IRF510NPBF-VB Datasheet

N-Channel 100-V (D-S) MOSFET

PRODUCT SUMMARY		
$V_{(BR)DSS}$ (V)	$R_{DS(on)}$ (Ω)	I_D (A)
100	0.127at V_{GS} = 10 V	18

FEATURES

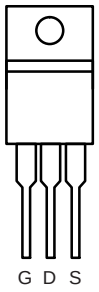
- Trench Power MOSFET
- 175 °C Junction Temperature
- Low Thermal Resistance Package
- 100 % R_g Tested

RoHS COMPLIANT

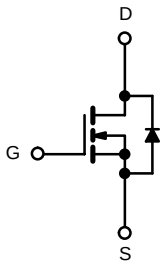
APPLICATIONS

- Isolated DC/DC Converters

TO-220AB



Top View



N-Channel MOSFET

ABSOLUTE MAXIMUM RATINGS T_C = 25 °C, unless otherwise noted				
Parameter		**Symbol**	**Limit**	**Unit**
Drain-Source Voltage		V_{DS}	100	V
Gate-Source Voltage		V_{GS}	± 20	
Continuous Drain Current (T_J = 175 °C)	T_C = 25 °C	I_D	18	A
	T_C = 125 °C		15	
Pulsed Drain Current		I_{DM}	68	
Avalanche Current	L = 0.1 mH	I_{AS}	18	
Single Pulse Avalanche Energy[b]		E_{AS}	200	mJ
Maximum Power Dissipation[b]	T_C = 25 °C	P_D	105	W
	T_A = 25 °C[d]		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 (TO-263)[d]	R_{thJA}	40	°C/W
Junction-to-Case (Drain)		R_{thJC}	0.4	

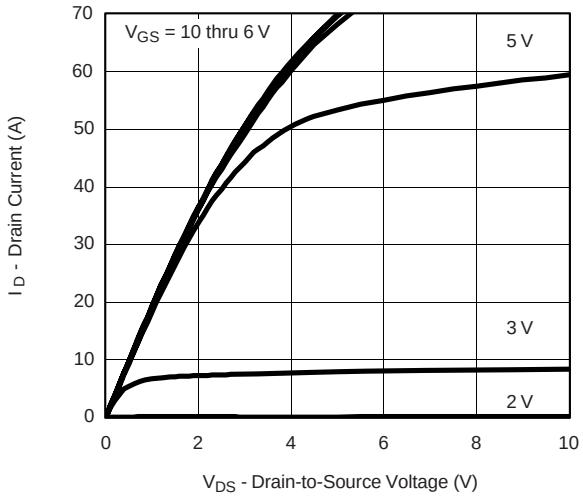
Notes:
a. Package limited.
b. Duty cycle ≤ 1 %.
c. See SOA curve for voltage derating.
d. When Mounted on 1" square PCB (FR-4 material).

SPECIFICATIONS T_J = 25 °C, unless otherwise noted						
Parameter	**Symbol**	**Test Conditions**	**Min.**	**Typ.**	**Max.**	**Unit**
Static						
Drain-Source Breakdown Voltage	$V_{(BR)DSS}$	V_{DS} = 0 V, I_D = 250 µA	100			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} = 100 V, V_{GS} = 0 V			1	µA
		V_{DS} = 100 V, V_{GS} = 0 V, T_J = 125 °C			50	
		V_{DS} = 100 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	120			A
Drain-Source On-State Resistance[a]	$r_{DS(on)}$	V_{GS} = 10 V, I_D = 20 A		0.127		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		
Forward Transconductance[a]	g_{fs}	V_{DS} = 15 V, I_D = 20 A	25			S
Dynamic[b]						
Input Capacitance	C_{iss}	V_{GS} = 0 V, V_{DS} = 25 V, f = 1 MHz		1300		pF
Output Capacitance	C_{oss}			260		
Reverse Transfer Capacitance	C_{rss}			110		
Total Gate Charge[c]	Q_g	V_{DS} = 100 V, V_{GS} = 10 V, I_D = 65 A			28	nC
Gate-Source Charge[c]	Q_{gs}				4.8	
Gate-Drain Charge[c]	Q_{gd}				15	
Gate Resistance	R_g		0.5	1.7	3.3	Ω
Turn-On Delay Time[c]	$t_{d(on)}$	V_{DD} = 100 V, R_L = 1.5 Ω I_D ≅ 65 A, V_{GEN} = 10 V, R_g = 2.5 Ω		8		ns
Rise Time[c]	t_r			120		
Turn-Off Delay Time[c]	$t_{d(off)}$			25		
Fall Time[c]	t_f			50		
Source-Drain Diode Ratings and Characteristics T_C = 25 °C[b]						
Continuous Current	I_S			18		A
Pulsed Current	I_{SM}			68		
Forward Voltage[a]	V_{SD}	I_F = 65 A, V_{GS} = 0 V		1.0	1.5	V
Reverse Recovery Time	t_{rr}	I_F = 50 A, di/dt = 100 A/µs		130	200	ns
Peak Reverse Recovery Current	$I_{RM(REC)}$			8	12	A
Reverse Recovery Charge	Q_{rr}			0.52	1.2	µC

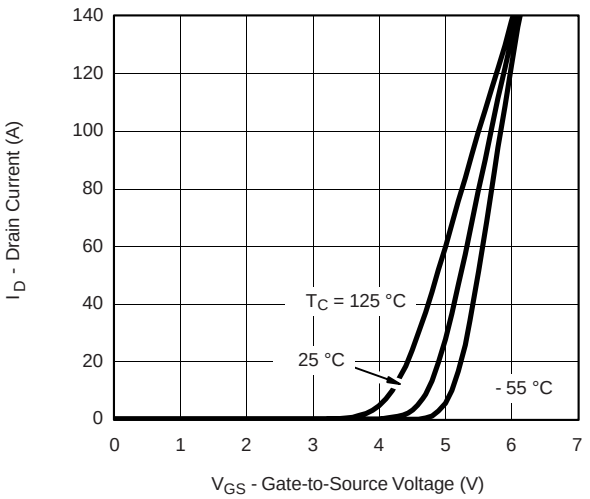
Notes:
a. Pulse test; pulse width ≤ 300 µs, duty cycle ≤ 2 %.
b. Guaranteed by design, not subject to production testing.
c. Independent of operating temperature.

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.

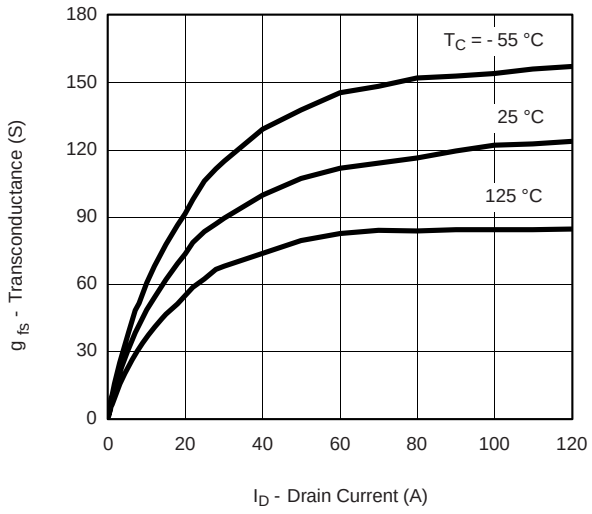
TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



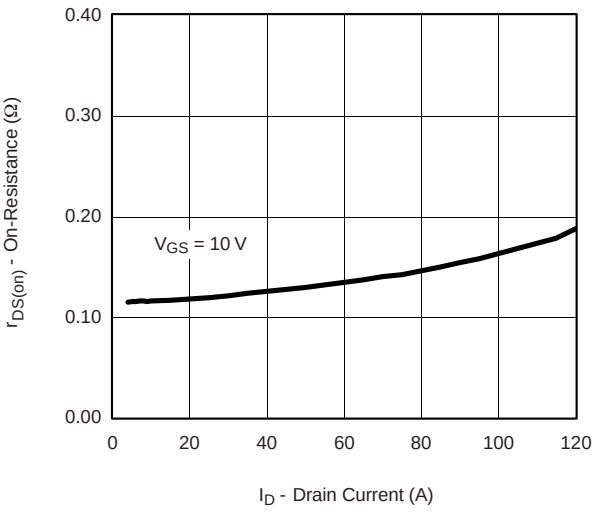
Output Characteristics



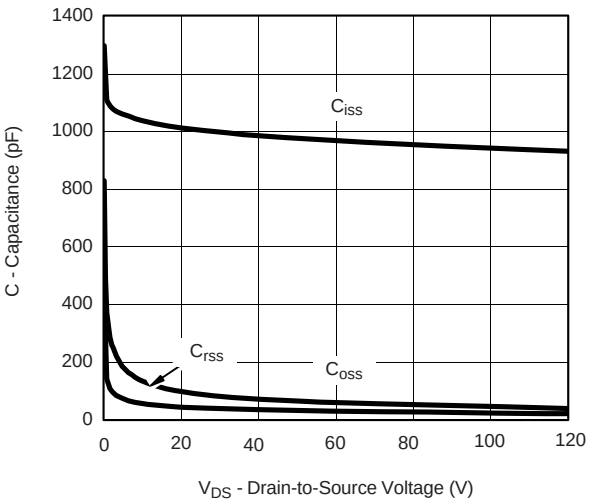
Transfer Characteristics



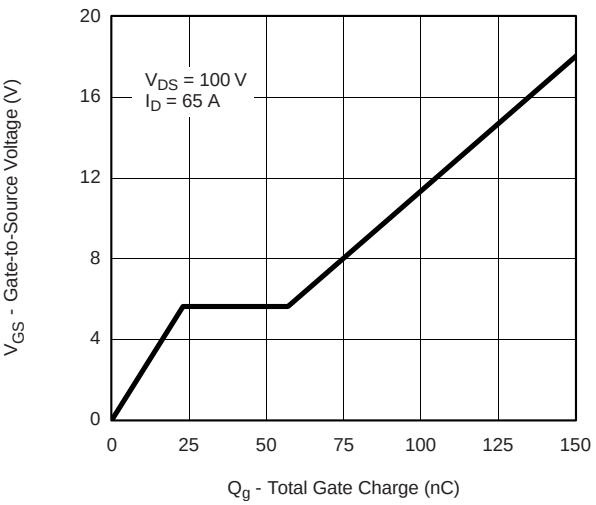
Transconductance



On-Resistance vs. Drain Current

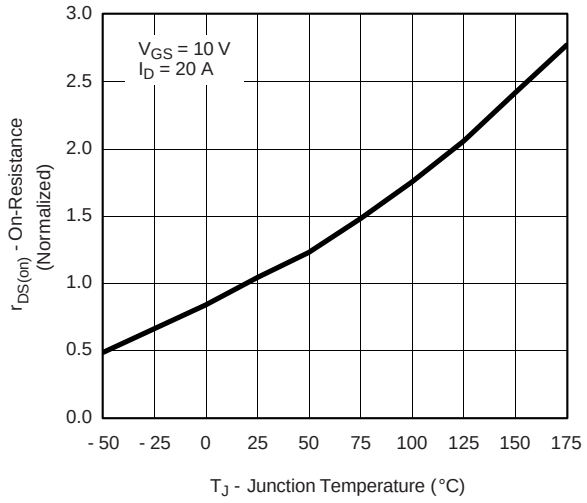


Capacitance

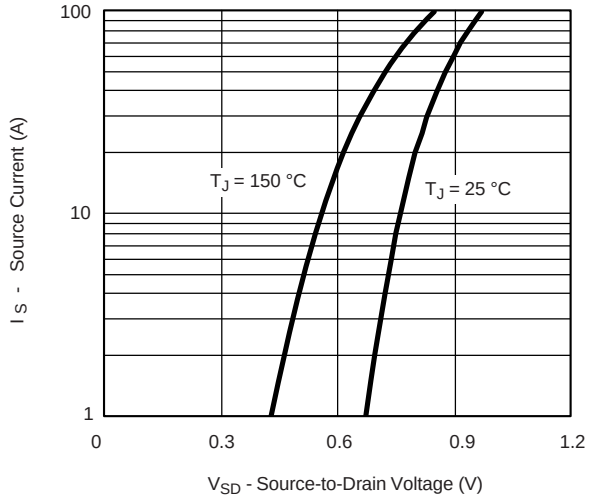


Gate Charge

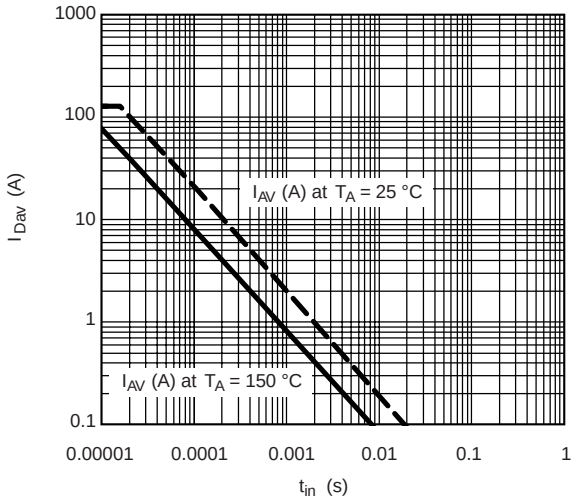
TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



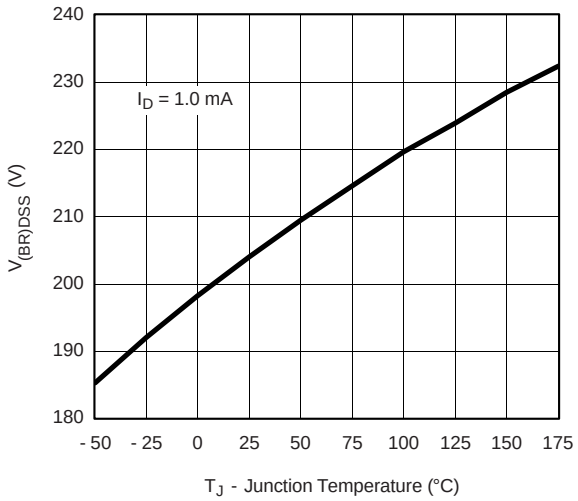
On-Resistance vs. Junction Temperature



Source-Drain Diode Forward Voltage

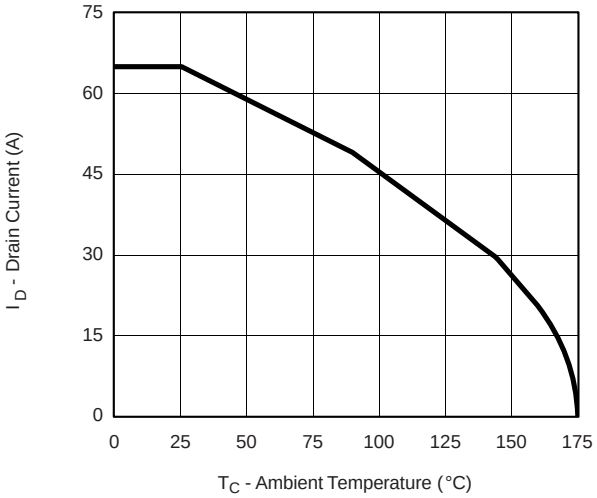


Avalanche Current vs. Time

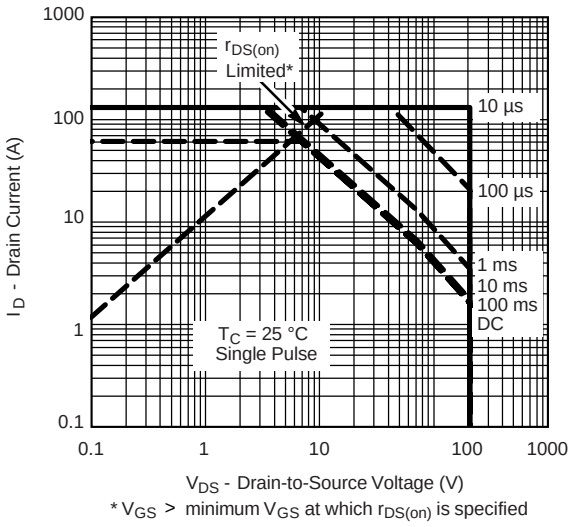


Drain Source Breakdown vs. Junction Temperature

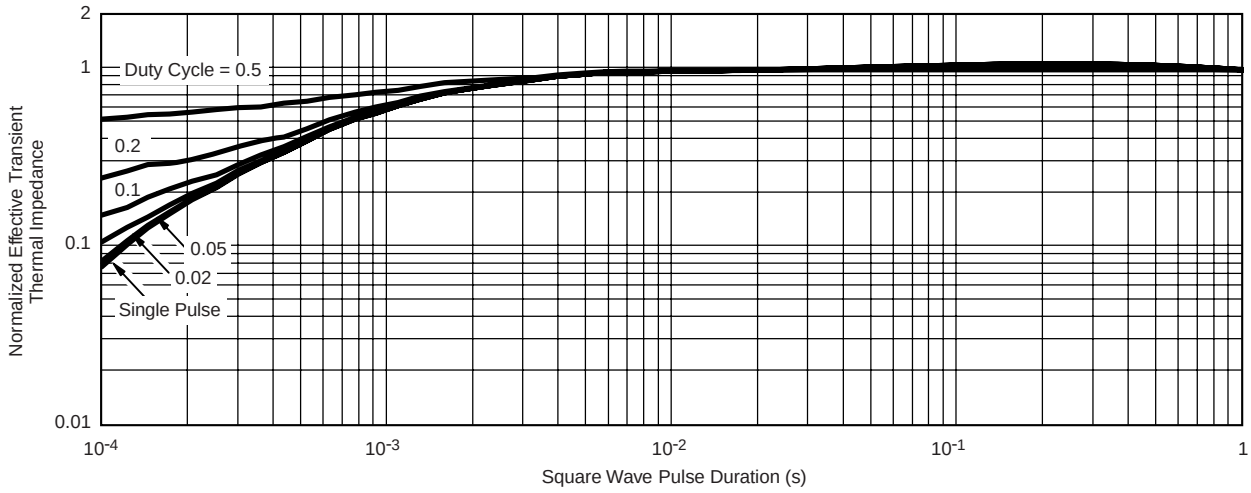
THERMAL RATINGS



Maximum Avalanche and Drain Current vs. Case Temperature

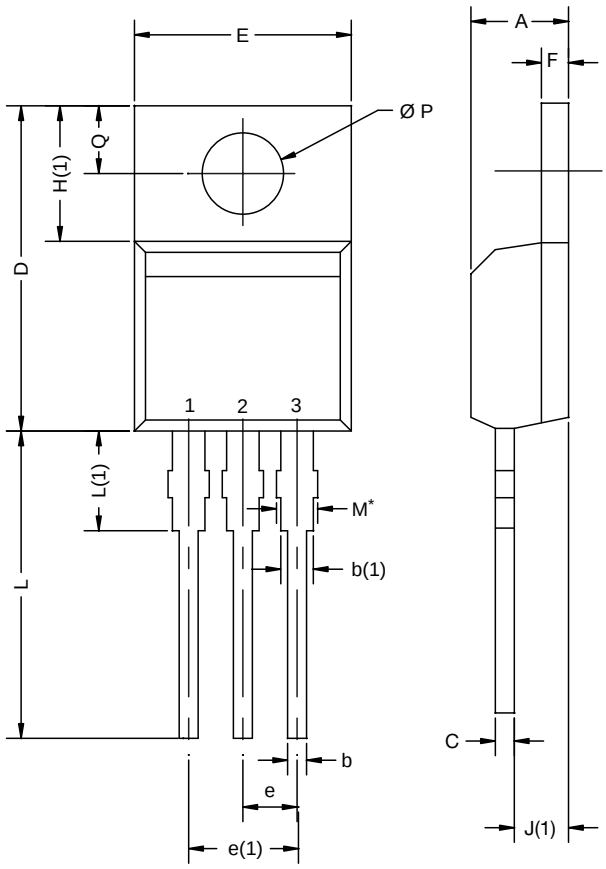


Safe Operating Area



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
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: X12-0208-Rev. N, 08-Oct-12 DWG: 5471				

Notes

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

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