

IRF510NPBF-VB Datasheet

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

PRODUCT SUMMARY

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

FEATURES

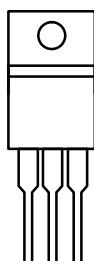
- Trench Power MOSFET
- 175 °C Junction Temperature
- Low Thermal Resistance Package
- 100 % R_g Tested


RoHS
 COMPLIANT

APPLICATIONS

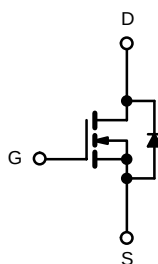
- Isolated DC/DC Converters

TO-220AB



G D S

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)	I_D	18	A
		15	
Pulsed Drain Current	I_{DM}	68	
Avalanche Current	I_{AS}	18	
Single Pulse Avalanche Energy ^b	E_{AS}	200	mJ
Maximum Power Dissipation ^b	P_D	105	W
		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	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 $T_J = 25\text{ }^{\circ}\text{C}$, unless otherwise noted						
Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Unit
Static						
Drain-Source Breakdown Voltage	$V_{(BR)DSS}$	$V_{DS} = 0\text{ V}, I_D = 250\text{ }\mu\text{A}$	100			V
Gate-Threshold Voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}, I_D = 250\text{ }\mu\text{A}$	2		4	
Gate-Body Leakage	I_{GSS}	$V_{DS} = 0\text{ V}, V_{GS} = \pm 20\text{ V}$			± 100	nA
Zero Gate Voltage Drain Current	I_{DSS}	$V_{DS} = 100\text{ V}, V_{GS} = 0\text{ V}$			1	μA
		$V_{DS} = 100\text{ V}, V_{GS} = 0\text{ V}, T_J = 125\text{ }^{\circ}\text{C}$			50	
		$V_{DS} = 100\text{ V}, V_{GS} = 0\text{ V}, T_J = 175\text{ }^{\circ}\text{C}$			250	
On-State Drain Current ^a	$I_{D(on)}$	$V_{DS} \geq 5\text{ V}, V_{GS} = 10\text{ V}$	120			A
Drain-Source On-State Resistance ^a	$r_{DS(on)}$	$V_{GS} = 10\text{ V}, I_D = 20\text{ A}$		0.127		Ω
		$V_{GS} = 10\text{ V}, I_D = 20\text{ A}, T_J = 125\text{ }^{\circ}\text{C}$		0.130		
		$V_{GS} = 10\text{ V}, I_D = 20\text{ A}, T_J = 175\text{ }^{\circ}\text{C}$		0.170		
Forward Transconductance ^a	g_{fs}	$V_{DS} = 15\text{ V}, I_D = 20\text{ A}$	25			S
Dynamic ^b						
Input Capacitance	C_{iss}	$V_{GS} = 0\text{ V}, V_{DS} = 25\text{ V}, f = 1\text{ MHz}$		1300		pF
Output Capacitance	C_{oss}			260		
Reverse Transfer Capacitance	C_{rss}			110		
Total Gate Charge ^c	Q_g	$V_{DS} = 100\text{ V}, V_{GS} = 10\text{ V}, I_D = 65\text{ A}$			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	$t_{d(on)}$	$V_{DD} = 100\text{ V}, R_L = 1.5\text{ }\Omega$ $I_D \cong 65\text{ A}, V_{GEN} = 10\text{ V}, R_g = 2.5\text{ }\Omega$		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 $T_C = 25\text{ }^{\circ}\text{C}^b$						
Continuous Current	I_S			18		A
Pulsed Current	I_{SM}			68		
Forward Voltage ^a	V_{SD}	$I_F = 65\text{ A}, V_{GS} = 0\text{ V}$		1.0	1.5	V
Reverse Recovery Time	t_{rr}	$I_F = 50\text{ A}, di/dt = 100\text{ A}/\mu\text{s}$		130	200	ns
Peak Reverse Recovery Current	$I_{RM(REC)}$			8	12	A
Reverse Recovery Charge	Q_{rr}			0.52	1.2	μC

Notes:

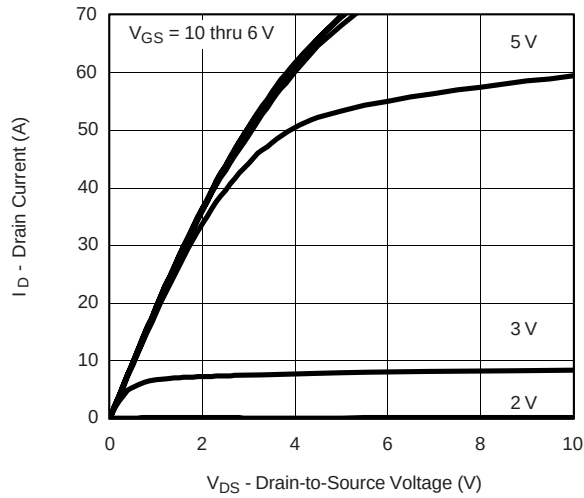
a. Pulse test; pulse width $\leq 300\text{ }\mu\text{s}$, duty cycle $\leq 2\%$.

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

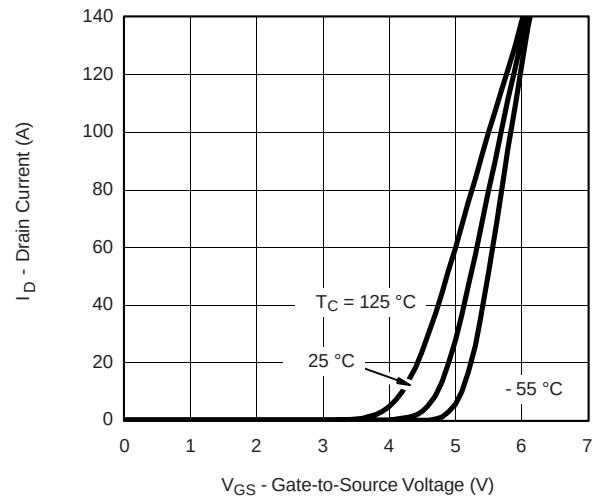
c. Independent of operating temperature.

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.

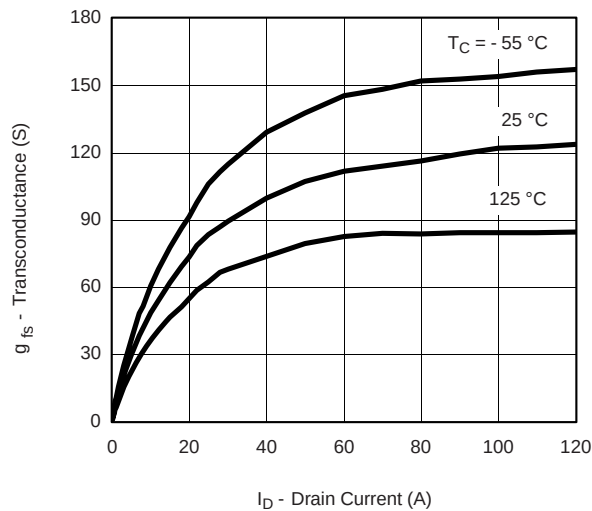
TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



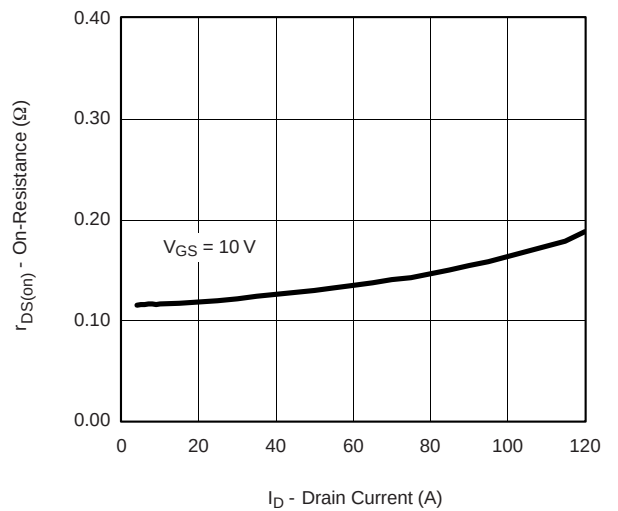
Output Characteristics



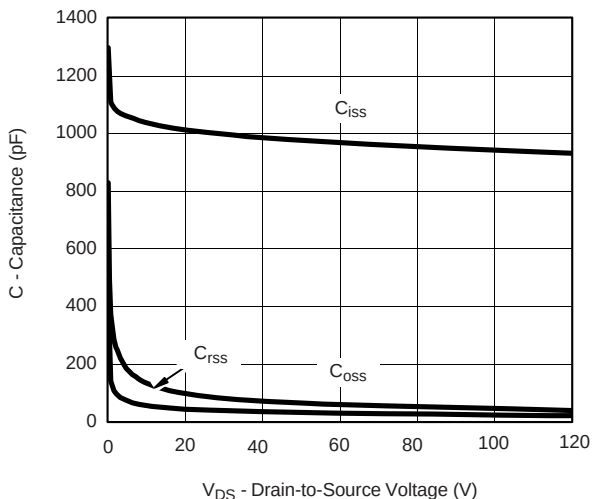
Transfer Characteristics



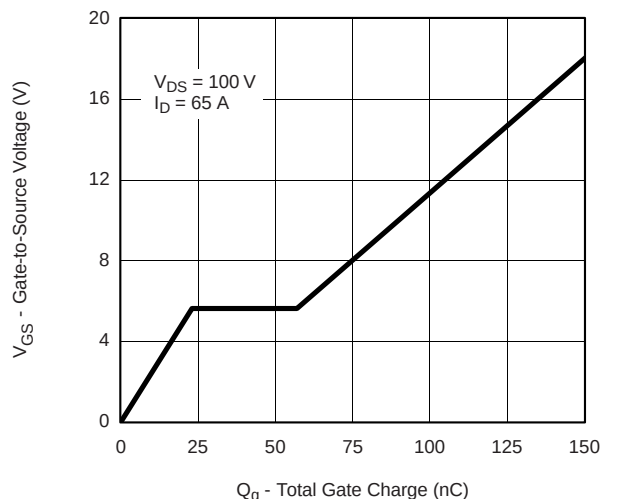
Transconductance



On-Resistance vs. Drain Current

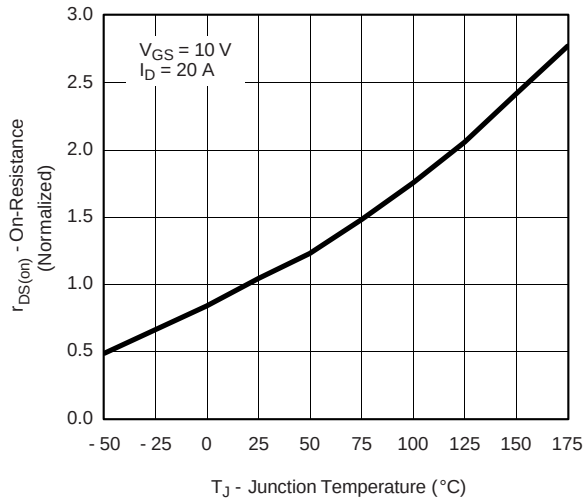


Capacitance

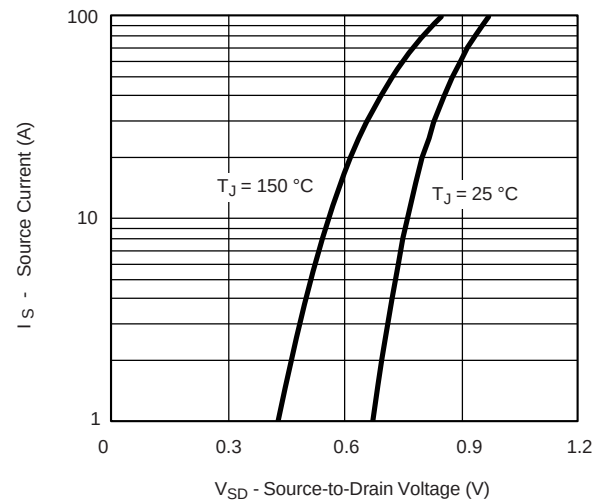


Gate Charge

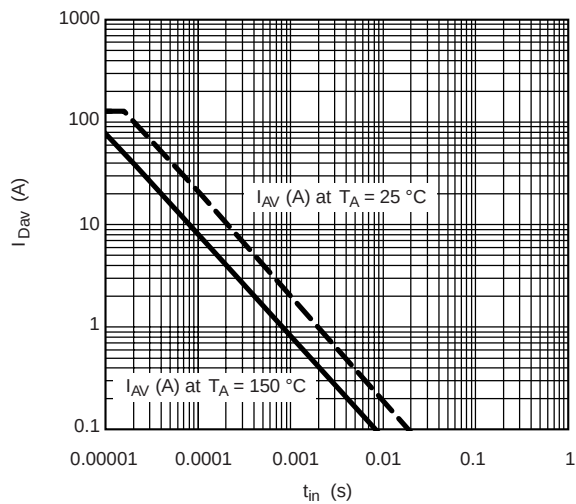
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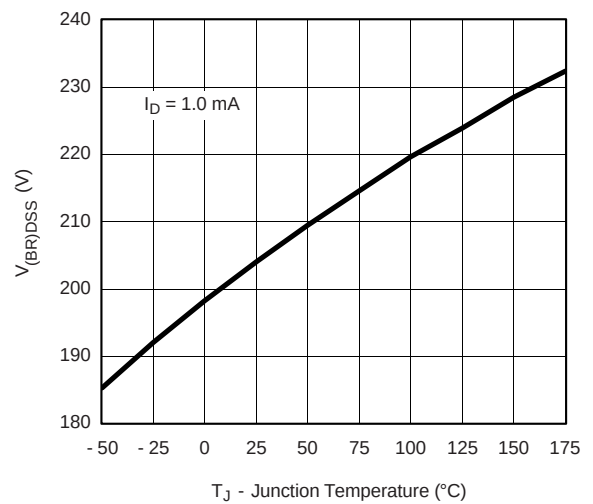
On-Resistance vs. Junction Temperature



Source-Drain Diode Forward Voltage

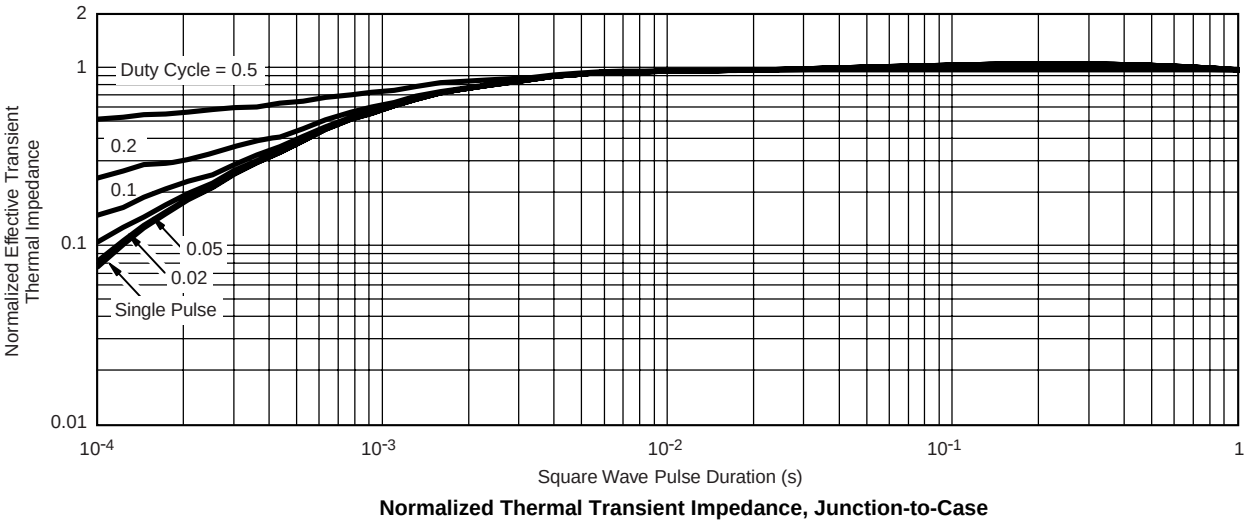
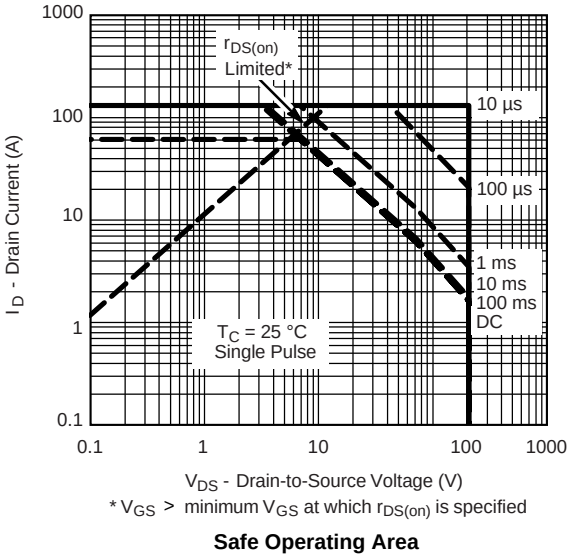
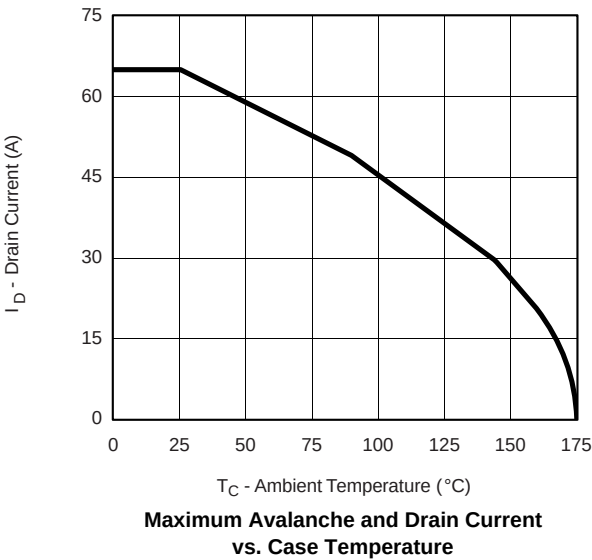


Avalanche Current vs. Time

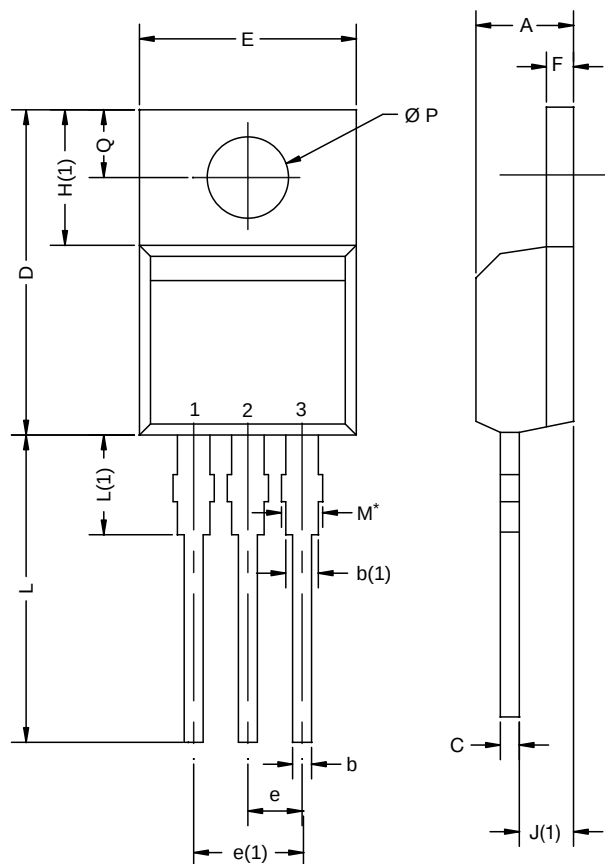


Drain Source Breakdown vs. Junction Temperature

THERMAL RATINGS



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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
$\varnothing P$	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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