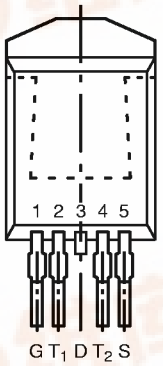
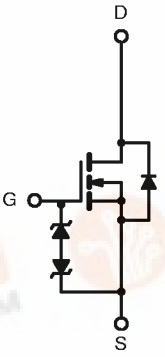
N-Channel 40-V (D-S) MOSFET With Sensing Diodes

PRODUCT SUMMARY		
$V_{(BR)DSS}$ (V)	$r_{DS(on)}$ (Ω)	I_D (A)
40	0.012 @ V_{GS} = 10 V	±60[a]
	0.015 @ V_{GS} = 4.5 V	±60

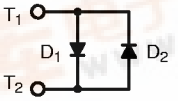
175°C Rated Maximum Junction Temperature TrenchFET® Power MOSFETs

D²Pak
TO-236, 5 Leads





N-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	
V_{GS} Clamp Current		I_G	±50	mA
Continuous Drain Current (T_J = 175°C)	T_c = 25°C	I_D	±60[a]	A
	T_c = 100°C		±50	
Avalanche Current		I_{AR}	±50	
Repetitive Avalanche Energy	L = 0.1 mH	E_{AR}	125	mJ
Source-to-Anode Voltage		V_{SA}	±100	V
Source-to-Cathode Voltage		V_{SC}	±100	
Maximum Power Dissipation[c]	T_A = 25°C	P_D	111	W
Operating Junction and Storage Temperature Range		T_J, T_{stg}	–55 to 175	°C

THERMAL RESISTANCE RATINGS			
Parameter	Symbol	Limit	Unit
Junction-to-Ambient	R_{thJA}	40	°C/W
Junction-to-Case	R_{thJC}	1.35	

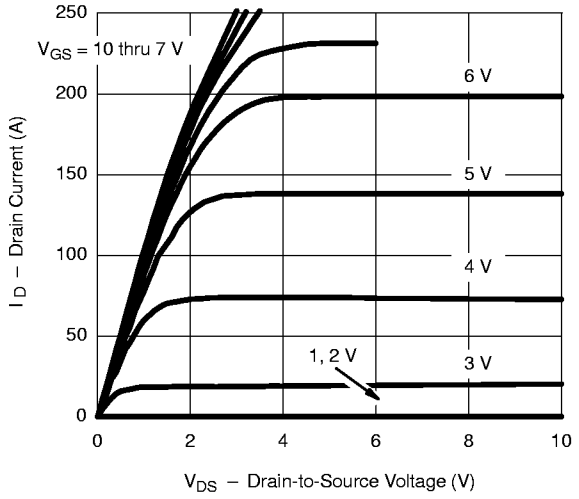
Notes:
a. Package limited.
b. Duty Cycle ≤ 1%.
c. See SOA curve for voltage derating.

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 = 1 mA	40			V
V_{GS} Clamp Voltage	V_{GS}	V_{DS} = 0 V, I_G = 20 µA	10		20	
Gate Threshold Voltage	$V_{GS(th)}$	V_{DS} = V_{GS}, I_{DS} = 1 mA	1		2	
Gate-Body Leakage	I_{GSS}	V_{DS} = 0 V, V_{GS} = ±5 V			±250	nA
Zero Gate Voltage Drain Current	I_{DSS}	V_{DS} = 35 V, V_{GS} = 0 V			1	µA
Zero Gate Voltage Drain Current	I_{DSS}	V_{DS} = 35 V, V_{GS} = 0 V, T_J = 125°C			50	
		V_{DS} = 35 V, V_{GS} = 0 V, T_J = 175°C			250	
Drain-Source On-State Resistance[b]	$r_{DS(on)}$	V_{GS} = 10 V, I_D = 20 A		0.0095	0.012	Ω
		V_{GS} = 10 V, I_D = 20 A, T_J = 125°C			0.018	
		V_{GS} = 10 V, I_D = 20 A, T_J = 175°C			0.024	
		V_{GS} = 4.5 V, I_D = 20 A		0.012	0.015	
Sense Diode Forward Voltage	V_{FD1}	I_F = 250 µA	675		735	mV
	V_{FD2}	I_R = 250 µA	675		735	
Sense Diode Forward Voltage Increase	ΔV_F	From I_F = 125 µA to I_F = 250 µA	25		50	
Forward Transconductance[b]	g_{fs}	V_{DS} = 15 V, I_D = 20 A		35		S
Dynamic[a]						
Input Capacitance	C_{iss}	V_{GS} = 0 V, V_{DS} = 25 V, f = 1 MHz		1920		pF
Output Capacitance	C_{oss}			560		
Reversen Transfer Capacitance	C_{rss}			210		
Total Gate Charge[c]	Q_g	V_{DS} = 20 V, V_{GS} = 10 V, I_D = 25 A		51	70	nC
Gate-Source Charge[c]	Q_{gs}			5.5		
Gate-Drain Charge[c]	Q_{gd}			12		
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		20	40	ns
Rise Time[c]	t_r			70	120	
Turn-Off Delay Time[c]	$t_{d(off)}$			35	70	
Fall Time[c]	t_f			20	40	
Source-Drain Diode Ratings and Characteristics (T_C = 25°C)[a]						
Continuous Current	I_S				60	A
Pulsed Current	I_{SM}				240	
Forward Voltage[b]	V_{SD}	I_F = 60 A, V_{GS} = 0 V			1.4	V
Reverse Recovery Time	t_{rr}	I_F = 60 A, di/dt = 100 A/µs		40	60	ns

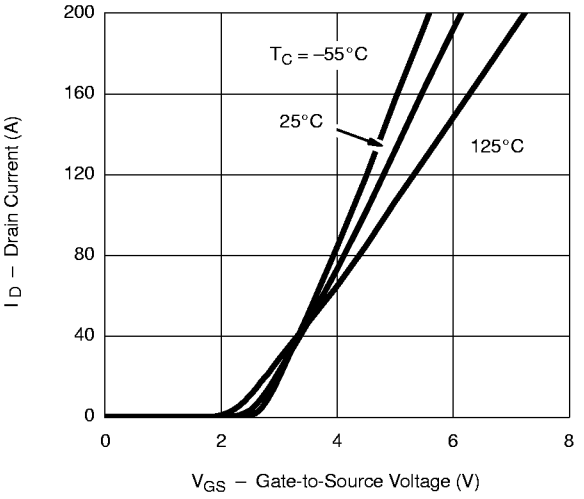
Notes:
a. Guaranteed by design, not subject to production testing.
b Pulse test; pulse width ≤ 300 µs, duty cycle ≤ 2%.
c Independent of operating temperature.

TYPICAL CHARACTERISTICS (25°C UNLESS NOTED)

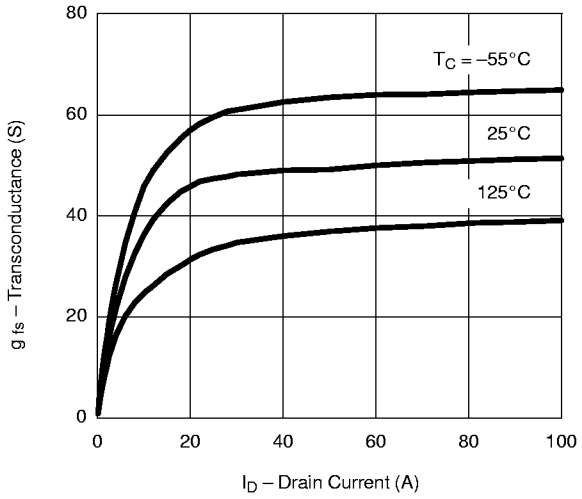
Output Characteristics



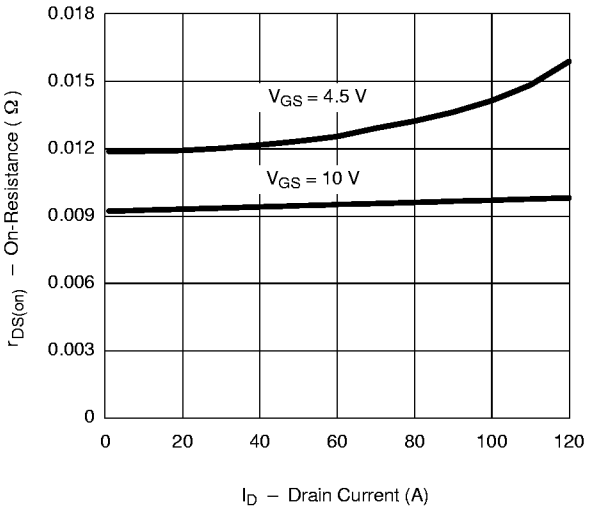
Transfer Characteristics



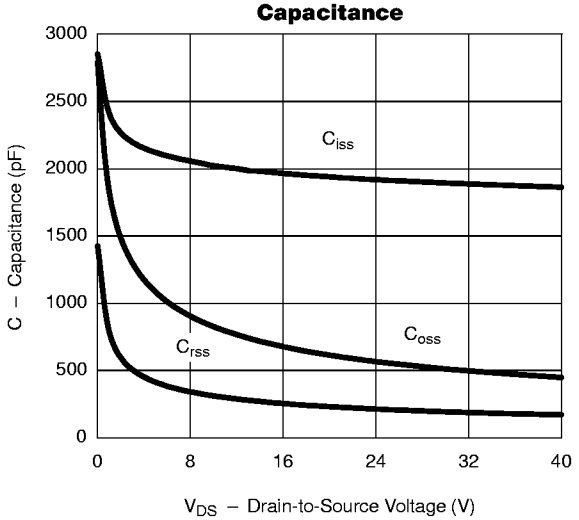
Transconductance



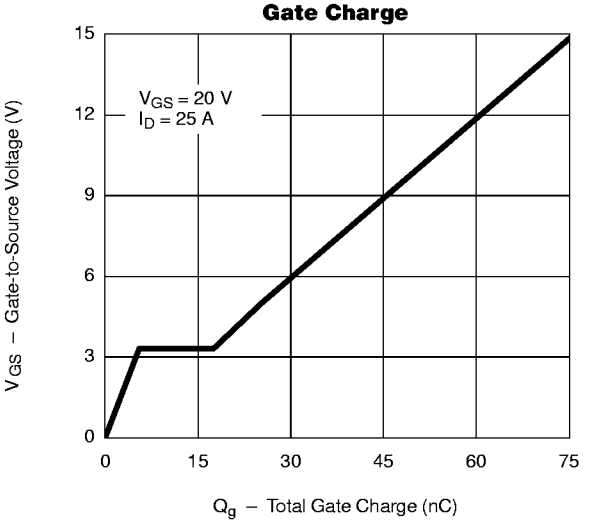
On-Resistance vs. Drain Current



Capacitance

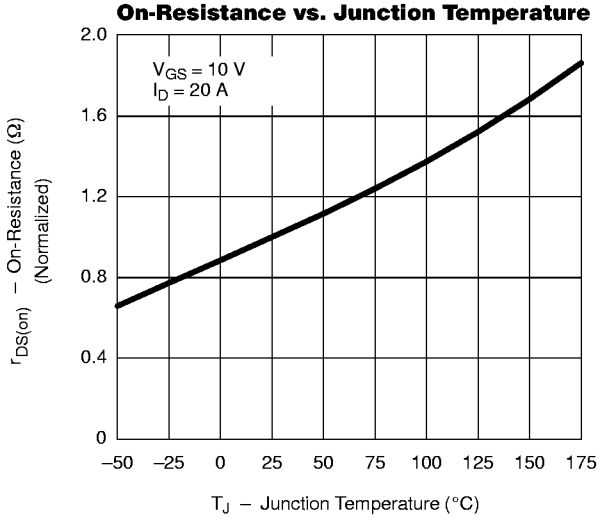


Gate Charge

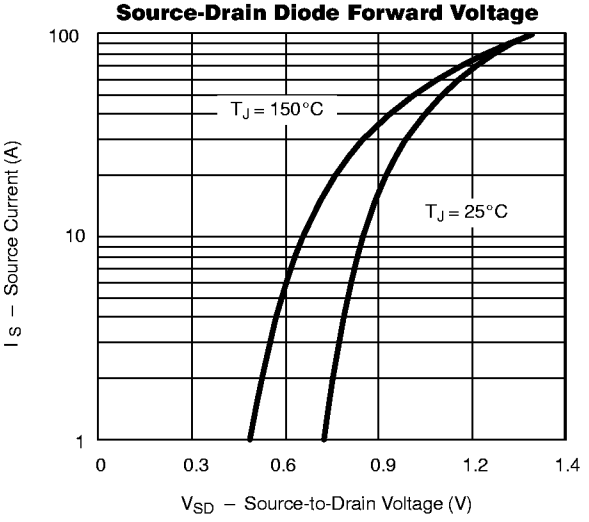


TYPICAL CHARACTERISTICS (25°C UNLESS NOTED)

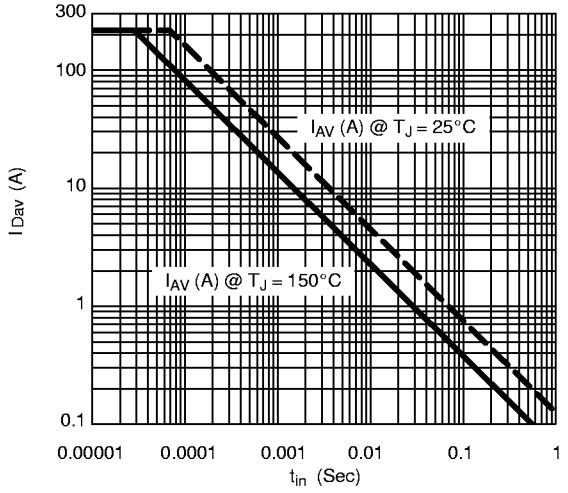
On-Resistance vs. Junction Temperature



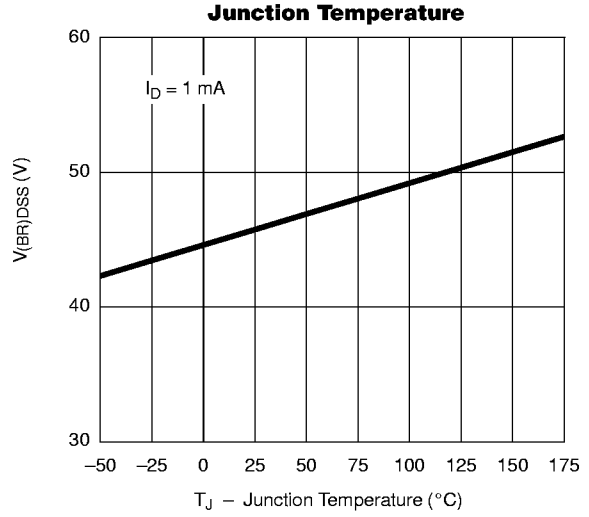
Source-Drain Diode Forward Voltage



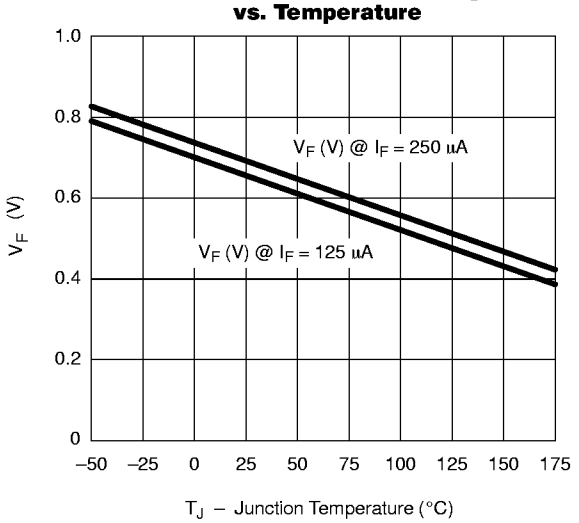
Avalanche Current vs. Time



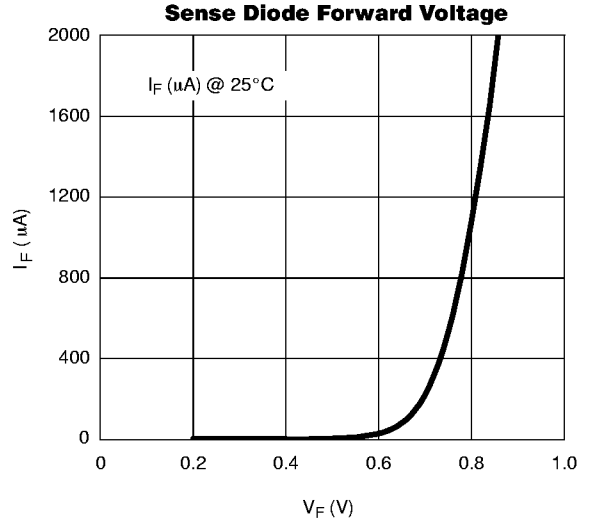
Drain-Source Breakdown vs. Junction Temperature



Sense Diode Forward Voltage vs. Temperature

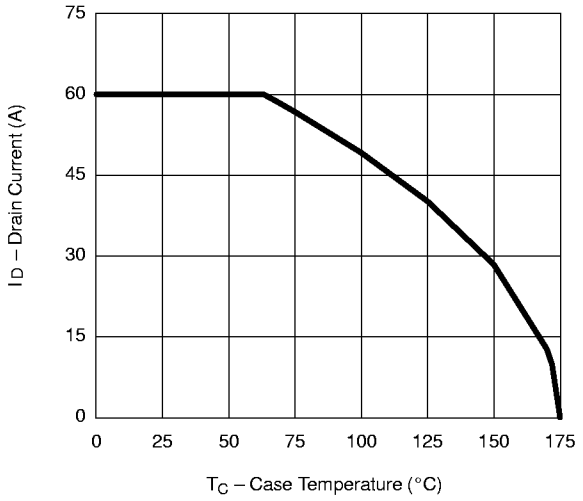


Sense Diode Forward Voltage

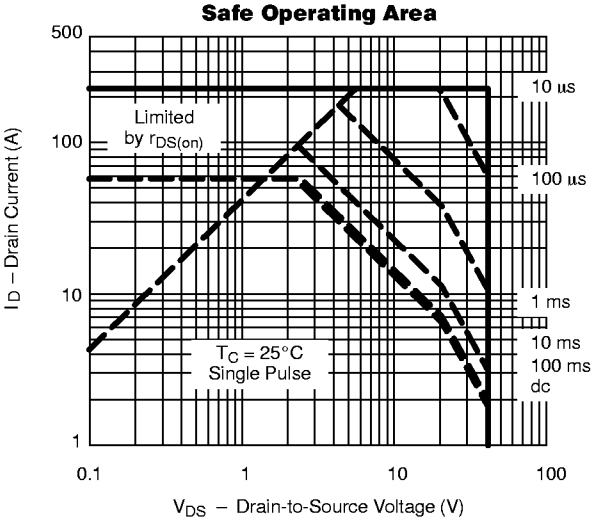


THERMAL RATINGS

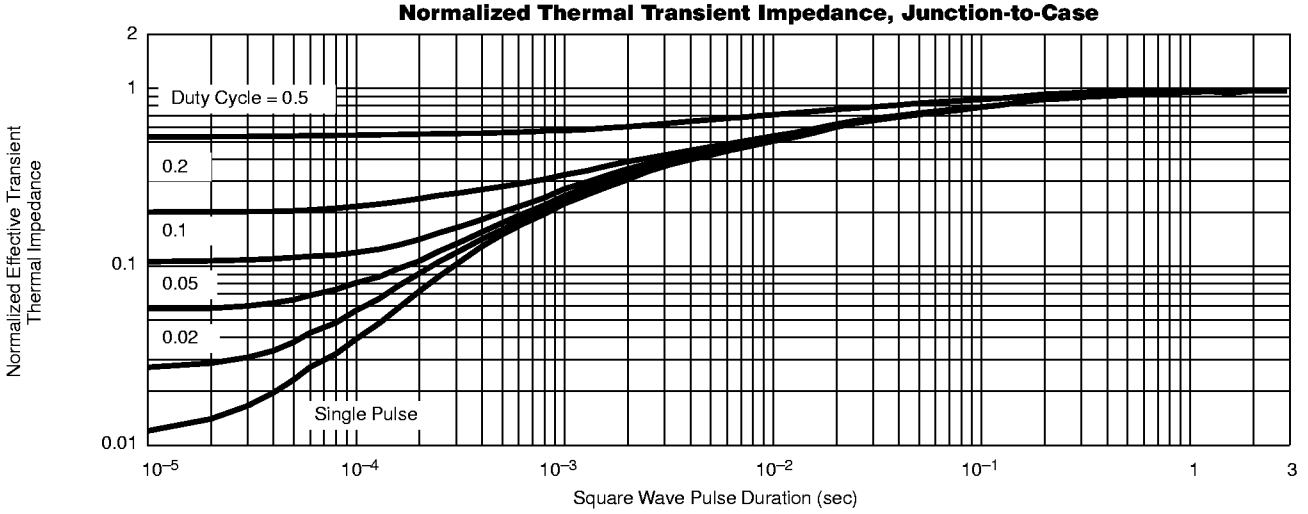
Maximum Avalanche and Drain Current vs. Case Temperature



Safe Operating Area



Normalized Thermal Transient Impedance, Junction-to-Case



Gate-Source Voltage vs. Gate Current