IRF650PBF-VB Datasheet

N-Channel 200 V (D-S) MOSFET

PRODUCT SUMMARY		
V_{DS} (V)	$R_{DS(on)}$ (Ω)	I_D (A)
200	0.058at V_{GS} = 10 V	35

FEATURES

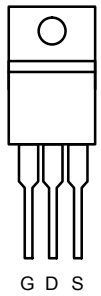
- Trench Power MOSFETS
- 175 °C Junction Temperature
- New Low Thermal Resistance Package
- Compliant to RoHS Directive 2002/95/EC

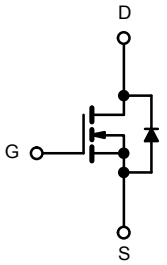
RoHS
COMPLIANT

APPLICATIONS

- Industrial

TO-220AB





N-Channel MOSFET

ABSOLUTE MAXIMUM RATINGS (T_C = 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)	T_C = 25 °C	I_D	35	A
	T_C = 125 °C		23	
Pulsed Drain Current		I_{DM}	70	
Avalanche Current		I_{AR}	35	
Repetitive Avalanche Energy[a]	L = 0.1 mH	E_{AR}	61	mJ
Maximum Power Dissipation[a]	T_C = 25 °C	P_D	300[b]	W
	T_A = 25 °C[c]		3.75	
Operating Junction and Storage Temperature Range		T_J, T_{stg}	- 55 to 175	°C

THERMAL RESISTANCE RATINGS			
Parameter	**Symbol**	**Limit**	**Unit**
Junction-to-Ambient (PCB Mount)[c]	R_{thJA}	40	°C/W
Junction-to-Case (Drain)	R_{thJC}	0.5	

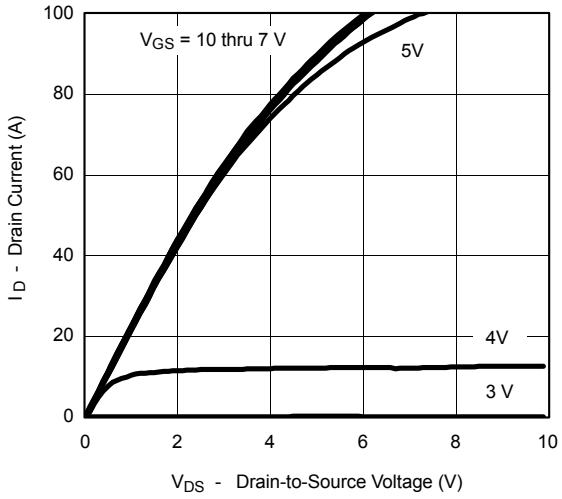
Notes:
a. Duty cycle ≤ 1 %.
b. See SOA curve for voltage derating.
c. When mounted on 1" square PCB (FR-4 material).

SPECIFICATIONS (T_J = 25 °C, unless otherwise noted)						
Parameter	**Symbol**	**Test Conditions**	**Min .**	**Typ.**	**Max.**	**Unit**
Static						
Drain-Source Breakdown Voltage	V_{DS}	V_{DS} = 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} = ± 30 V			± 250	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[a]	$I_{D(on)}$	V_{DS} ≥ 5 V, V_{GS} = 10 V	70			A
Drain-Source On-State Resistance[a]	$R_{DS(on)}$	V_{GS} = 10 V, I_D = 20 A		0.058		Ω
		V_{GS} = 10 V, I_D = 20 A, T_J = 125 °C		0.130		
		V_{GS} = 10 V, I_D = 20 A, T_J = 175 °C		0.170		
		V_{GS} = 6 V, I_D = 15 A		0.070		
Forward Transconductance[a]	g_{fs}	V_{DS} = 15 V, I_D = 20 A		70		S
Dynamic[b]						
Input Capacitance	C_{iss}	V_{GS} = 0 V, V_{DS} = 25 V, f = 1 MHz		2690		pF
Output Capacitance	C_{oss}			200		
Reverse Transfer Capacitance	C_{rss}			110		
Total Gate Charge[c]	Q_g	V_{DS} = 100 V, V_{GS} = 10 V, I_D = 45 A		95	140	nC
Gate-Source Charge[c]	Q_{gs}			28		
Gate-Drain Charge[c]	Q_{gd}			34		
Gate Resistance	R_g	f = 1 MHz		1.6		Ω
Turn-On Delay Time[c]	$t_{d(on)}$	V_{DD} = 100 V, R_L = 2.78 Ω I_D ≅ 45 A, V_{GEN} = 10 V, R_g = 2.5 Ω		22	35	ns
Rise Time[c]	t_r			220	330	
Turn-Off Delay Time[c]	$t_{d(off)}$			40	60	
Fall Time[c]	t_f			145	220	
Source-Drain Diode Ratings and Characteristics (T_C = 25 °C)[b]						
Continuous Current	I_S				45	A
Pulsed Current	I_{SM}				70	
Forward Voltage[a]	V_{SD}	I_F = 45 A, V_{GS} = 0 V		1	1.5	V
Reverse Recovery Time	t_{rr}	I_F = 45 A, di/dt = 100 A/µs		150	225	ns
Peak Reverse Recovery Current	$I_{RM(REC)}$			12	18	A
Reverse Recovery Charge	Q_{rr}			0.9	2	µC

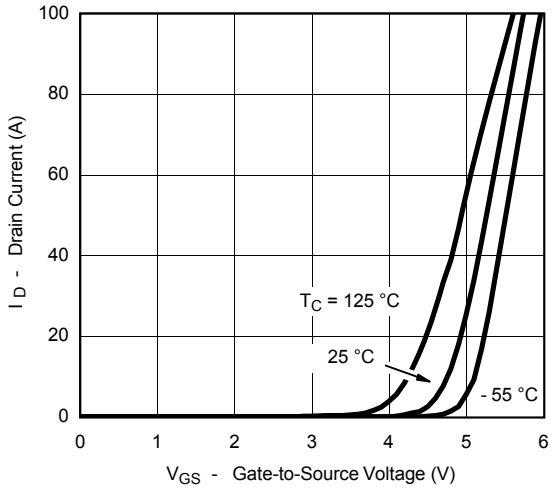
Notes:
a. Pulse test; pulse width ≤ 300 µs, duty cycle ≤ 2 %.
b. Guaranteed by design, not subject to production testing.
c. Independent of operating temperature.

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.

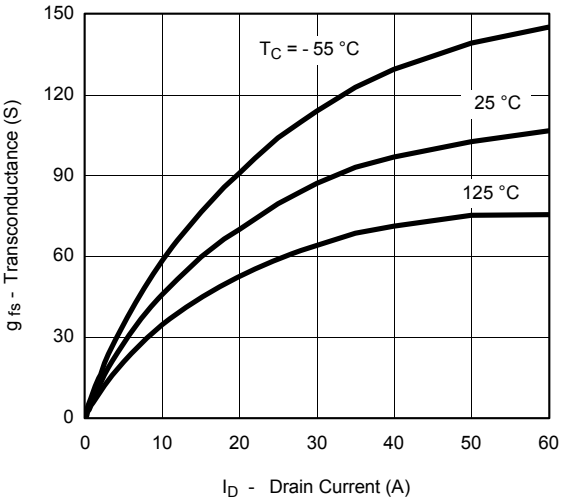
TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



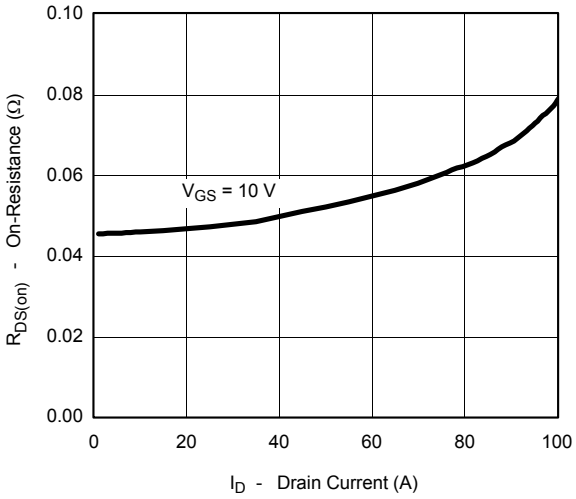
Output Characteristics



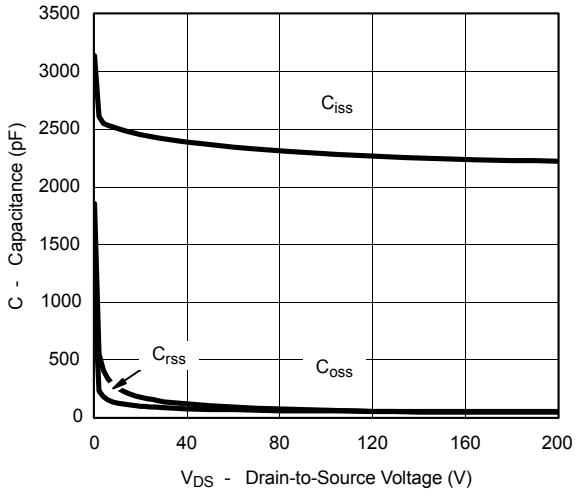
Transfer Characteristics



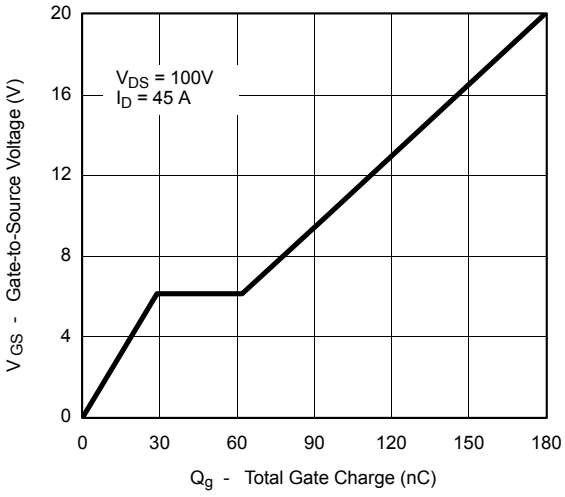
Transconductance



On-Resistance vs. Drain Current

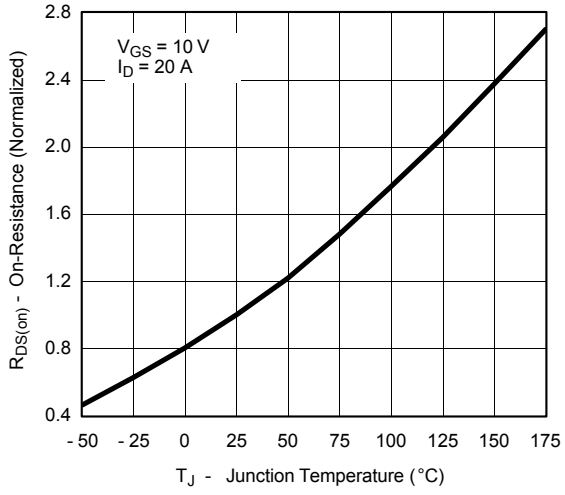


Capacitance

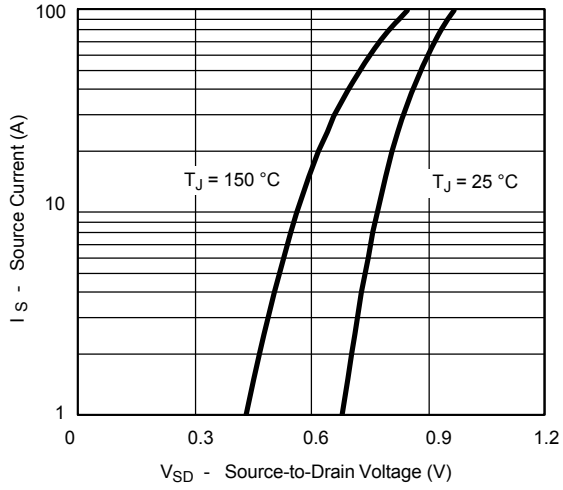


Gate Charge

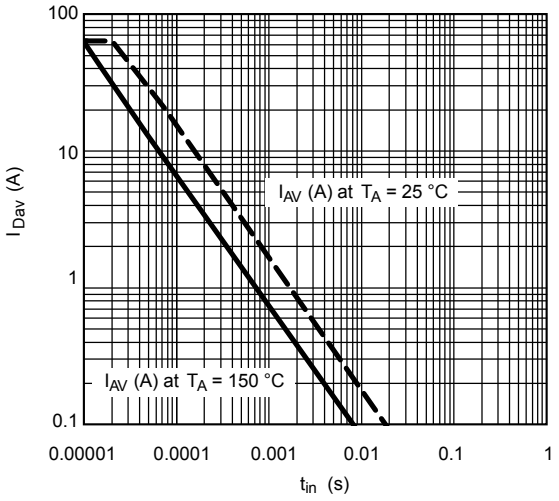
TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



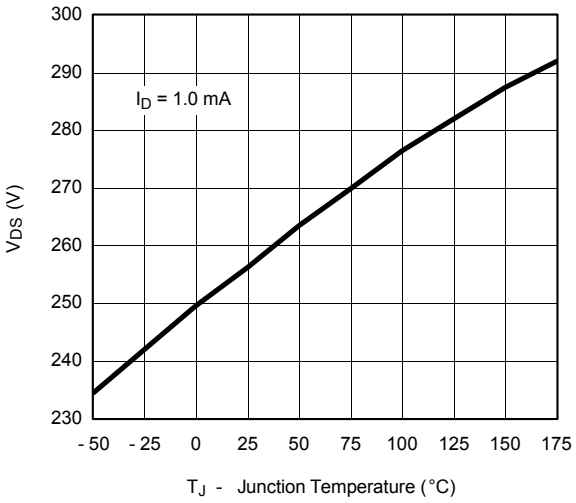
On-Resistance vs. Junction Temperature



Source-Drain Diode Forward Voltage

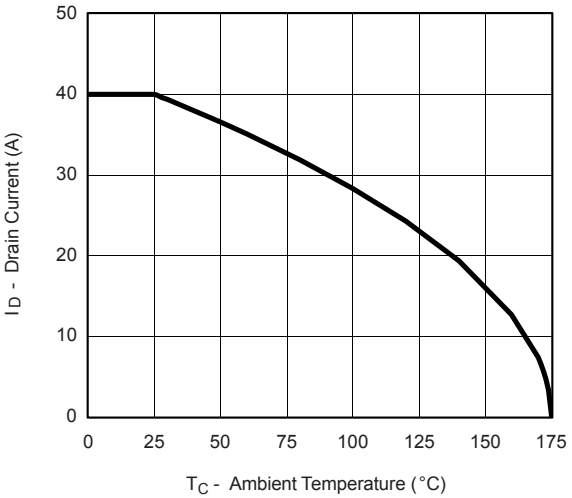


Avalanche Current vs. Time

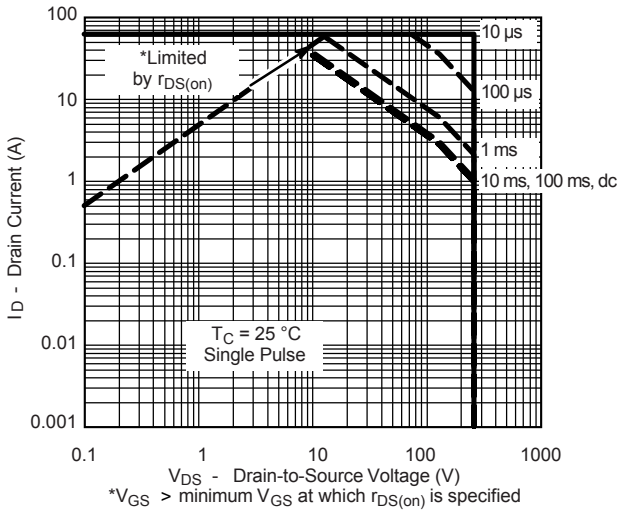


Drain Source Breakdown vs. Junction Temperature

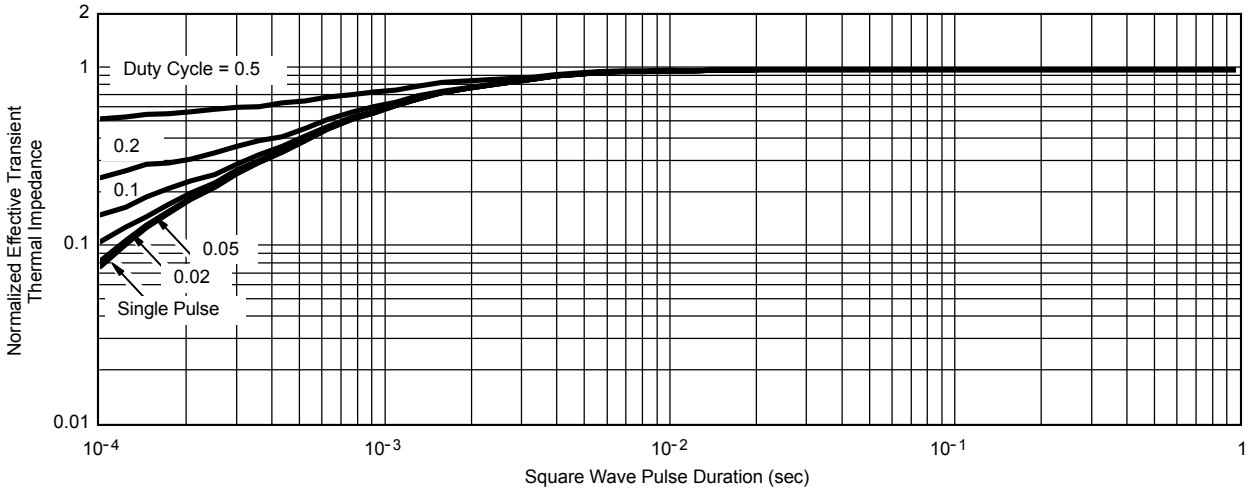
THERMAL RATINGS



Maximum Avalanche and Drain Current vs. Case Temperature

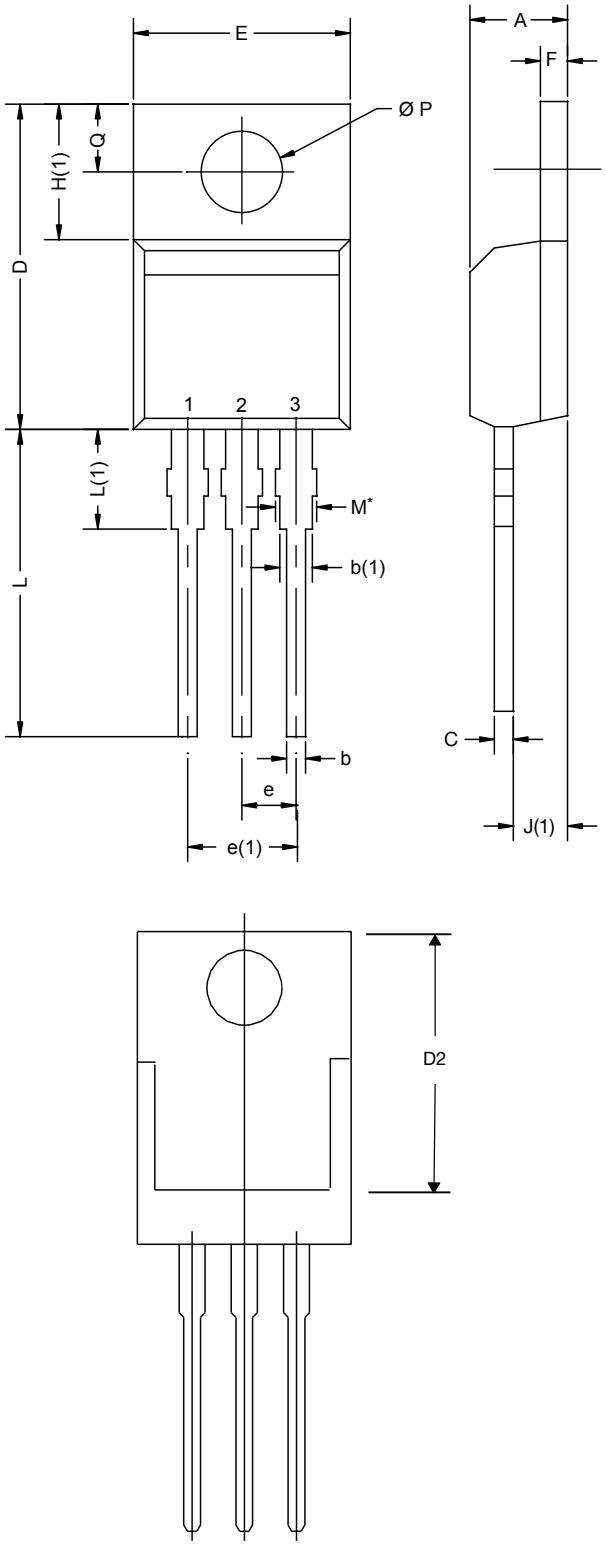


Safe Operating Area, Case Temperature



Normalized Thermal Transient Impedance, Junction-to-Case

TO-220AB



DIM.	MILLIMETERS		INCHES	
	MIN.	MAX.	MIN.	MAX.
A	4.25	4.65	0.167	0.183
b	0.69	1.01	0.027	0.040
b(1)	1.20	1.73	0.047	0.068
c	0.36	0.61	0.014	0.024
D	14.85	15.49	0.585	0.610
D2	12.19	12.70	0.480	0.500
E	10.04	10.51	0.395	0.414
e	2.41	2.67	0.095	0.105
e(1)	4.88	5.28	0.192	0.208
F	1.14	1.40	0.045	0.055
H(1)	6.09	6.48	0.240	0.255
J(1)	2.41	2.92	0.095	0.115
L	13.35	14.02	0.526	0.552
L(1)	3.32	3.82	0.131	0.150
Ø P	3.54	3.94	0.139	0.155
Q	2.60	3.00	0.102	0.118
ECN: T14-0413-Rev. P, 16-Jun-14 DWG: 5471				

Note

* M = 1.32 mm to 1.62 mm (dimension including protrusion) Heatsink hole for HVM

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