

P-Channel 40 V (D-S), 175 °C MOSFET

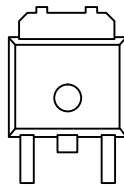
PRODUCT SUMMARY

V _{DS} (V)	R _{DS(on)} (Ω)	I _D (A) ^d
- 40	0.0094 at V _{GS} = - 10 V	- 50
	0.0145 at V _{GS} = - 4.5 V	- 50

FEATURES

- TrenchFET[®] Power MOSFETs
- 175 °C Junction Temperature
- Compliant to RoHS Directive 2002/95/EC

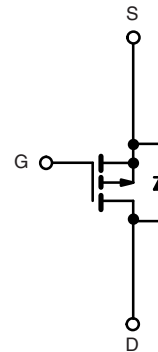

RoHS
COMPLIANT

TO-252


G D S

Top View

Drain Connected to Tab

Ordering Information: SUD50P04-09L-E3 (Lead (Pb)-free)


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)	I _D	T _C = 25 °C	- 50 ^d
		T _C = 125 °C	- 50 ^d
Pulsed Drain Current	I _{DM}	- 100	A
Avalanche Current	I _{AS}	- 50	
Single Avalanche Energy ^a	E _{AS}	125	mJ
Power Dissipation	P _D	T _C = 25 °C	136 ^c
		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	R _{thJA}	t ≤ 10 s	15	18
		Steady State	40	
Junction-to-Case	R _{thJC}	0.82	1.1	°C/W

Notes:

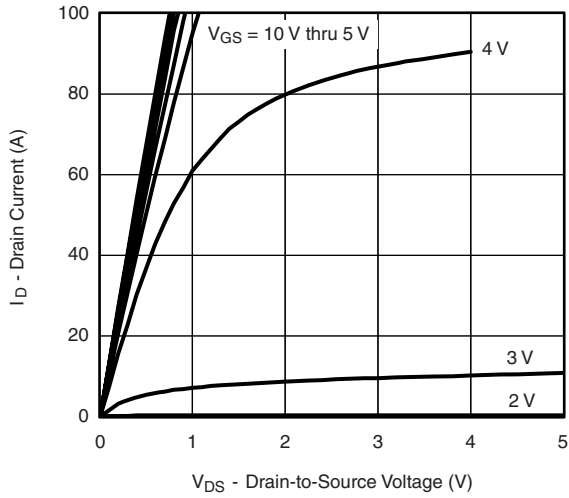
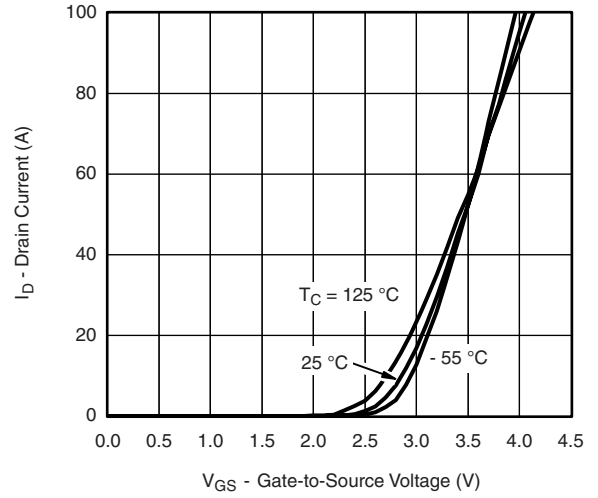
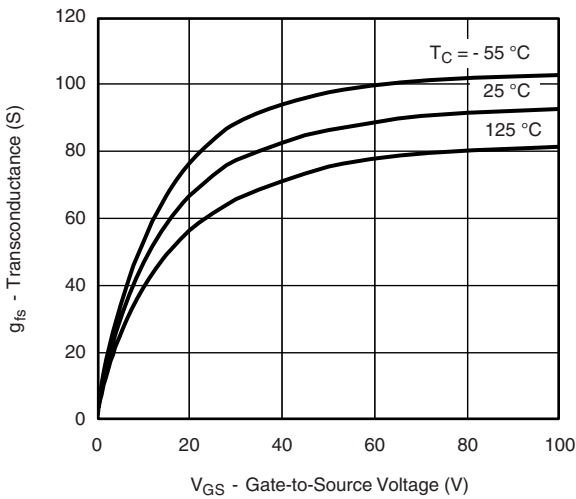
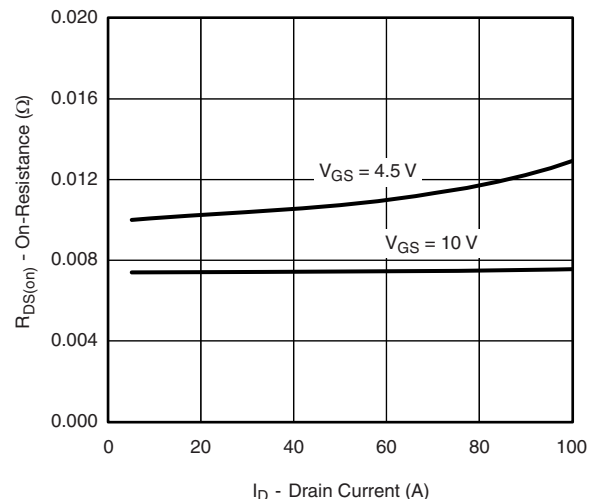
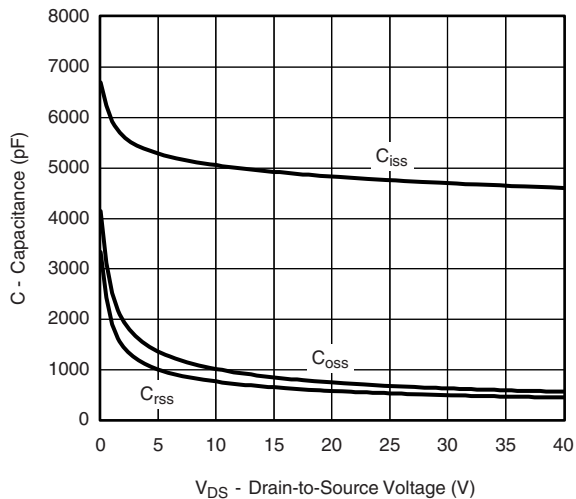
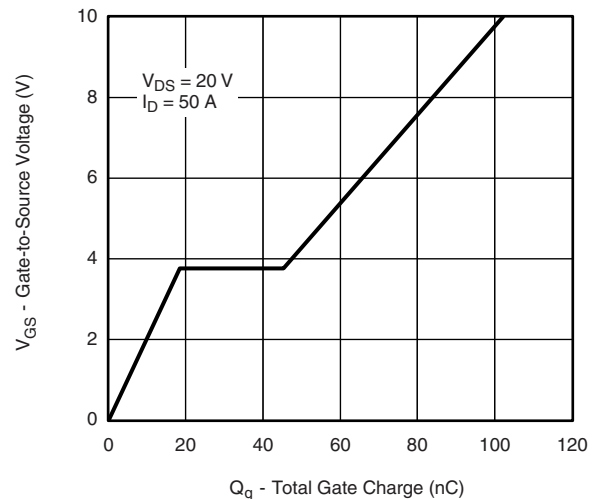
- Duty cycle ≤ 1 %.
- When mounted on 1" square PCB (FR-4 material).
- See SOA curve for voltage derating.
- Package limited.

SPECIFICATIONS $T_J = 25\text{ }^\circ\text{C}$, unless otherwise noted						
Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Unit
Static						
Drain-Source Breakdown Voltage	V_{DS}	$V_{GS} = 0\text{ V}$, $I_D = -250\text{ }\mu\text{A}$	-40			V
Gate Threshold Voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}$, $I_D = -250\text{ }\mu\text{A}$	-1		-3	
Gate-Body Leakage	I_{GSS}	$V_{DS} = 0\text{ V}$, $V_{GS} = \pm 20\text{ V}$			± 100	nA
Zero Gate Voltage Drain Current	I_{DSS}	$V_{DS} = -32\text{ V}$, $V_{GS} = 0\text{ V}$			-1	μA
		$V_{DS} = -32\text{ V}$, $V_{GS} = 0\text{ V}$, $T_J = 125\text{ }^\circ\text{C}$			-50	
		$V_{DS} = -32\text{ V}$, $V_{GS} = 0\text{ V}$, $T_J = 175\text{ }^\circ\text{C}$			-150	
On-State Drain Current ^a	$I_{D(on)}$	$V_{DS} = -5\text{ V}$, $V_{GS} = -10\text{ V}$	-50			A
Drain-Source On-State Resistance ^a	$R_{DS(on)}$	$V_{GS} = -10\text{ V}$, $I_D = -24\text{ A}$		0.0075	0.0094	Ω
		$V_{GS} = -10\text{ V}$, $I_D = -50\text{ A}$, $T_J = 125\text{ }^\circ\text{C}$			0.014	
		$V_{GS} = -10\text{ V}$, $I_D = -50\text{ A}$, $T_J = 175\text{ }^\circ\text{C}$			0.017	
		$V_{GS} = -4.5\text{ V}$, $I_D = -18\text{ A}$		0.0115	0.0145	
Forward Transconductance ^a	g_{fs}	$V_{DS} = -5\text{ V}$, $I_D = -24\text{ A}$		73		S
Dynamic^b						
Input Capacitance	C_{iss}	$V_{GS} = 0\text{ V}$, $V_{DS} = -25\text{ V}$, $f = 1\text{ MHz}$		4800		pF
Output Capacitance	C_{oss}			700		
Reverse Transfer Capacitance	C_{rss}			550		
Total Gate Charge ^c	Q_g	$V_{DS} = -20\text{ V}$, $V_{GS} = -10\text{ V}$, $I_D = -50\text{ A}$		102	150	nC
Gate-Source Charge ^c	Q_{gs}			18.5		
Gate-Drain Charge ^c	Q_{gd}			27		
Turn-On Delay Time ^c	$t_{d(on)}$	$V_{DD} = -20\text{ V}$, $R_L = 0.4\text{ }\Omega$ $I_D \cong -50\text{ A}$, $V_{GEN} = -10\text{ V}$, $R_g = 6\text{ }\Omega$		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 $T_C = 25\text{ }^\circ\text{C}$^b						
Continuous Current	I_S				-50	A
Pulsed Current	I_{SM}				-100	
Forward Voltage ^a	V_{SD}	$I_F = -50\text{ A}$, $V_{GS} = 0\text{ V}$		-1.0	-1.5	V
Reverse Recovery Time	t_{rr}	$I_F = -50\text{ A}$, $dI/dt = 100\text{ A}/\mu\text{s}$		55	85	ns

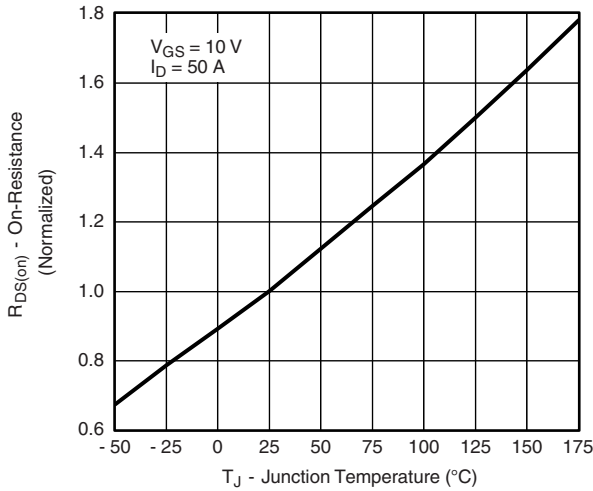
Notes:

- a. Pulse test; pulse width $\leq 300\text{ }\mu\text{s}$, duty cycle $\leq 2\%$.
b. Guaranteed by design, not subject to production testing.
c. Independent of operating temperature.

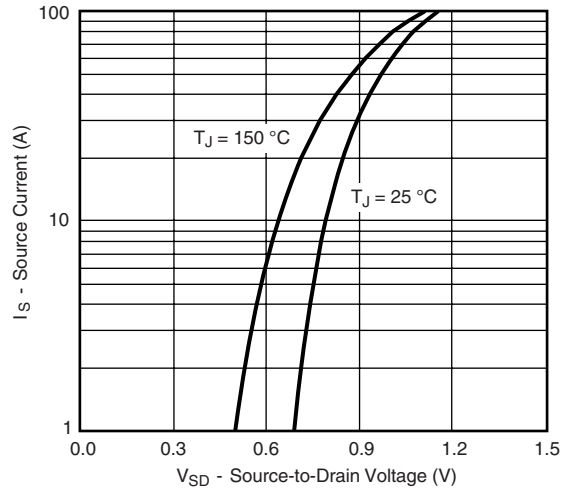
Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure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

TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted

Output Characteristics

Transfer Characteristics

Transconductance

On-Resistance vs. Drain Current

Capacitance

Gate Charge

TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted

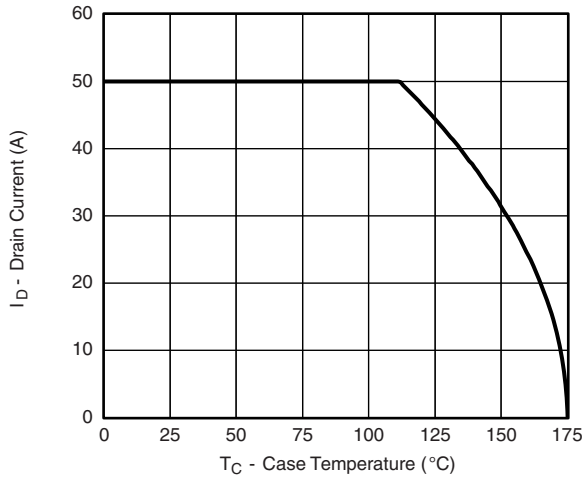


On-Resistance vs. Junction Temperature

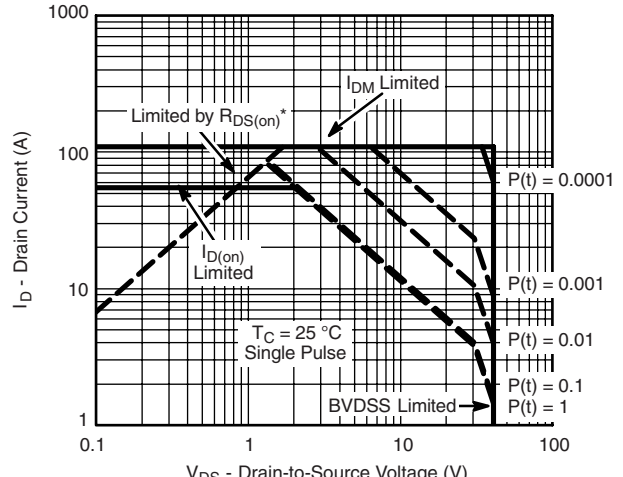


Source-Drain Diode Forward Voltage

THERMAL RATINGS

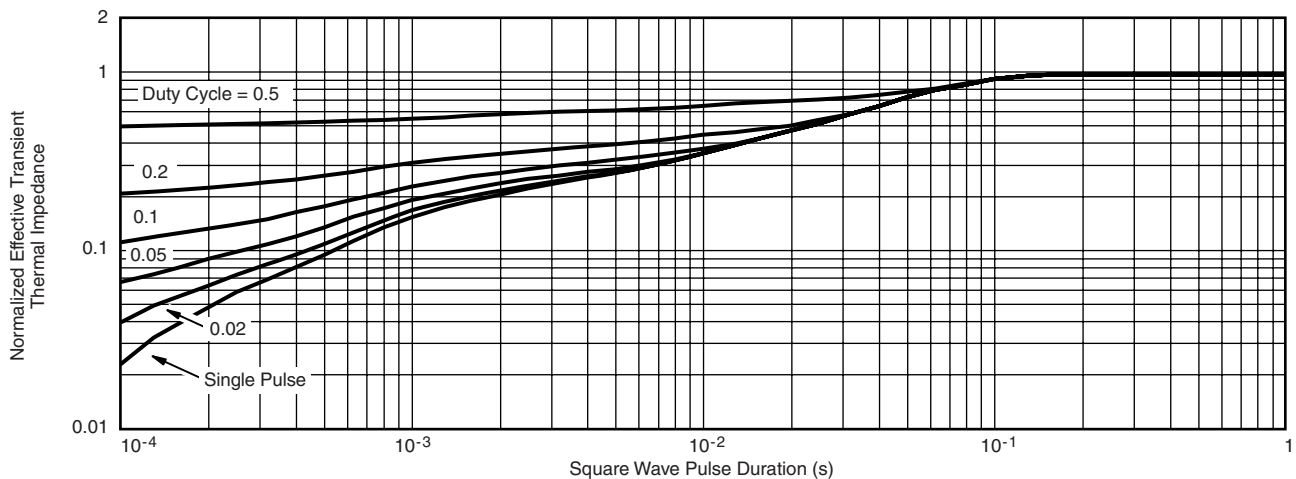


Maximum Avalanche and Drain Current vs. Case Temperature



* $V_{GS} >$ minimum V_{GS} at which $R_{DS(on)}$ is specified

Safe Operating Area



Normalized Thermal Transient Impedance, Junction-to-Case

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