FU9N20D-VB Datasheet

N-Channel 200 V (D-S) MOSFET

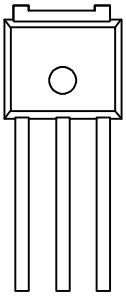
PRODUCT SUMMARY		
V_{DS} (V)	$R_{DS(on)}$ (Ω)	I_D (A)
200	0.270 at V_{GS} = 10 V	8

FEATURES

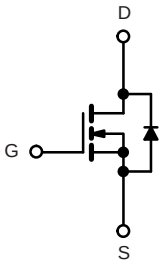
- Trench Power MOSFET
- 175 °C Junction Temperature
- PWM Optimized
- 100 % R_g Tested
- Compliant to RoHS Directive 2002/95/EC

RoHS COMPLIANT

TO-251



Top View



N-Channel MOSFET

APPLICATIONS

- Primary Side Switch

ABSOLUTE MAXIMUM RATINGS (T_A = 25 °C, unless otherwise noted)				
Parameter		**Symbol**	**Limit**	**Unit**
Drain-Source Voltage		V_{DS}	200	V
Gate-Source Voltage		V_{GS}	± 20	
Continuous Drain Current (T_J = 175 °C)[b]	T_C = 25 °C	I_D	8	A
	T_C = 125 °C		5	
Pulsed Drain Current		I_{DM}	25	
Continuous Source Current (Diode Conduction)		I_S	5	
Avalanche Current		I_{AS}	5	
Single Pulse Avalanche Energy	L = 0.1 mH	E_{AS}	18	mJ
Maximum Power Dissipation	T_C = 25 °C	P_D	96[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**
Junction-to-Ambient[a]	t ≤ 10 s	R_{thJA}	15	18	°C/W
	Steady State		40	50	
Junction-to-Case (Drain)		R_{thJC}	0.85	1.1	

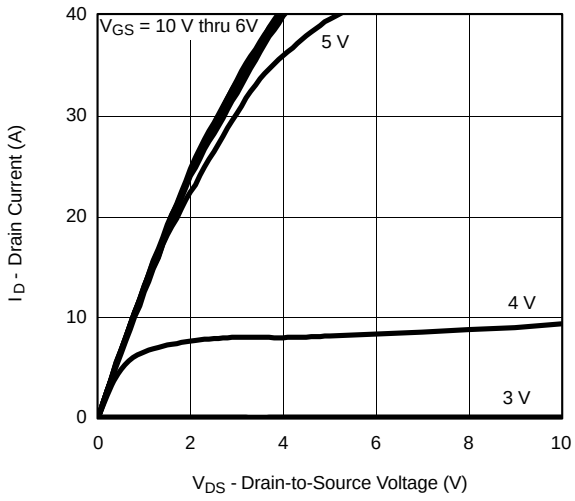
Notes:
a. Surface mounted on 1" x 1" FR4 board.
b. See SOA curve for voltage derating.

SPECIFICATIONS (T_J = 25 °C, unless otherwise noted)						
Parameter	**Symbol**	**Test Conditions**	**Min.**	**Typ.[a]**	**Max.**	**Unit**
Static						
Drain-Source Breakdown Voltage	V_{DS}	V_{GS} = 0 V, I_D = 250 µA	200			V
Gate Threshold Voltage	$V_{GS(th)}$	V_{DS} = V_{GS}, I_D = 250 µA	2		4	
Gate-Body Leakage	I_{GSS}	V_{DS} = 0 V, V_{GS} = ± 20 V			± 100	nA
Zero Gate Voltage Drain Current	I_{DSS}	V_{DS} = 200 V, V_{GS} = 0 V			1	µA
		V_{DS} = 200 V, V_{GS} = 0 V, T_J = 125 °C			50	
		V_{DS} = 200 V, V_{GS} = 0 V, T_J = 175 °C			250	
On-State Drain Current[b]	$I_{D(on)}$	V_{DS} = 5 V, V_{GS} = 10 V	40			A
Drain-Source On-State Resistance[b]	$R_{DS(on)}$	V_{GS} = 10 V, I_D = 3 A		0.270		Ω
		V_{GS} = 10 V, I_D = 3 A, T_J = 125 °C		0.300		
		V_{GS} = 10 V, I_D = 3 A, T_J = 175 °C		0.320		
		V_{GS} = 6 V, I_D = 3 A		0.310		
Forward Transconductance[b]	g_{fs}	V_{DS} = 15 V, I_D = 3 A		35		S
Dynamic[a]						
Input Capacitance	C_{iss}	V_{GS} = 0 V, V_{DS} = 25 V, F = 1 MHz		800		pF
Output Capacitance	C_{oss}			100		
Reverse Transfer Capacitance	C_{rss}			50		
Total Gate Charge[c]	Q_g	V_{DS} = 100 V, V_{GS} = 10 V, I_D = 3 A		34	51	nC
Gate-Source Charge[c]	Q_{gs}			8		
Gate-Drain Charge[c]	Q_{gd}			12		
Gate Resistance	R_g		0.5		2.9	Ω
Turn-On Delay Time[c]	$t_{d(on)}$	V_{DD} = 100 V, R_L = 5.2 Ω I_D ≅ 3 A, V_{GEN} = 10 V, R_g = 2.5 Ω		15	25	ns
Rise Time[c]	t_r			50	75	
Turn-Off Delay Time[c]	$t_{d(off)}$			30	45	
Fall Time[c]	t_f			60	90	
Source-Drain Diode Ratings and Characteristics (T_C = 25 °C)						
Pulsed Current	I_{SM}				5	A
Diode Forward Voltage[b]	V_{SD}	I_F = 3 A, V_{GS} = 0 V		0.9	1.5	V
Source-Drain Reverse Recovery Time	t_{rr}	I_F = 3 A, dI/dt = 100 A/µs		180	250	ns

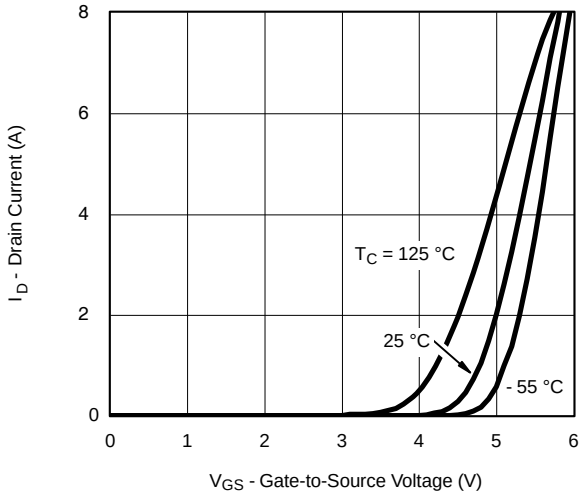
Notes:
a. Guaranteed by design, not subject to production testing.
b. Pulse test; pulse width ≤ 300 µs, duty cycle ≤ 2 %.
c. Independent of operating temperature.

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.

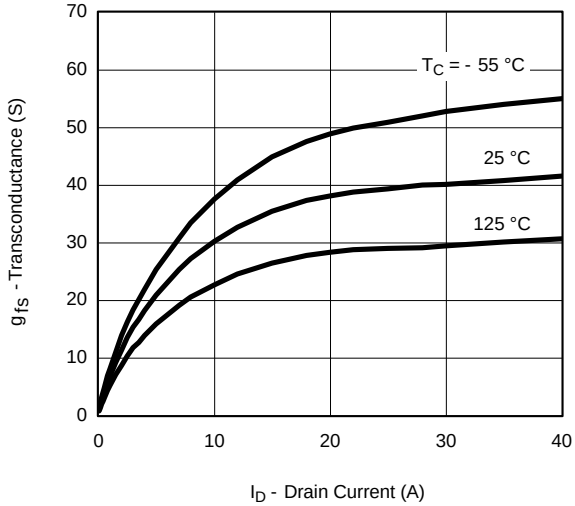
TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



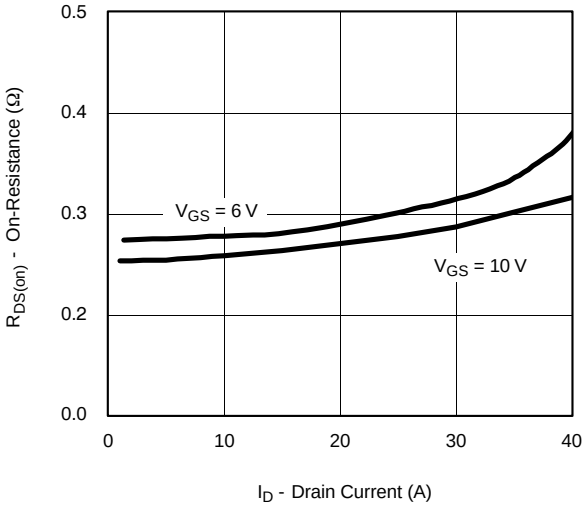
Output Characteristics



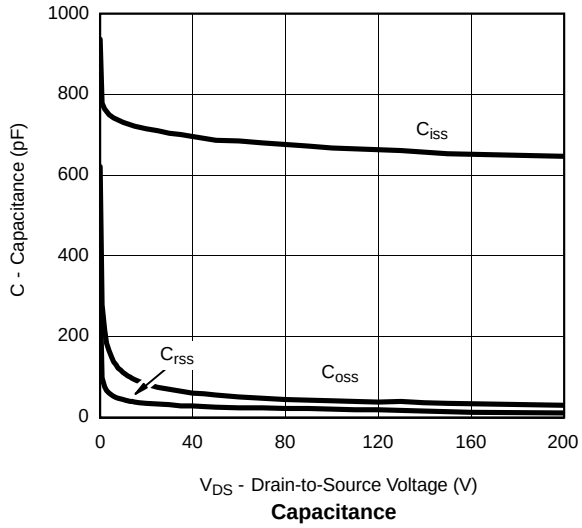
Transfer Characteristics



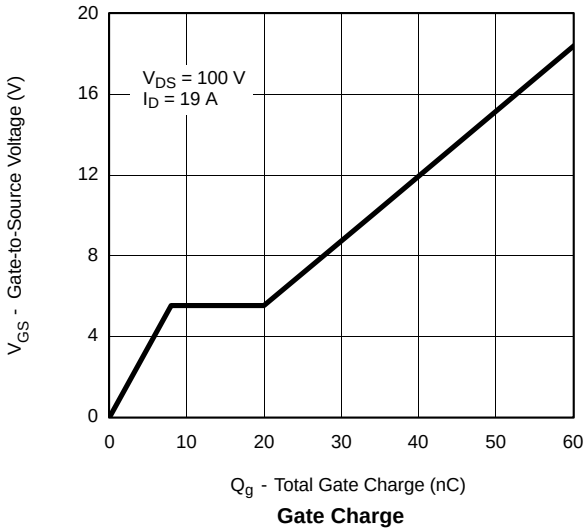
Transconductance



On-Resistance vs. Drain Current

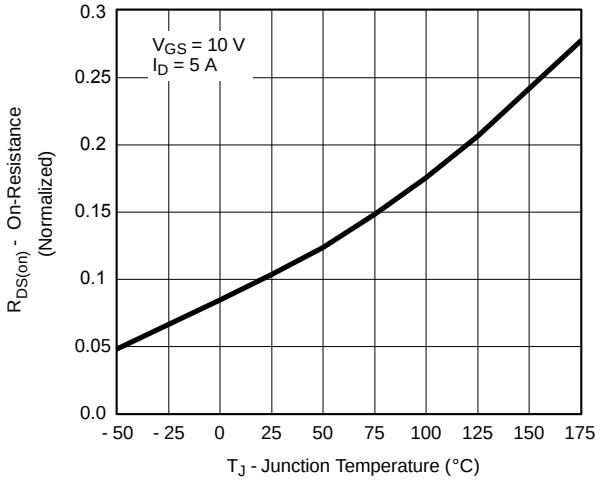


Capacitance

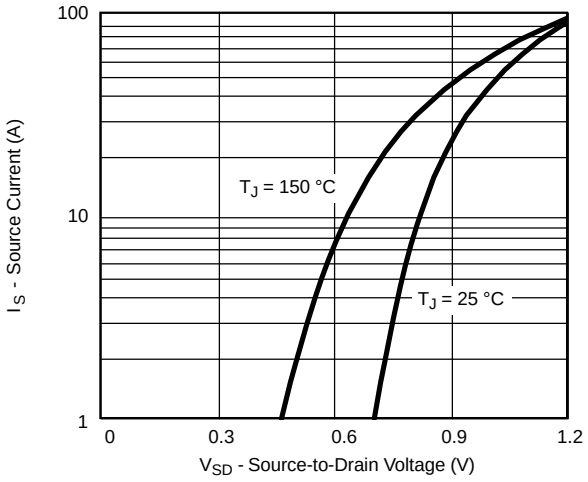


Gate Charge

TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)

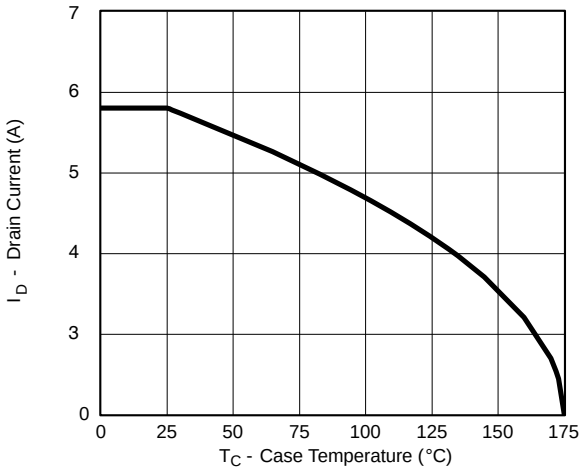


On-Resistance vs. Junction Temperature

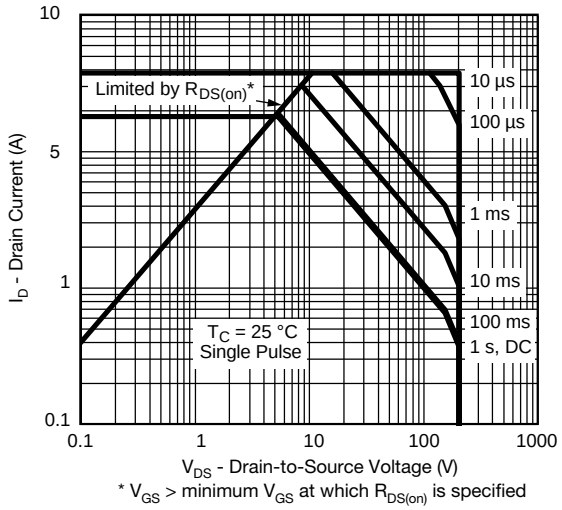


Source-Drain Diode Forward Voltage

THERMAL RATINGS

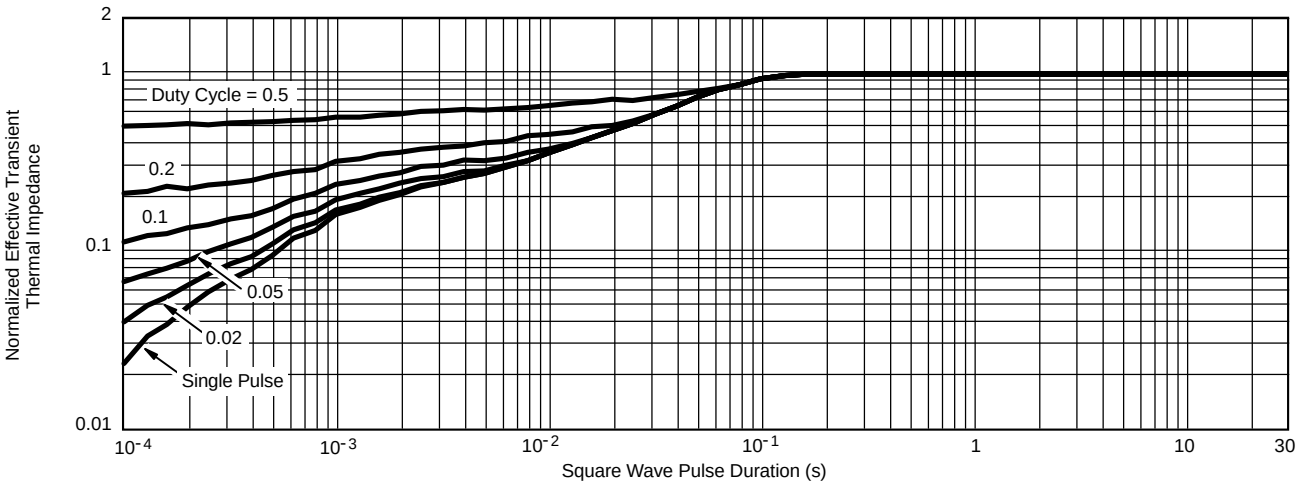


Maximum Avalanche Drain Current vs. Case Temperature



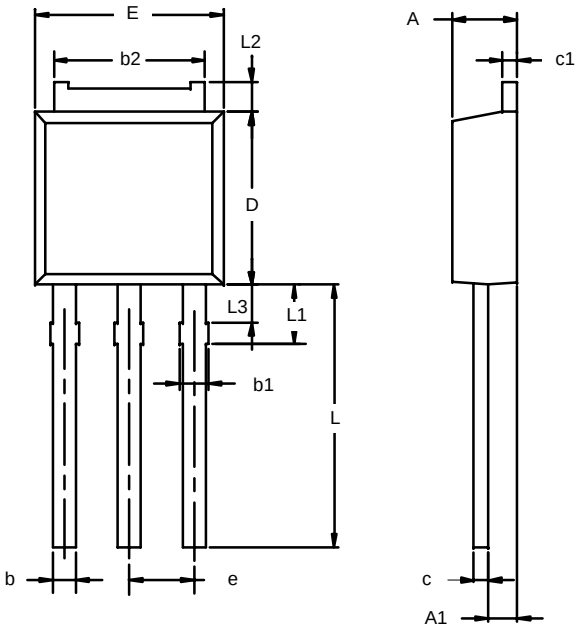
* V_{GS} > minimum V_{GS} at which $R_{DS(on)}$ is specified

Safe Operating Area



Normalized Thermal Transient Impedance, Junction-to-Case

TO-251AA



Note: Dimension L3 is for reference only.

Dim	MILLIMETERS		INCHES	
	Min	Max	Min	Max
A	2.21	2.38	0.087	0.094
A1	0.89	1.14	0.035	0.045
b	0.71	0.89	0.028	0.035
b1	0.76	1.14	0.030	0.045
b2	5.23	5.43	0.206	0.214
c	0.46	0.58	0.018	0.023
c1	0.46	0.58	0.018	0.023
D	5.97	6.22	0.235	0.245
E	6.48	6.73	0.255	0.265
e	2.28 BSC		0.090 BSC	
L	3.89	9.53	0.153	0.375
L1	1.91	2.28	0.075	0.090
L2	0.89	1.27	0.035	0.050
L3	1.15	1.52	0.045	0.060

ECN: S-03946—Rev. E, 09-Jul-01
DWG: 5346

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