

IRFU13N20DPBF-VB Datasheet

N-Channel 200V (D-S) MOSFET

PRODUCT SUMMARY

V_{DS} (V)	$R_{DS(on)}$ (Ω)	I_D (A)
200	0.056 at $V_{GS} = 10$ V	25
	0.070 at $V_{GS} = 6$ V	23

FEATURES

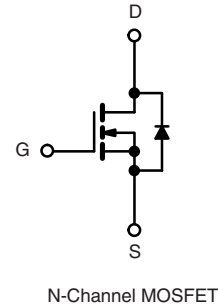
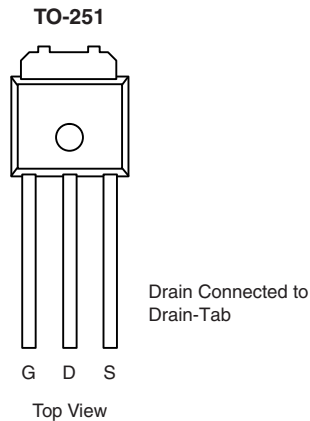
- Trench Power MOSFET
- 175 °C Junction Temperature
- PWM Optimized
- 100 % R_g Tested
- Compliant to RoHS Directive 2002/95/EC



RoHS
COMPLIANT

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 ($T_J = 175\text{ }^{\circ}\text{C}$) ^b	$T_C = 25\text{ }^{\circ}\text{C}$	I_D	25	A
	$T_C = 125\text{ }^{\circ}\text{C}$		17	
Pulsed Drain Current		I_{DM}	60	
Continuous Source Current (Diode Conduction)		I_S	19	
Avalanche Current		I_{AS}	25	
Single Pulse Avalanche Energy	$L = 0.1\text{ mH}$	E_{AS}	18	mJ
Maximum Power Dissipation	$T_C = 25\text{ }^{\circ}\text{C}$	P_D	145 ^b	W
	$T_A = 25\text{ }^{\circ}\text{C}$		3.5 ^a	
Operating Junction and Storage Temperature Range		T_J, T_{stg}	- 55 to 175	$^{\circ}\text{C}$

THERMAL RESISTANCE RATINGS

Parameter	Symbol	Typical	Maximum	Unit
Junction-to-Ambient ^a	R_{thJA}	15	18	°C/W
		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 = 5 A		0.056		Ω
		V _{GS} = 10 V, I _D = 5 A, T _J = 125 °C		0.130		
		V _{GS} = 10 V, I _D = 5 A, T _J = 175 °C		0.260		
		V _{GS} = 6 V, I _D = 5 A		0.070		
Forward Transconductance ^b	g _{fs}	V _{DS} = 15 V, I _D = 19 A		35		S
Dynamic ^a						
Input Capacitance	C _{iss}	V _{GS} = 0 V, V _{DS} = 25 V, F = 1 MHz		2400		pF
Output Capacitance	C _{oss}			280		
Reverse Transfer Capacitance	C _{rss}			180		
Total Gate Charge ^c	Q _g	V _{DS} = 100 V, V _{GS} = 10 V, I _D = 19 A		40		nC
Gate-Source Charge ^c	Q _{gs}			10		
Gate-Drain Charge ^c	Q _{gd}			15		
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 ≅ 19 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}				50	A
Diode Forward Voltage ^b	V _{SD}	I _F = 19 A, V _{GS} = 0 V		0.9	1.5	V
Source-Drain Reverse Recovery Time	t _{rr}	I _F = 19 A, dI/dt = 100 A/μs		180	250	ns

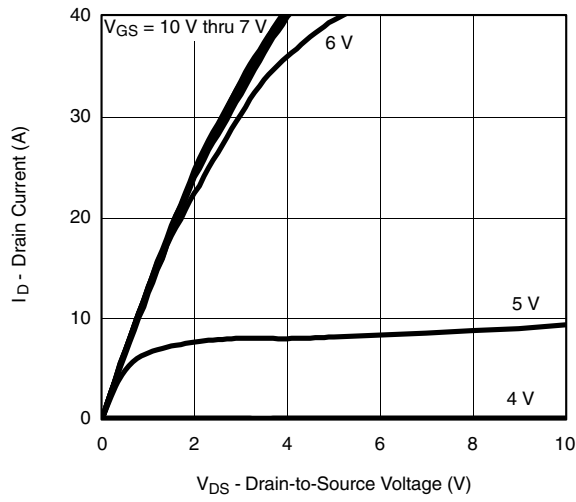
Notes:

a. Guaranteed by design, not subject to production testing.

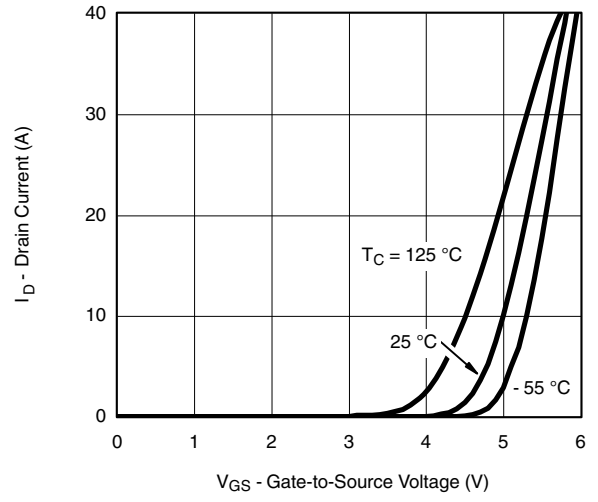
b. Pulse test; pulse width $\leq 300\text{ }\mu\text{s}$, duty cycle $\leq 2\%$.

c. Independent of operating temperature.

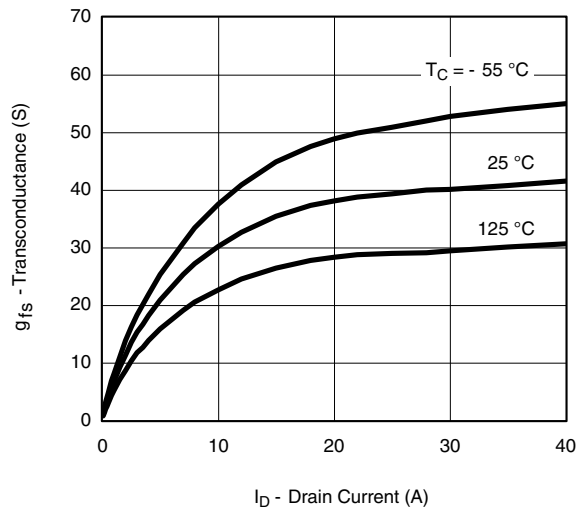
TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



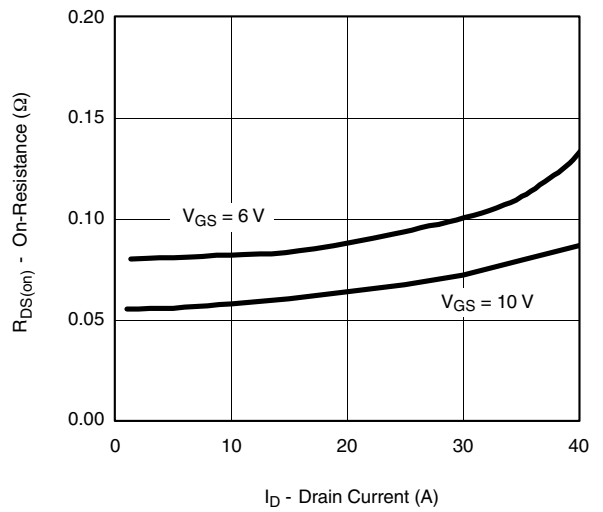
Output Characteristics



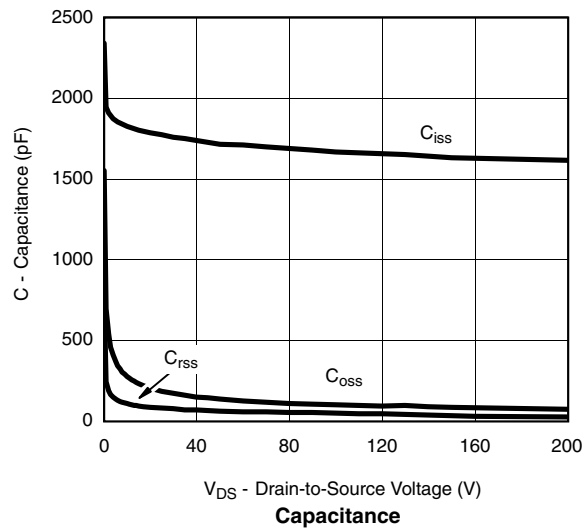
Transfer Characteristics



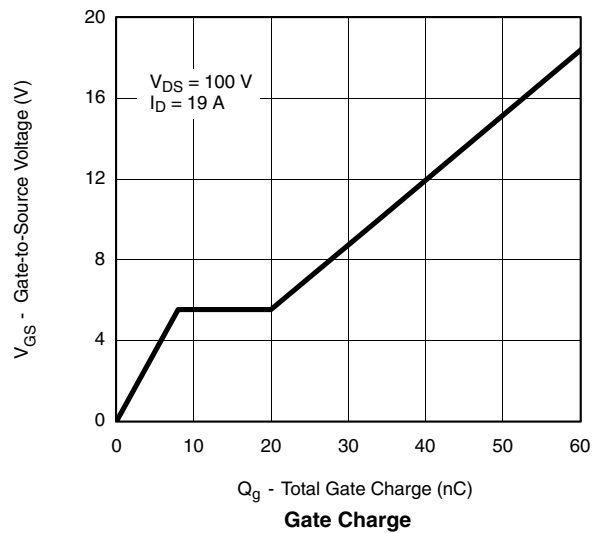
Transconductance



On-Resistance vs. Drain Current

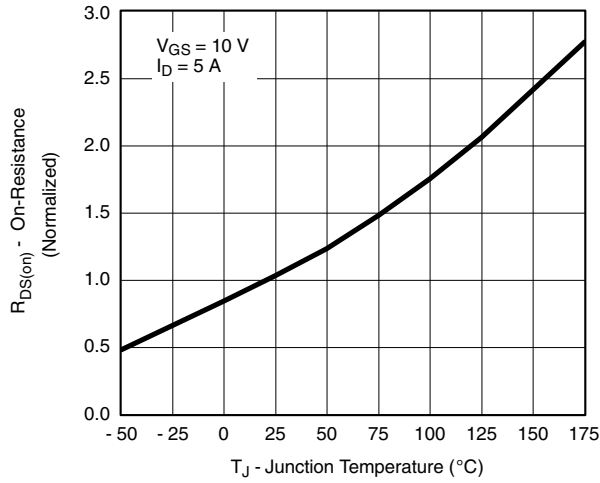


Capacitance

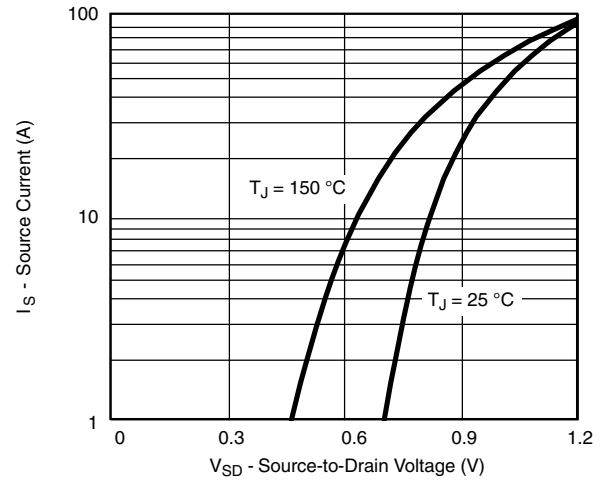


Gate Charge

TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)

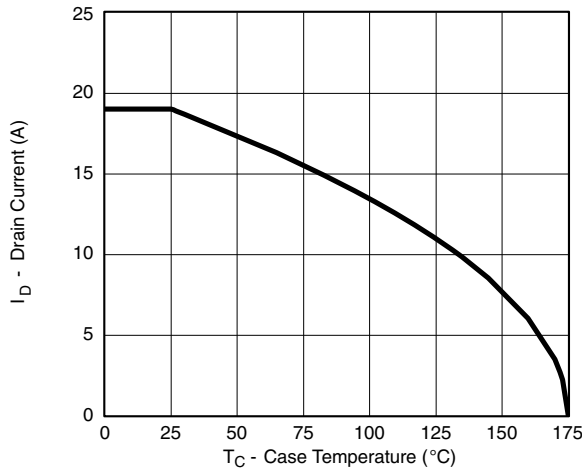


On-Resistance vs. Junction Temperature

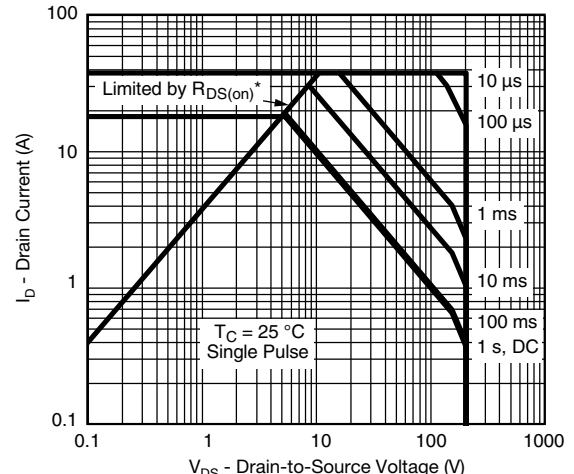


Source-Drain Diode Forward Voltage

THERMAL RATINGS

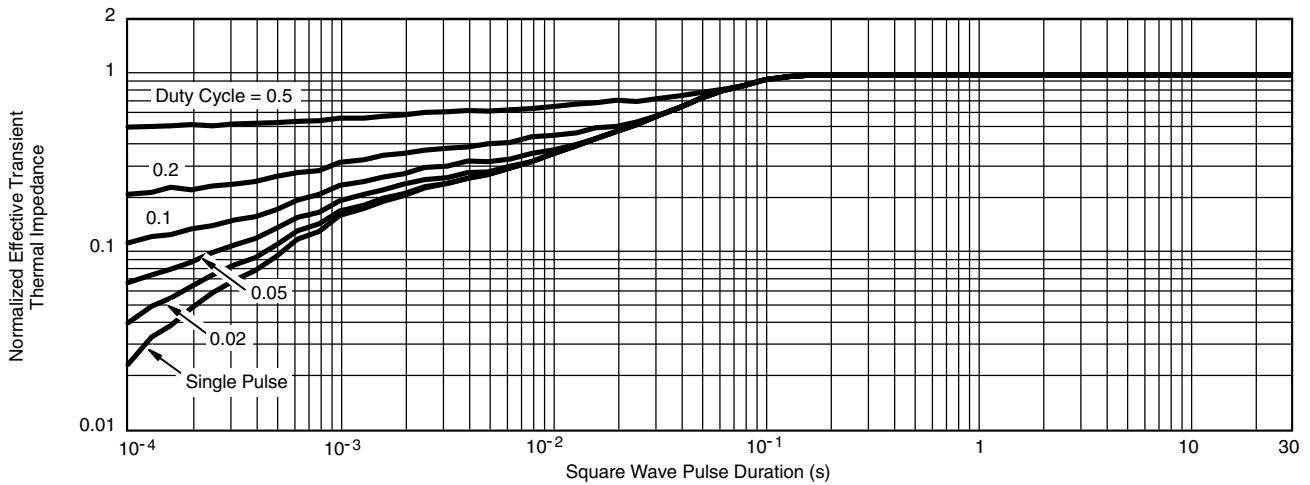


Maximum Avalanche Drain Current vs. Case Temperature



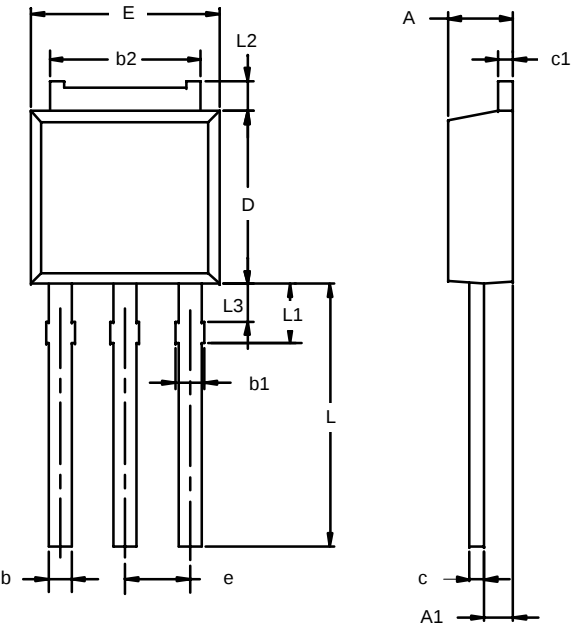
* $V_{GS} >$ minimum V_{GS} at which $R_{DS(on)}$ is specified

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

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