N-Channel 40-V (D-S) MOSFET with Sensing Diode

PRODUCT SUMMARY

$V_{(BR)DSS}$ (V)	$r_{DS(on)}$ (Ω)	I_D (A)
40	0.0055 @ V_{GS} = 10 V	60[a]

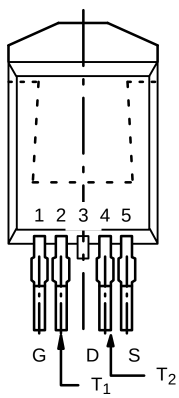
FEATURES

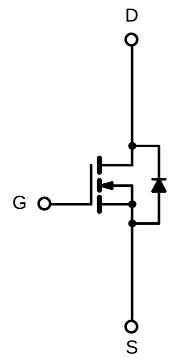
- TrenchFET® Power MOSFETS Plus Temperature Sensing Diode
- 175°C Junction Temperature
- New Low Thermal Resistance Package

APPLICATIONS

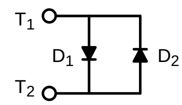
- Automotive
- Industrial

D²PAK-5L





N-Channel MOSFET



ABSOLUTE MAXIMUM RATINGS (T_C = 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)[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

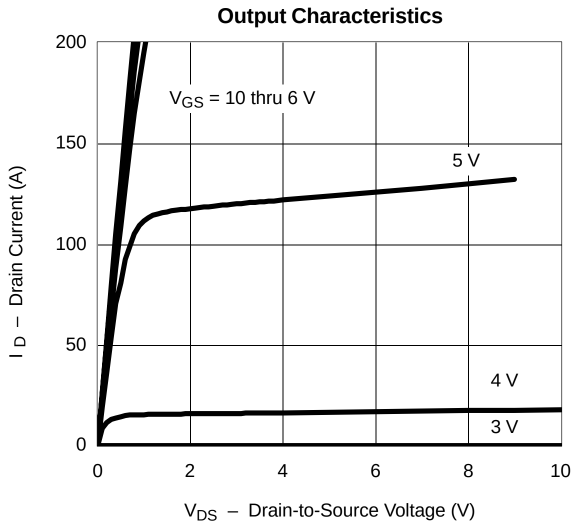
Parameter		Symbol	Limit	Unit
Junction-to-Ambient[d]	PCB Mount[d]	R_{thJA}	40	°C/W
Junction-to-Case		R_{thJC}	0.75	

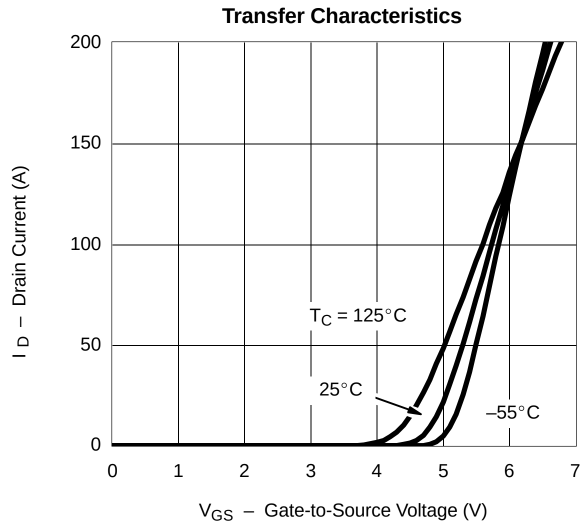
Notes
a. Package limited.
b. Duty cycle ≤ 1%.
c. See SOA curve for voltage derating.
d. When mounted on 1” square PCB (FR-4 material).

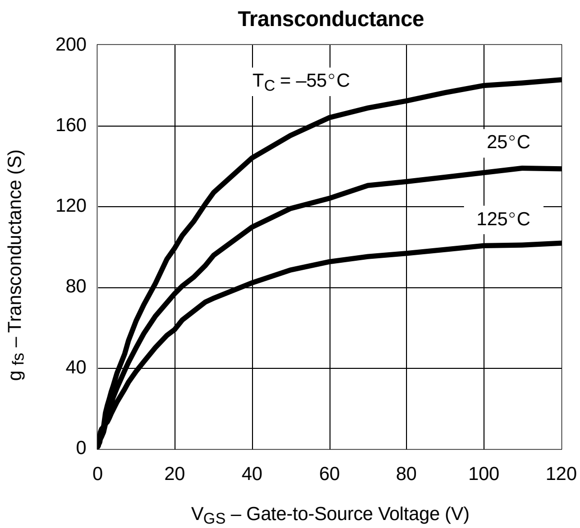
MOSFET SPECIFICATIONS (T_J = 25°C UNLESS OTHERWISE NOTED)						
Parameter	**Symbol**	**Test Condition**	**Min**	**Typ**	**Max**	**Unit**
Static						
Drain-Source Breakdown Voltage	$V_{(BR)DSS}$	V_{GS} = 0 V, I_D = 250 µA	40			V
Gate Threshold Voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}$, I_{DS} = 250 µA	2			V
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			500	
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 = 25 A		0.0044	0.0055	Ω
		V_{GS} = 10 V, I_D = 25 A, T_J = 125°C			0.0088	
		V_{GS} = 10 V, I_D = 25 A, T_J = 175°C			0.011	
Sense Diode Forward Voltage	V_{FD1}	I_F = 50 µA	655		715	mV
	V_{FD2}	I_F = 25 µA	600		660	
Sense Diode Forward Voltage Increase	ΔV_F	From I_F = 25 µA to I_F = 50 µA	30		80	
Forward Transconductance[a]	g_{fs}	V_{DS} = 15 V, I_D = 20 A		35		S
Dynamic[b]						
Input Capacitance	C_{iss}	V_{GS} = 0 V, V_{DS} = 25 V, f = 1 MHz		6400		pF
Output Capacitance	C_{oss}			1100		
Reversen Transfer Capacitance	C_{rss}			630		
Total Gate Charge[c]	Q_g	V_{DS} = 20 V, V_{GS} = 10 V, I_D = 25 A		115	150	nC
Gate-Source Charge[c]	Q_{gs}			35		
Gate-Drain Charge[c]	Q_{gd}			35		
Turn-On Delay Time[c]	$t_{d(on)}$	V_{DD} = 20 V, R_L = 0.8 Ω I_D ≃ 25 A, V_{GEN} = 10 V, R_G = 2.5 Ω		15	20	ns
Rise Time[c]	t_r			150	210	
Turn-Off Delay Time[c]	$t_{d(off)}$			60	85	
Fall Time[c]	t_f			80	110	
Source-Drain Diode Ratings and Characteristics (T_C = 25°C)[b]						
Continuous Current	I_S				60	A
Pulsed Current	I_{SM}				200	A
Forward Voltage[a]	V_{SD}	I_F = 60 A, V_{GS} = 0 V		1.0	1.5	V
Reverse Recovery Time	t_{rr}	I_F = 60 A, di/dt = 100 A/µs		45	70	ns
Peak Reverse Recovery Current	$I_{RM(REC)}$			2.5	5	A
Reverse Recovery Charge	Q_{rr}			0.06	0.18	µC

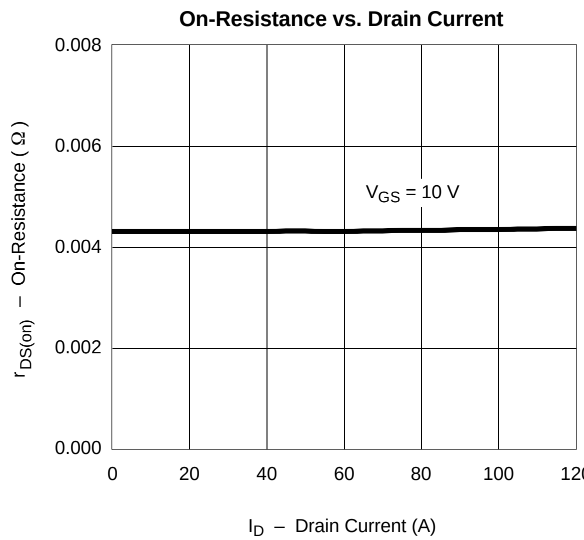
Notes:
a. Pulse test; pulse width ≤ 300 µs, duty cycle ≤ 2%.
b. Guaranteed by design, not subject to production testing.
c. Independent of operating temperature.

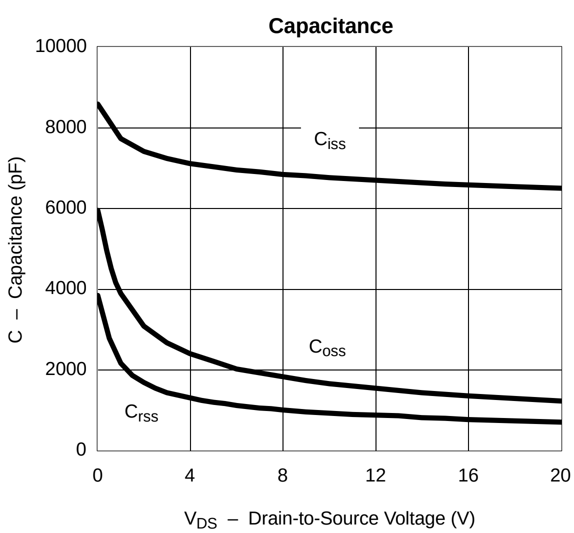
TYPICAL CHARACTERISTICS (25°C UNLESS NOTED)

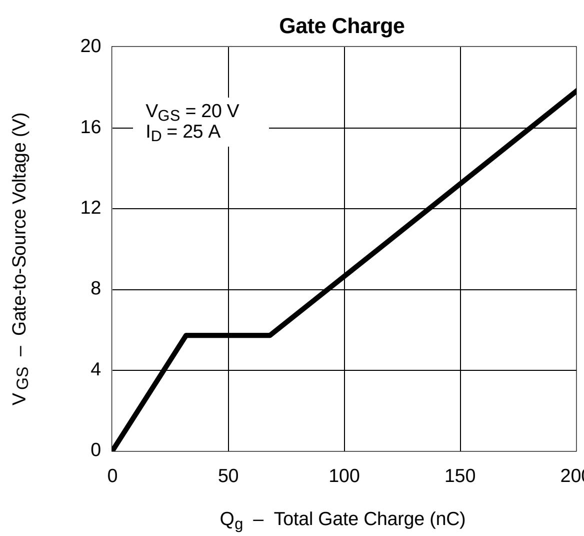






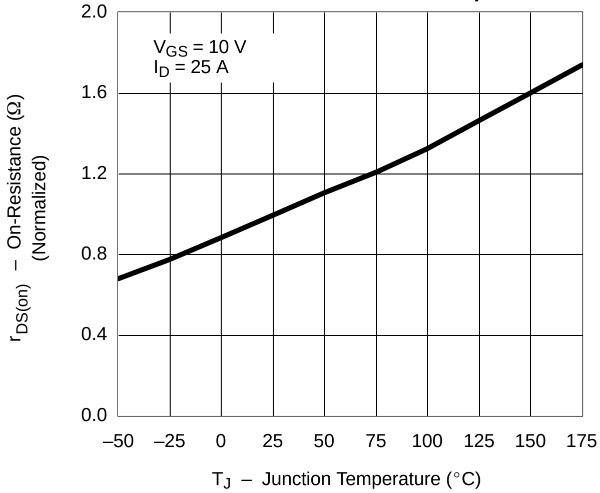




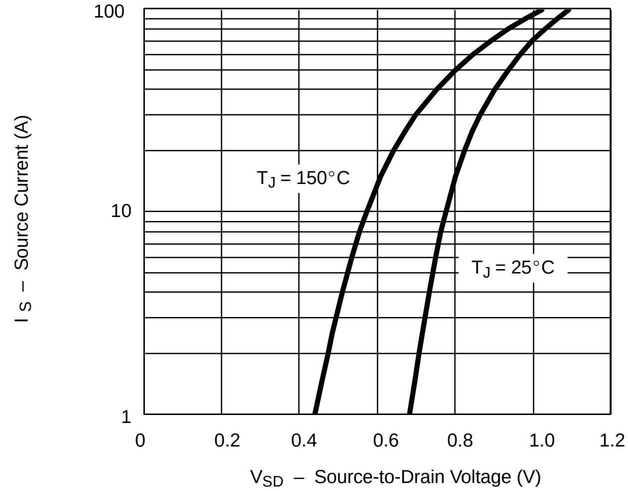


TYPICAL CHARACTERISTICS (25°C UNLESS NOTED)

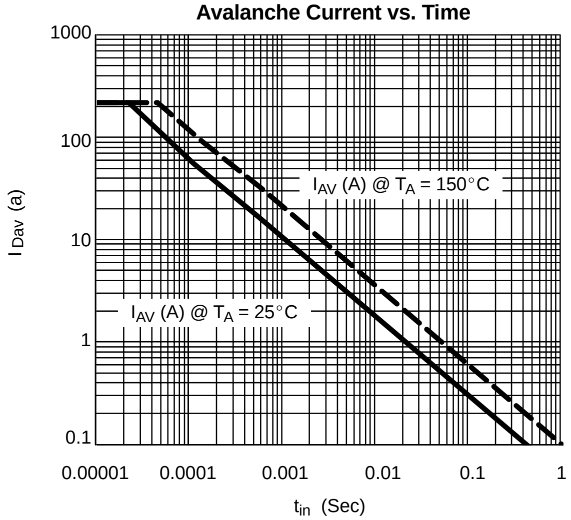
On-Resistance vs. Junction Temperature



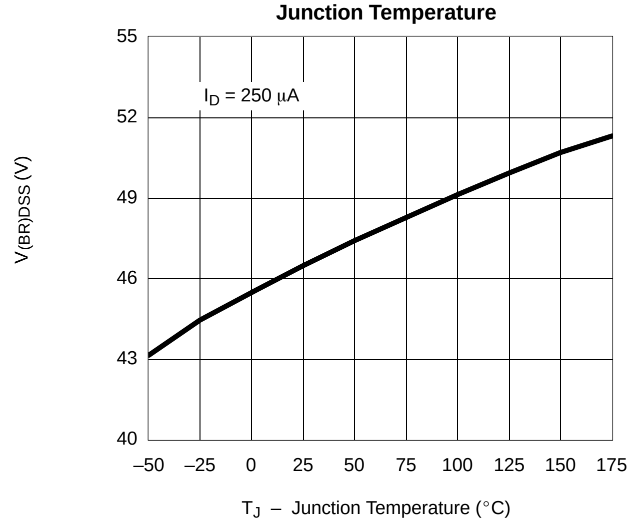
Source-Drain Diode Forward Voltage



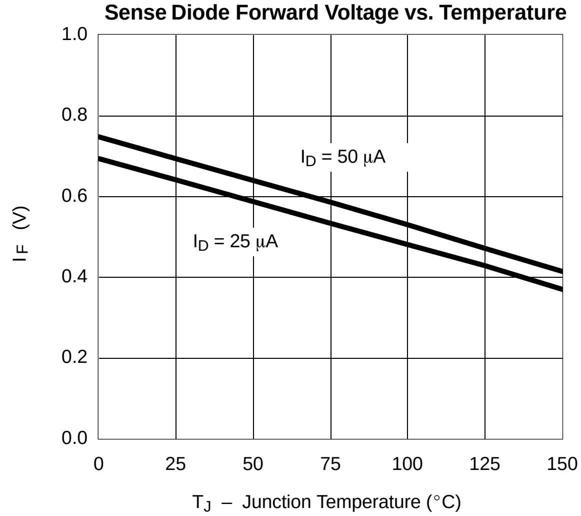
Avalanche Current vs. Time



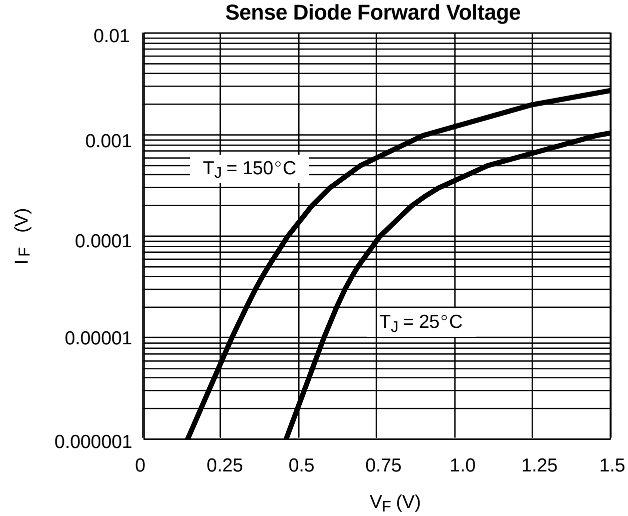
Drain Source Breakdown vs. Junction Temperature



Sense Diode Forward Voltage vs. Temperature

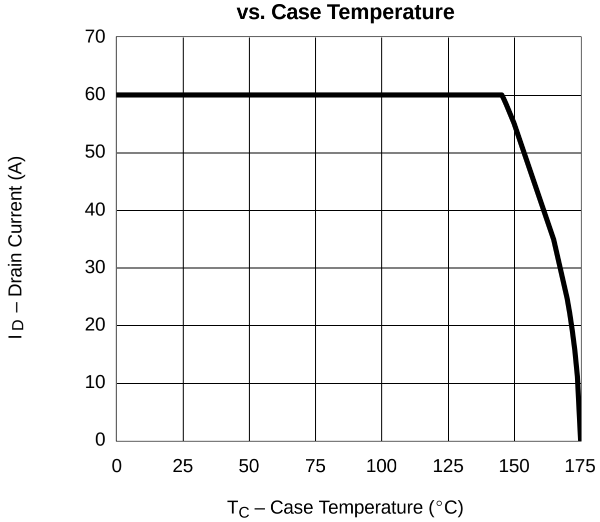


Sense Diode Forward Voltage

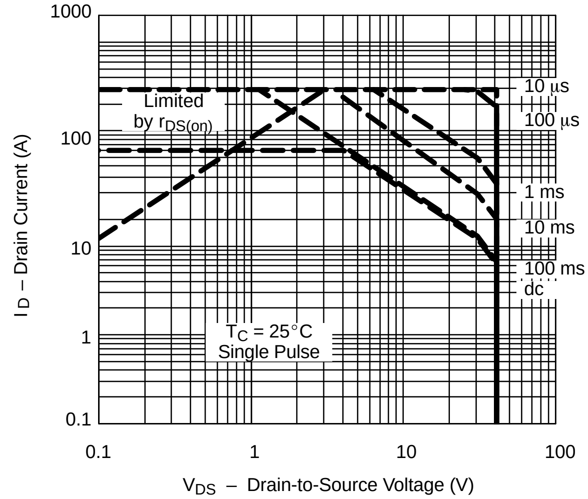


THERMAL RATINGS

Maximum Avalanche and Drain Current vs. Case Temperature



Safe Operating Area



Normalized Thermal Transient Impedance, Junction-to-Case