

IRL540NPBF-VB Datasheet

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



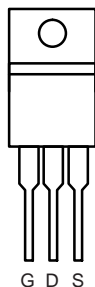
Available
RoHS*
 COMPLIANT

PRODUCT SUMMARY	
V_{DS} (V)	100
$R_{DS(on)}$ (Ω) at $V_{GS} = 10$ V	0.036
I_D (A) ^a	55
Configuration	Single

FEATURES

- Trench Power MOSFETS
- 175 °C Junction Temperature
- Low Thermal Resistance Package

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	55	A
	$T_C = 125$ °C		40	
Pulsed Drain Current		I_{DM}	135	
Avalanche Current		I_{AR}	35	
Repetitive Avalanche Energy ^a		E_{AR}	61	mJ
Maximum Power Dissipation ^a	$T_C = 25$ °C	P_D	127 ^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}	1.4	

Notes:

a. Duty cycle ≤ 1 %.

b. See SOA curve for voltage derating.

c. When Mounted on 1" square PCB (FR-4 material).

* Pb containing terminations are not RoHS compliant, exemptions may apply.

SPECIFICATIONS $T_J = 25\text{ }^{\circ}\text{C}$, unless otherwise noted						
Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Unit
Static						
Drain-Source Breakdown Voltage	$V_{(BR)DSS}$	$V_{SS} = 0\text{ V}$, $I_D = 250\text{ }\mu\text{A}$	100			V
Gate-Threshold Voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}$, $I_D = 250\text{ }\mu\text{A}$	1		3	
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
		$V_{DS} = 80\text{ V}$, $V_{GS} = 0\text{ V}$, $T_J = 125\text{ }^{\circ}\text{C}$			50	
		$V_{DS} = 80\text{ V}$, $V_{GS} = 0\text{ V}$, $T_J = 175\text{ }^{\circ}\text{C}$			250	
On-State Drain Current ^a	$I_{D(on)}$	$V_{DS} \geq 5\text{ V}$, $V_{GS} = 10\text{ V}$	75			A
Drain-Source On-State Resistance ^a	$r_{DS(on)}$	$V_{GS} = 10\text{ V}$, $I_D = 5\text{ A}$		0.036		Ω
		$V_{GS} = 4.5\text{ V}$, $I_D = 3\text{ A}$		0.038		
		$V_{GS} = 10\text{ V}$, $I_D = 5\text{ A}$, $T_J = 125\text{ }^{\circ}\text{C}$		0.050		
		$V_{GS} = 10\text{ V}$, $I_D = 3\text{ A}$, $T_J = 175\text{ }^{\circ}\text{C}$		0.065		
Forward Transconductance ^a	g_{fs}	$V_{DS} = 15\text{ V}$, $I_D = 15\text{ A}$	10			S
Dynamic ^b						
Input Capacitance	C_{iss}	$V_{GS} = 0\text{ V}$, $V_{DS} = 25\text{ V}$, $f = 1\text{ MHz}$		4500		pF
Output Capacitance	C_{oss}			270		
Reverse Transfer Capacitance	C_{rss}			90		
Total Gate Charge ^c	Q_g	$V_{DS} = 50\text{ V}$, $V_{GS} = 10\text{ V}$, $I_D = 40\text{ A}$		35	60	nC
Gate-Source Charge ^c	Q_{gs}			11		
Gate-Drain Charge ^c	Q_{gd}			9		
Gate Resistance	R_G			1.7		Ω
Turn-On Delay Time ^c	$t_{d(on)}$	$V_{DD} = 50\text{ V}$, $R_L = 1.25\text{ }\Omega$ $I_D \cong 40\text{ A}$, $V_{GEN} = 10\text{ V}$, $R_G = 2.5\text{ }\Omega$		11	20	ns
Rise Time ^c	t_r			12	20	
Turn-Off Delay Time ^c	$t_{d(off)}$			30	45	
Fall Time ^c	t_f			12	20	
Source-Drain Diode Ratings and Characteristics $T_C = 25\text{ }^{\circ}\text{C}$ ^b						
Continuous Current	I_S				40	A
Pulsed Current	I_{SM}				120	
Forward Voltage ^a	V_{SD}	$I_F = 30\text{ A}$, $V_{GS} = 0\text{ V}$		1.0	1.5	V
Reverse Recovery Time	t_{rr}	$I_F = 30\text{ A}$, $di/dt = 100\text{ A}/\mu\text{s}$		60	100	ns
Peak Reverse Recovery Current	$I_{RM(REC)}$			5	8	A
Reverse Recovery Charge	Q_{rr}			0.15	0.4	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



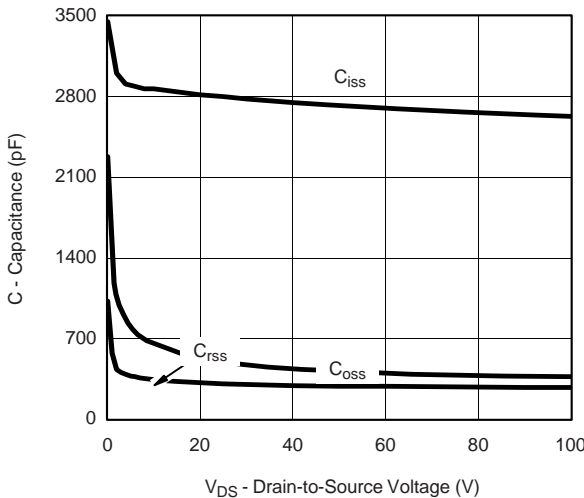
Transfer Characteristics



Transconductance



On-Resistance vs. Drain Current

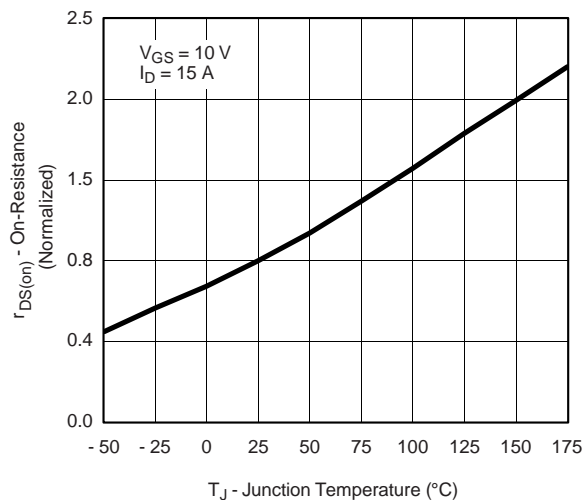


Capacitance

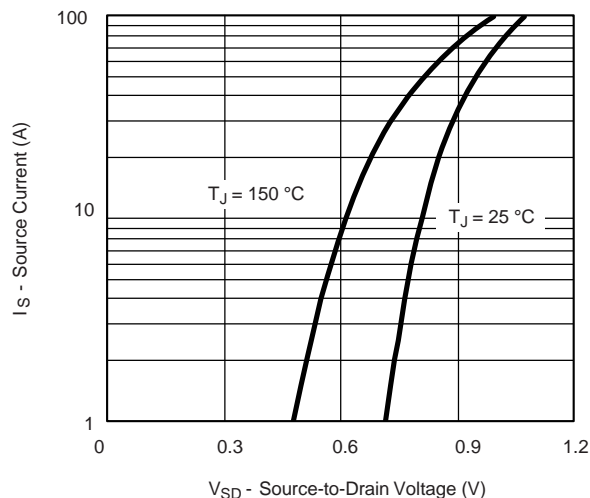


Gate Charge

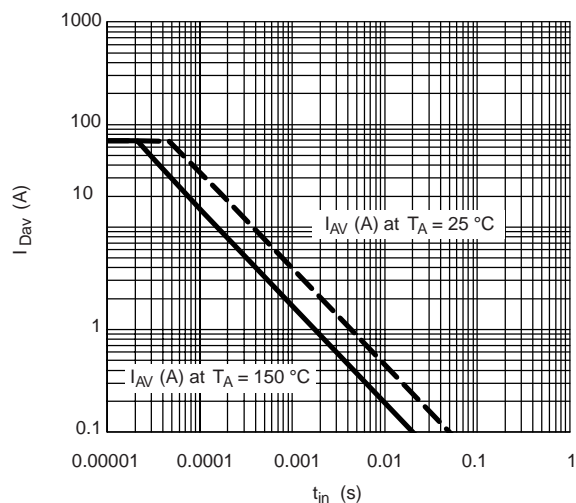
TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



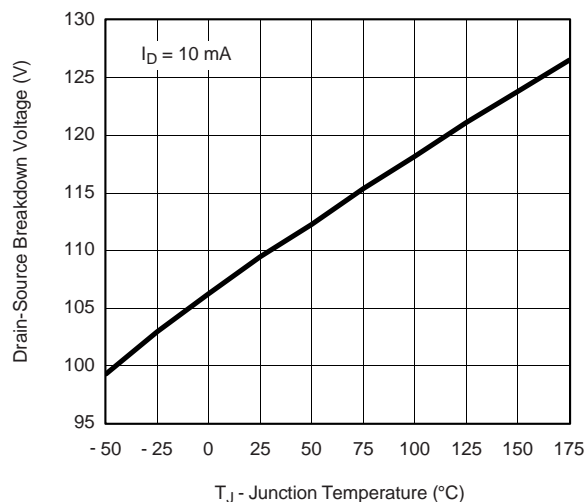
On-Resistance vs. Junction Temperature



Source-Drain Diode Forward Voltage



Avalanche Current vs. Time



Drain-Source Breakdown Voltage vs. Junction Temperature

THERMAL RATINGS



Maximum Avalanche and Drain Current vs. Case Temperature



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

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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