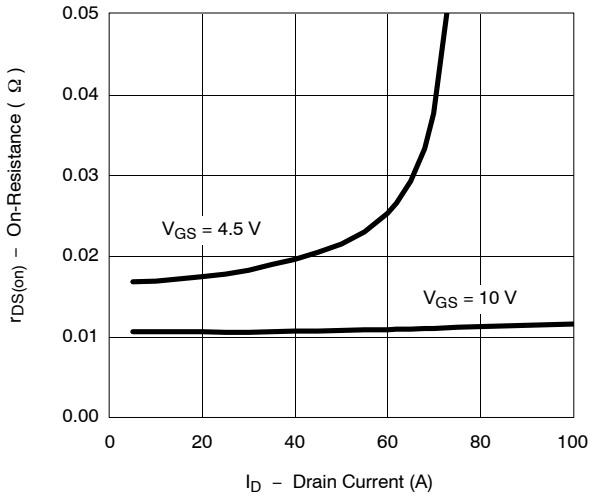
Transfer Characteristics



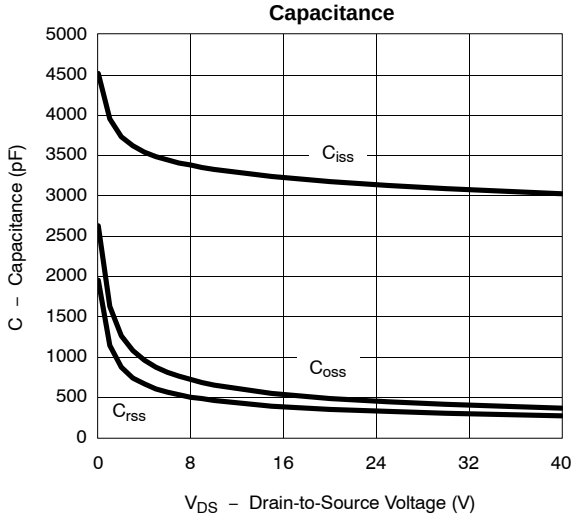
Transconductance



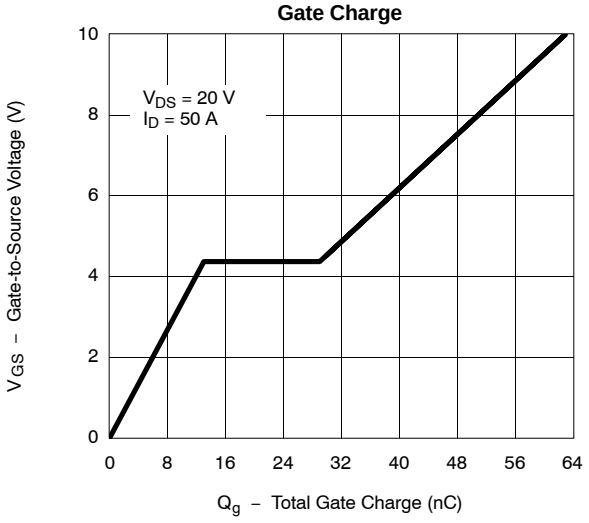
On-Resistance vs. Drain Current



Capacitance

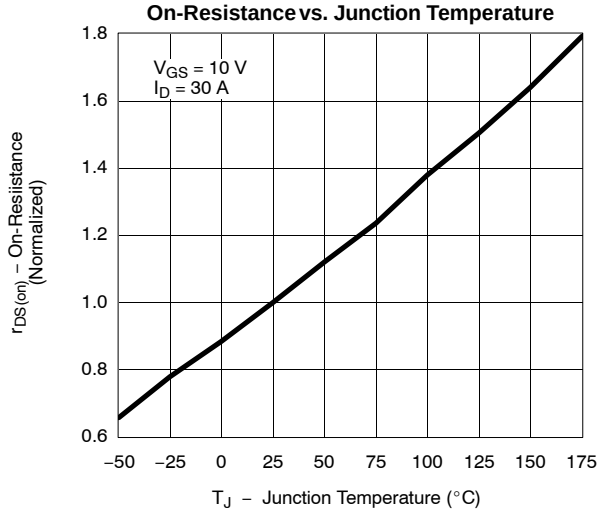


Gate Charge

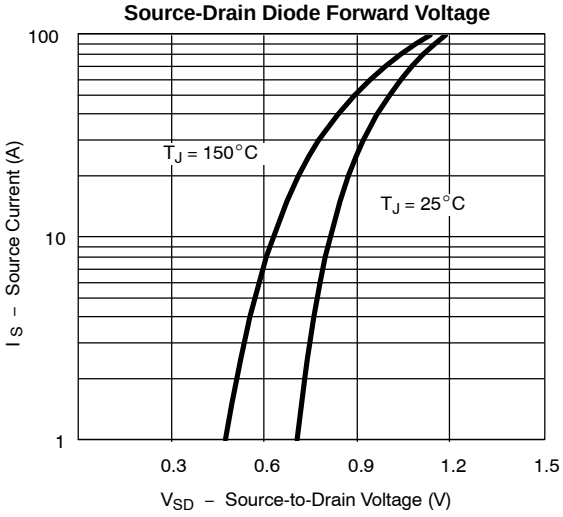


TYPICAL CHARACTERISTICS (25°C UNLESS NOTED)

On-Resistance vs. Junction Temperature

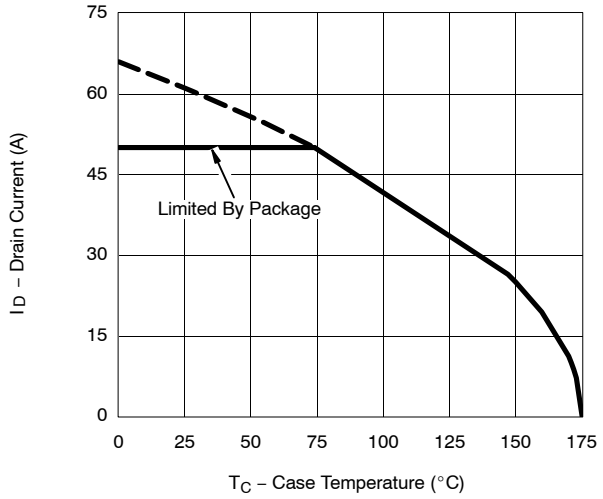


Source-Drain Diode Forward Voltage

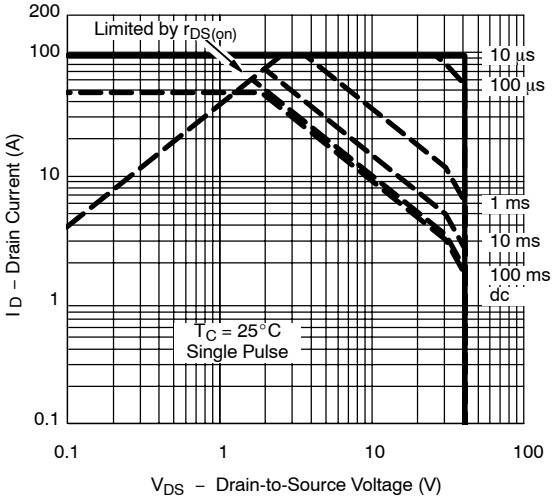


THERMAL RATINGS

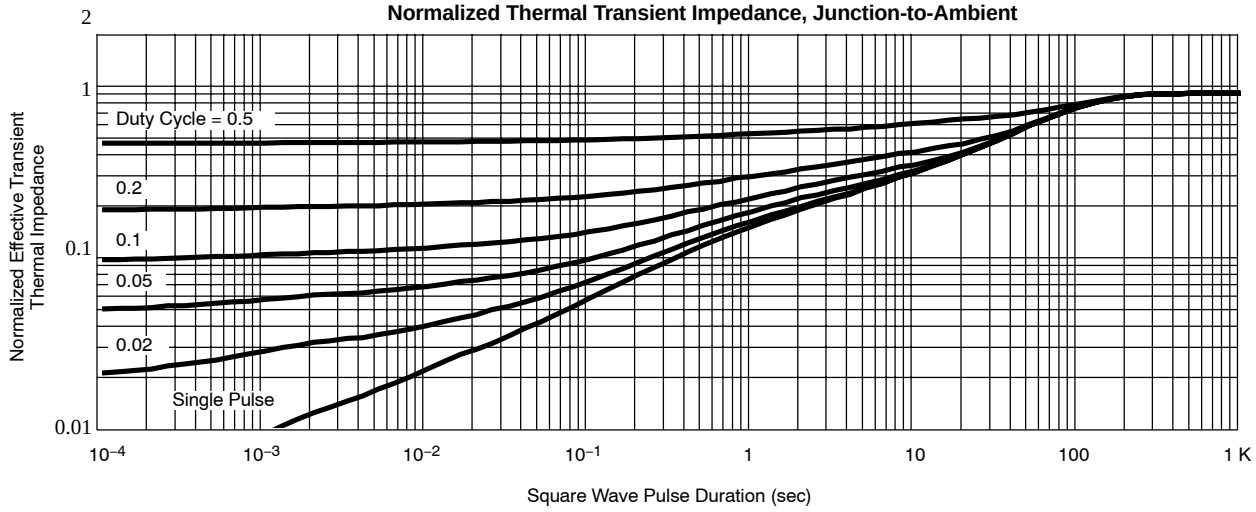
Maximum Avalanche and Drain Current vs. Case Temperature



Safe Operating Area



Normalized Thermal Transient Impedance, Junction-to-Ambient



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THERMAL RATINGS