P-Channel 55-V (D-S) MOSFET with Sensing Diode

PRODUCT SUMMARY		
$V_{(BR)DSS}$ (V)	$r_{DS(on)}$ (Ω)	I_D (A)
–55	0.011 @ V_{GS} = –10 V	–60[a]
	0.0175 @ V_{GS} = –4.5 V	–60[a]

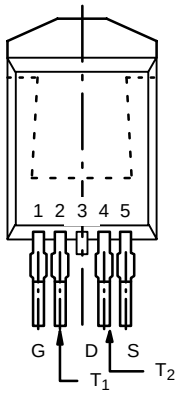
FEATURES

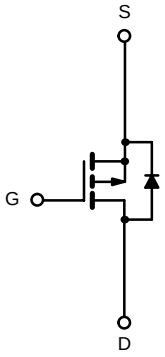
- TrenchFET® Power MOSFETS Plus Temperature Sensing Diode
- 175°C Junction Temperature
- New Low Thermal Resistance Package

APPLICATIONS

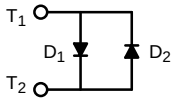
- Automotive
- Industrial

D²PAK-5L





P-Channel MOSFET



ABSOLUTE MAXIMUM RATINGS (T_C = 25°C UNLESS OTHERWISE NOTED)				
Parameter		Symbol	Limit	Unit
Drain-Source Voltage		V_{DS}	–55	V
Gate-Source Voltage		V_{GS}	±20	
Continuous Drain Current (T_J = 175°C)[d]	T_C = 25°C	I_D	–60[a]	A
	T_C = 100°C		–60[a]	
Pulsed Drain Current		I_{DM}	–250	
Continous Diode Current (Diode Conduction)[d]		I_S	–60[a]	
Avalanche Current		I_{AR}	–60[a]	
Repetitive Avalanche Energy[b]	L = 0.1 mH	E_{AR}	180	mJ
Maximum Power Dissipation[a]	T_C = 25°C	P_D	200[c]	W
	T_A = 25°C		3.75[d]	
Operating Junction and Storage Temperature Range		T_J, T_{stg}	–55 to 175	°C

THERMAL RESISTANCE RATINGS				
Parameter		Symbol	Limit	Unit
Junction-to-Ambient[d]	PCB Mount[d]	R_{thJA}	40	°C/W
Junction-to-Case		R_{thJC}	0.75	

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).

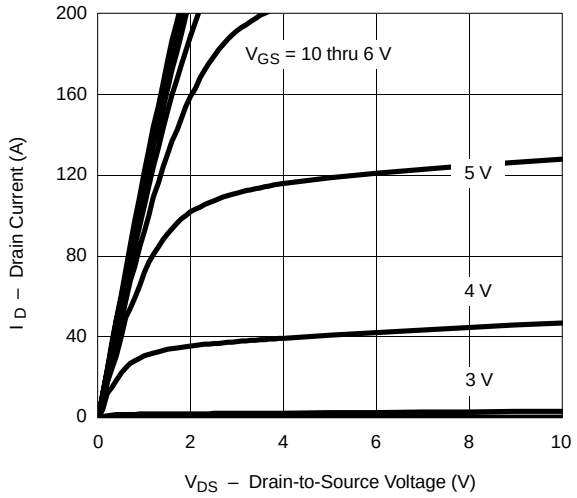
MOSFET SPECIFICATIONS (T_J =25°C UNLESS OTHERWISE NOTED)

Parameter	Symbol	Test Condition	Min	Typ	Max	Unit
Static						
Drain-Source Breakdown Voltage	$V_{(BR)DSS}$	V_{GS} = 0 V, I_D = –250 μA	–55			V
Gate Threshold Voltage	$V_{GS(th)}$	V_{DS} = V_{GS}, I_{DS} = –250 μA	–1			
Gate-Body Leakage	I_{GSS}	V_{DS} = 0 V, V_{GS} = ±20 V			±100	nA
Zero Gate Voltage Drain Current	I_{DSS}	V_{DS} = –44 V, V_{GS} = 0 V			–1	μA
		V_{DS} = –44 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	–120			A
Drain-Source On-State Resistance[a]	$r_{DS(on)}$	V_{GS} = –10 V, I_D = –30 A		0.009	0.011	Ω
		V_{GS} = –10 V, I_D = –30 A, T_J = 125°C			0.0175	
		V_{GS} = –10 V, I_D = –30 A, T_J = 175°C			0.022	
		V_{GS} = –4.5 V, I_D = –20 A			0.0175	
Sense Diode Forward Voltage	V_{FD}	V_{DS} = –25 V, I_F = –250 μA	–770		–830	mV
Sense Diode Forward Voltage Increase	ΔV_F	From I_F = –125 μA to I_F = –250 μA	–25		–55	
Forward Transconductance[a]	g_{fs}	V_{DS} = –25 V, I_D = –30 A		50		S
Dynamic[b]						
Input Capacitance	C_{iss}	V_{GS} = 0 V, V_{DS} = –25 V, f = 1 MHz		6450	160	pF
Output Capacitance	C_{oss}			1050		
Reversen Transfer Capacitance	C_{rss}			520		
Total Gate Charge[c]	Q_g	V_{DS} = –30 V, V_{GS} = –10 V, I_D = –60 A		107		nC
Gate-Source Charge[c]	Q_{gs}			28		
Gate-Drain Charge[c]	Q_{gd}			22		
Turn-On Delay Time[c]	$t_{d(on)}$	V_{DD} = –30 V, R_L = 0.6 Ω I_D ≃ –60 A, V_{GEN} = –10 V, R_G = 2.5 Ω		15	25	ns
Rise Time[c]	t_r			190	325	
Turn-Off Delay Time[c]	$t_{d(off)}$			145	220	
Fall Time[c]	t_f			265	450	
Source-Drain Diode Ratings and Characteristics (T_C = 25°C)[b]						
Continuous Current	I_S				–60	A
Pulsed Current	I_{SM}				–200	
Forward Voltage[a]	V_{SD}	I_F = –60 A, V_{GS} = 0 V		–1.1	–1.5	V
Reverse Recovery Time	t_{rr}	I_F = –60 A, di/dt = 100 A/μs		55	110	ns
Peak Reverse Recovery Current	$I_{RM(REC)}$			–1.6	–2.0	A
Reverse Recovery Charge	Q_{rr}			0.04	12	μC

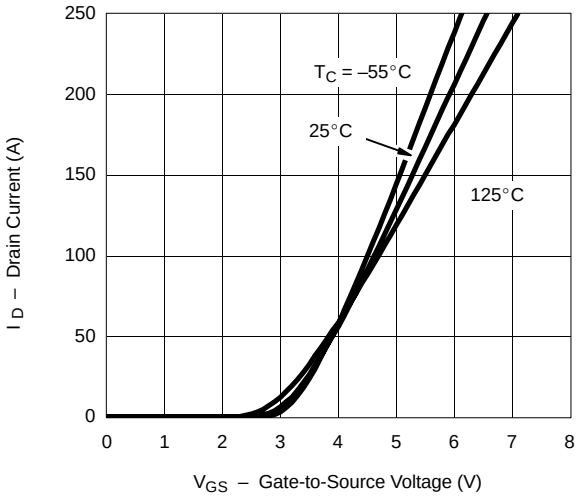
Notes:
a. Pulse test; pulse width ≤ 300 μs, duty cycle ≤ 2%.
b. Guaranteed by design, not subject to production testing.
c. Independent of operating temperature.

TYPICAL CHARACTERISTICS (25°C UNLESS NOTED)

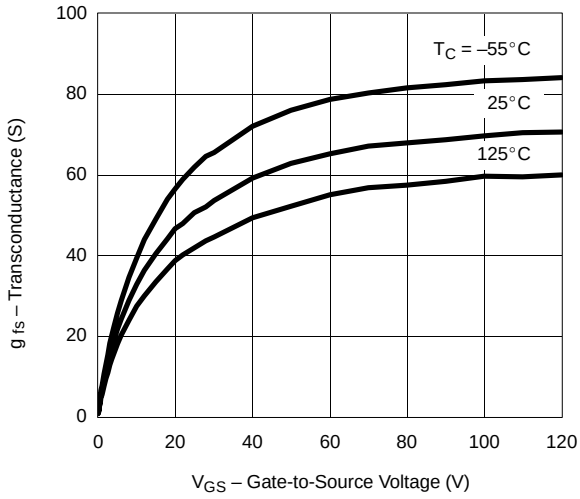
Output Characteristics



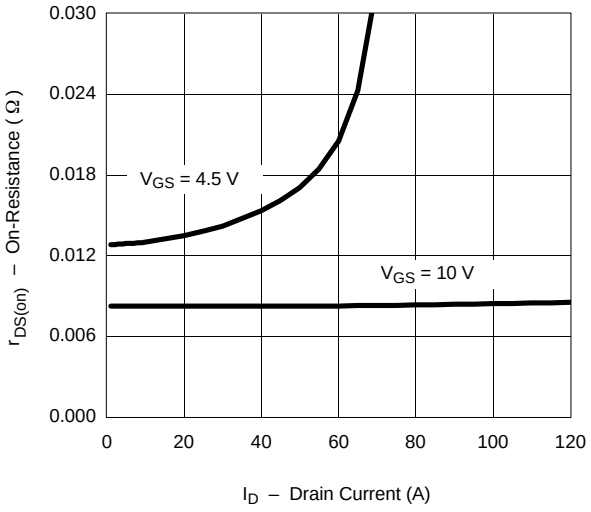
Transfer Characteristics



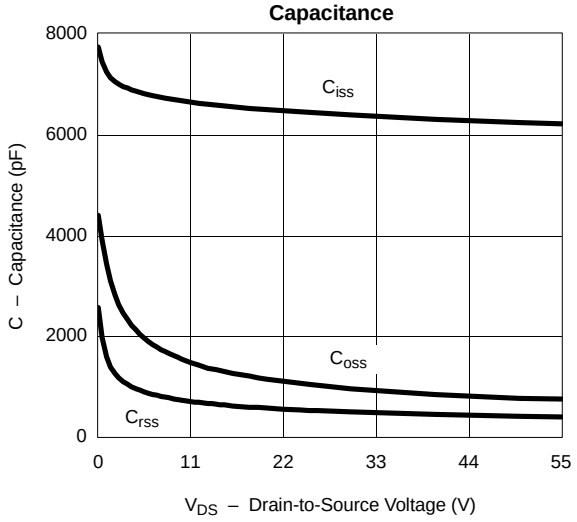
Transconductance



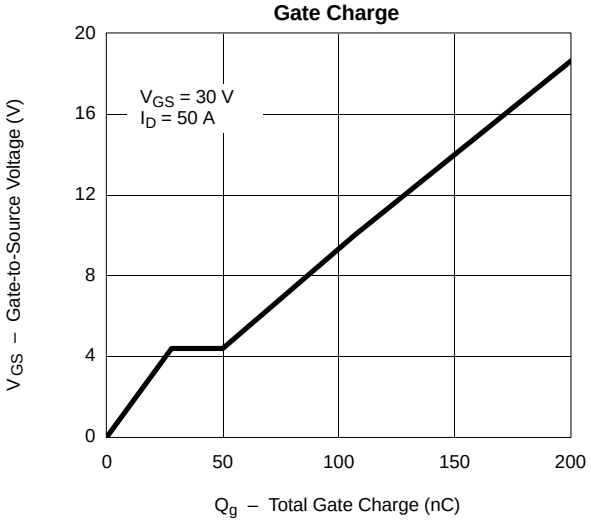
On-Resistance vs. Drain Current



Capacitance

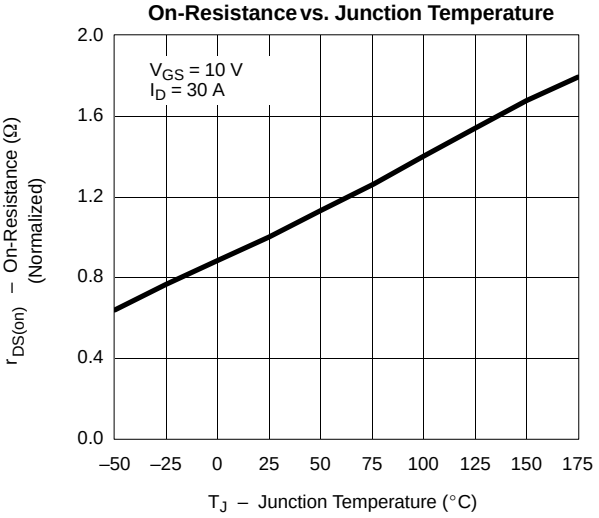


Gate Charge

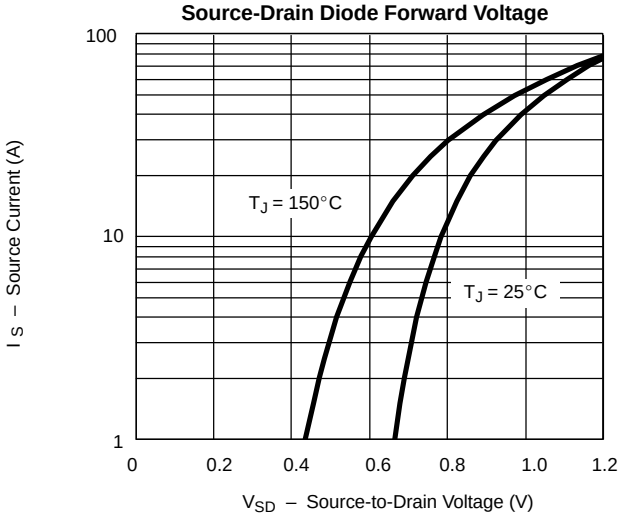


TYPICAL CHARACTERISTICS (25°C UNLESS NOTED)

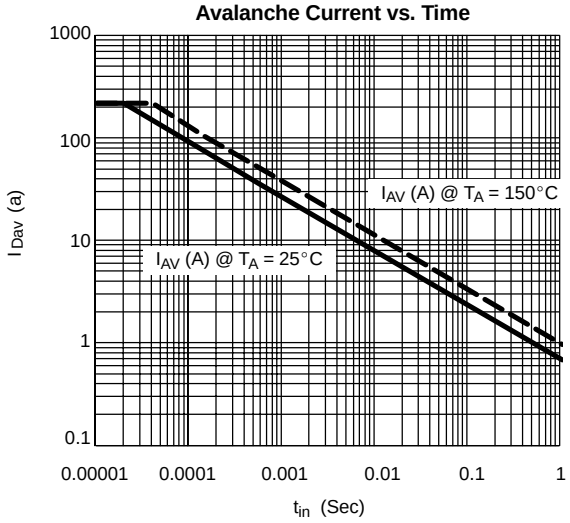
On-Resistance vs. Junction Temperature



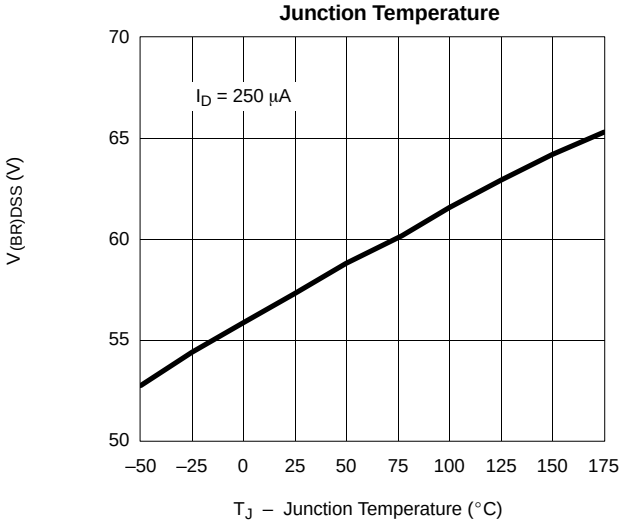
Source-Drain Diode Forward Voltage



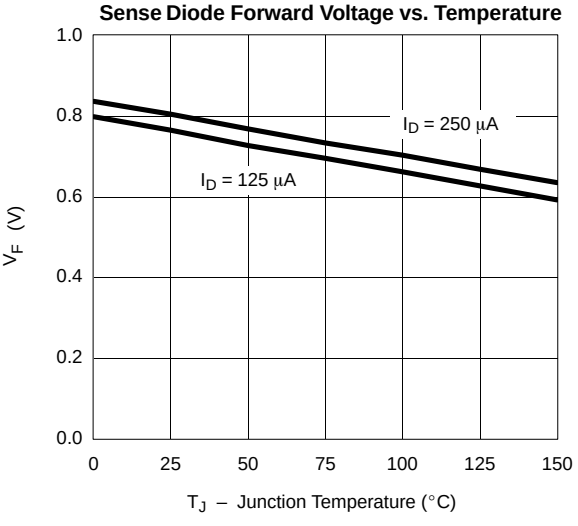
Avalanche Current vs. Time



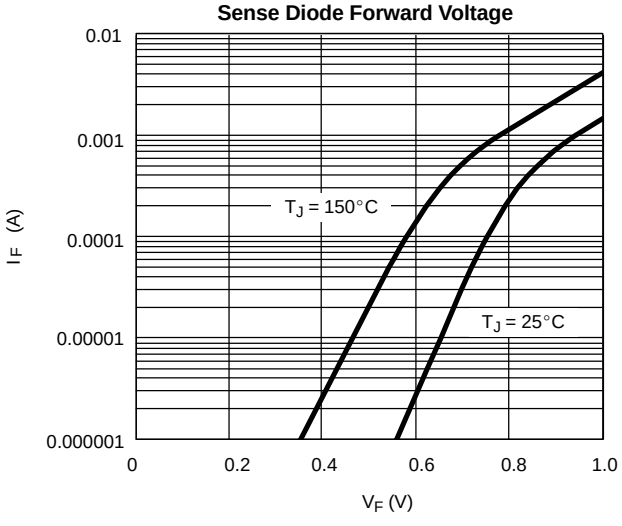
Drain Source Breakdown vs. Junction Temperature



Sense Diode Forward Voltage vs. Temperature

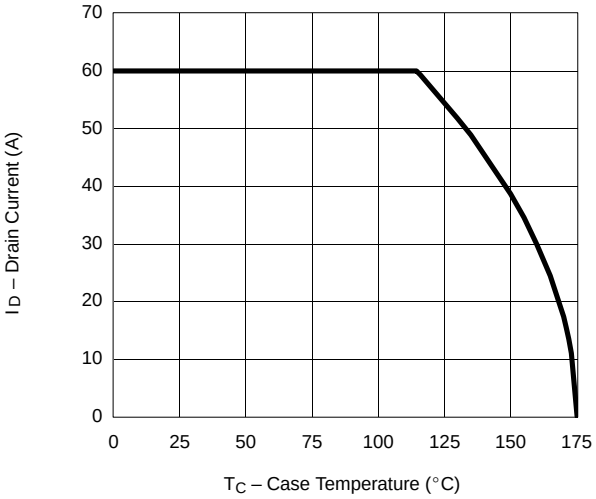


Sense Diode Forward Voltage

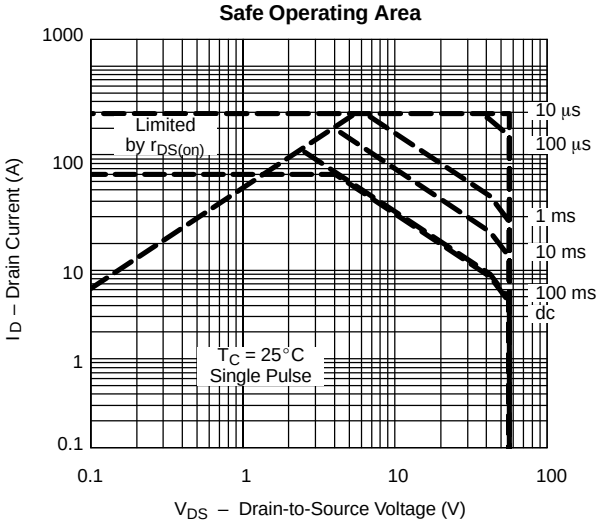


THERMAL RATINGS

Maximum Avalanche and Drain Current vs. Case Temperature



Safe Operating Area



Normalized Thermal Transient Impedance, Junction-to-Case