

# IRF520NS-VB Datasheet

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

PRODUCT SUMMARY		
$V_{(BR)DSS}$ (V)	$R_{DS(on)}$ ( $\Omega$ )	$I_D$ (A)
100	0.100 at $V_{GS} = 10$ V	20

### FEATURES

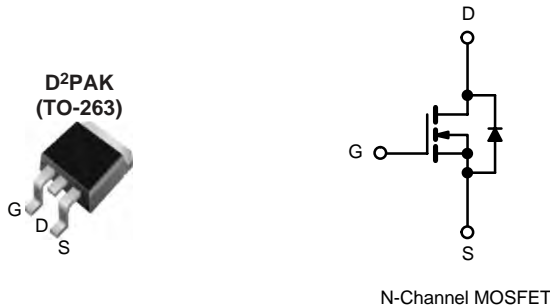
- TrenchFET<sup>®</sup> Power MOSFET
- 175 °C Junction Temperature
- Low Thermal Resistance Package
- 100 %  $R_g$  Tested



RoHS  
COMPLIANT

### APPLICATIONS

- Isolated DC/DC Converters



ABSOLUTE MAXIMUM RATINGS $T_C = 25$ °C, unless otherwise noted				
Parameter	Symbol	Limit	Unit	
Drain-Source Voltage	$V_{DS}$	100	V	
Gate-Source Voltage	$V_{GS}$	$\pm 20$		
Continuous Drain Current ( $T_J = 175$ °C)	$I_D$	$T_C = 25$ °C	20	A
		$T_C = 125$ °C	16	
Pulsed Drain Current	$I_{DM}$	70		
Avalanche Current	$I_{AS}$	20		
Single Pulse Avalanche Energy <sup>b</sup>	$E_{AS}$	200	mJ	
Maximum Power Dissipation <sup>b</sup>	$P_D$	$T_C = 25$ °C	105	W
		$T_A = 25$ °C <sup>d</sup>	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:

- Package limited.
- Duty cycle  $\leq 1$  %.
- See SOA curve for voltage derating.
- When Mounted on 1" square PCB (FR-4 material).

<b>SPECIFICATIONS</b> $T_J = 25\text{ }^\circ\text{C}$ , unless otherwise noted						
Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Unit
<b>Static</b>						
Drain-Source Breakdown Voltage	$V_{(BR)DSS}$	$V_{DS} = 0\text{ V}, I_D = 250\text{ }\mu\text{A}$	100			V
Gate-Threshold Voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}, I_D = 250\text{ }\mu\text{A}$	1		3	
Gate-Body Leakage	$I_{GSS}$	$V_{DS} = 0\text{ V}, V_{GS} = \pm 20\text{ V}$			$\pm 100$	nA
Zero Gate Voltage Drain Current	$I_{DSS}$	$V_{DS} = 100\text{ V}, V_{GS} = 0\text{ V}$			1	$\mu\text{A}$
		$V_{DS} = 100\text{ V}, V_{GS} = 0\text{ V}, T_J = 125\text{ }^\circ\text{C}$			50	
		$V_{DS} = 100\text{ V}, V_{GS} = 0\text{ V}, T_J = 175\text{ }^\circ\text{C}$			250	
On-State Drain Current <sup>a</sup>	$I_{D(on)}$	$V_{DS} \geq 5\text{ V}, V_{GS} = 10\text{ V}$	120			A
Drain-Source On-State Resistance <sup>a</sup>	$r_{DS(on)}$	$V_{GS} = 10\text{ V}, I_D = 20\text{ A}$		0.100		$\Omega$
		$V_{GS} = 10\text{ V}, I_D = 20\text{ A}, T_J = 125\text{ }^\circ\text{C}$		0.110		
		$V_{GS} = 10\text{ V}, I_D = 20\text{ A}, T_J = 175\text{ }^\circ\text{C}$		0.120		
Forward Transconductance <sup>a</sup>	$g_{fs}$	$V_{DS} = 15\text{ V}, I_D = 20\text{ A}$	25			S
<b>Dynamic<sup>b</sup></b>						
Input Capacitance	$C_{iss}$	$V_{GS} = 0\text{ V}, V_{DS} = 25\text{ V}, f = 1\text{ MHz}$		950		$\text{pF}$
Output Capacitance	$C_{oss}$			280		
Reverse Transfer Capacitance	$C_{rss}$			110		
Total Gate Charge <sup>c</sup>	$Q_g$	$V_{DS} = 100\text{ V}, V_{GS} = 10\text{ V}, I_D = 65\text{ A}$			28	$\text{nC}$
Gate-Source Charge <sup>c</sup>	$Q_{gs}$				4.8	
Gate-Drain Charge <sup>c</sup>	$Q_{gd}$				15	
Gate Resistance	$R_g$		0.5	1.7	3.3	$\Omega$
Turn-On Delay Time <sup>c</sup>	$t_{d(on)}$	$V_{DD} = 100\text{ V}, R_L = 1.5\text{ }\Omega$ $I_D \cong 65\text{ A}, V_{GEN} = 10\text{ V}, R_g = 2.5\text{ }\Omega$		8		ns
Rise Time <sup>c</sup>	$t_r$			120		
Turn-Off Delay Time <sup>c</sup>	$t_{d(off)}$			25		
Fall Time <sup>c</sup>	$t_f$			50		
<b>Source-Drain Diode Ratings and Characteristics</b> $T_C = 25\text{ }^\circ\text{C}^b$						
Continuous Current	$I_S$				65	A
Pulsed Current	$I_{SM}$				140	
Forward Voltage <sup>a</sup>	$V_{SD}$	$I_F = 65\text{ A}, V_{GS} = 0\text{ V}$		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	$\mu\text{C}$

Notes:

- Pulse test; pulse width  $\leq 300\text{ }\mu\text{s}$ , duty cycle  $\leq 2\%$ .
- Guaranteed by design, not subject to production testing.
- 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



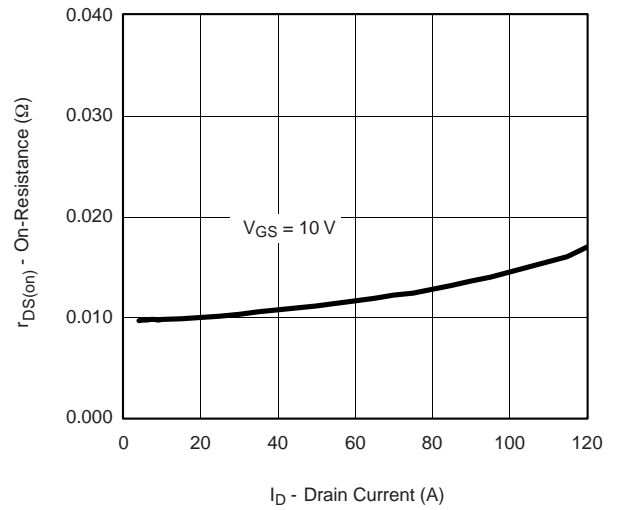
**Output Characteristics**



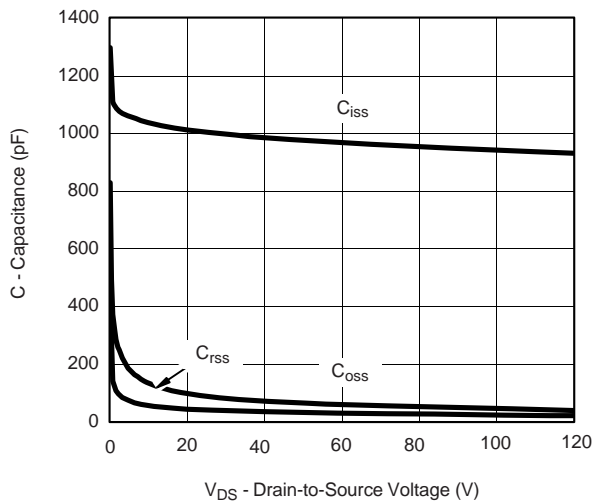
**Transfer Characteristics**



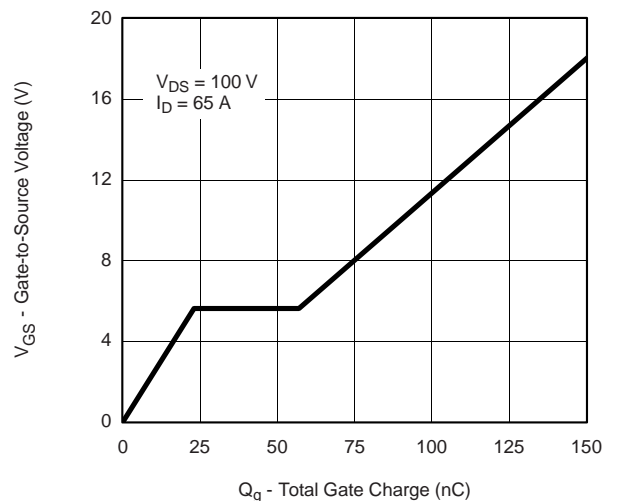
**Transconductance**



**On-Resistance vs. Drain Current**



**Capacitance**

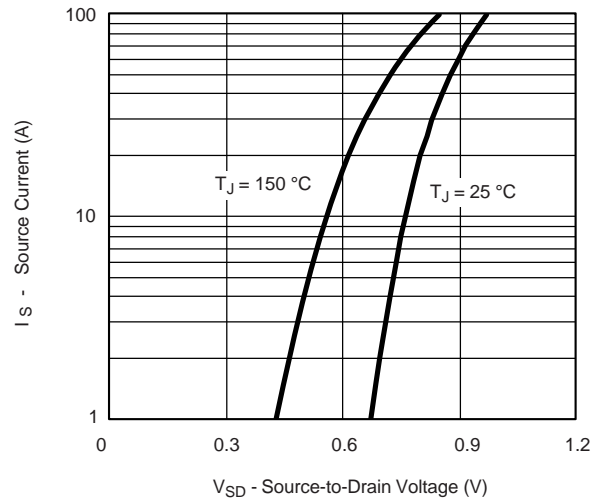


**Gate Charge**

**TYPICAL CHARACTERISTICS** 25 °C, unless otherwise noted



**On-Resistance vs. Junction Temperature**



**Source-Drain Diode Forward Voltage**



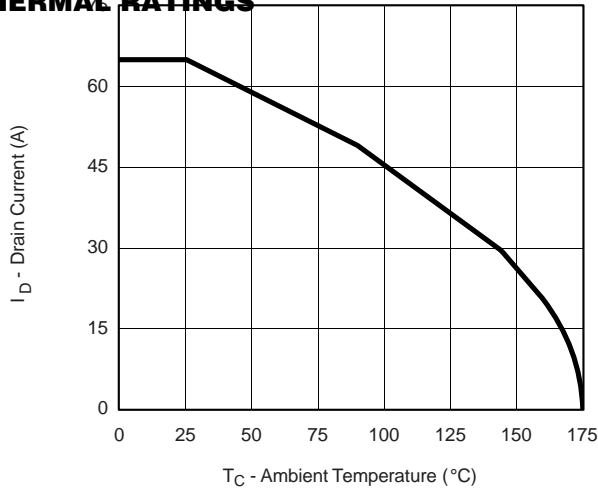
**Avalanche Current vs. Time**



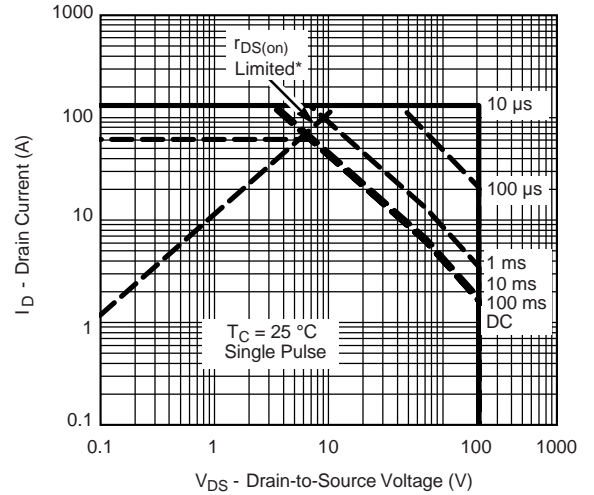
**Drain Source Breakdown vs. Junction Temperature**

**A**

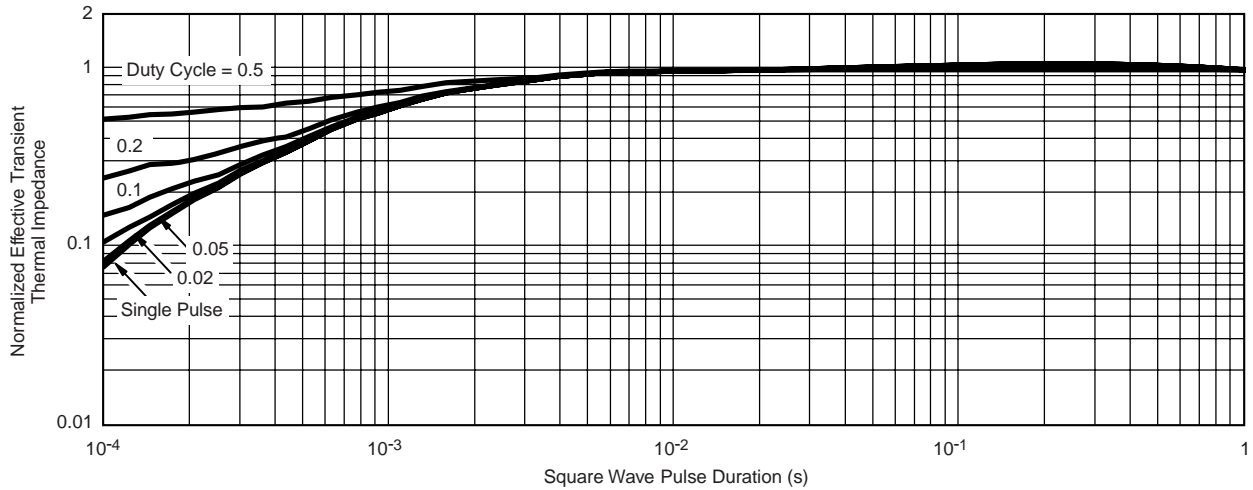
**THERMAL RATINGS**



**Maximum Avalanche and Drain Current vs. Case Temperature**

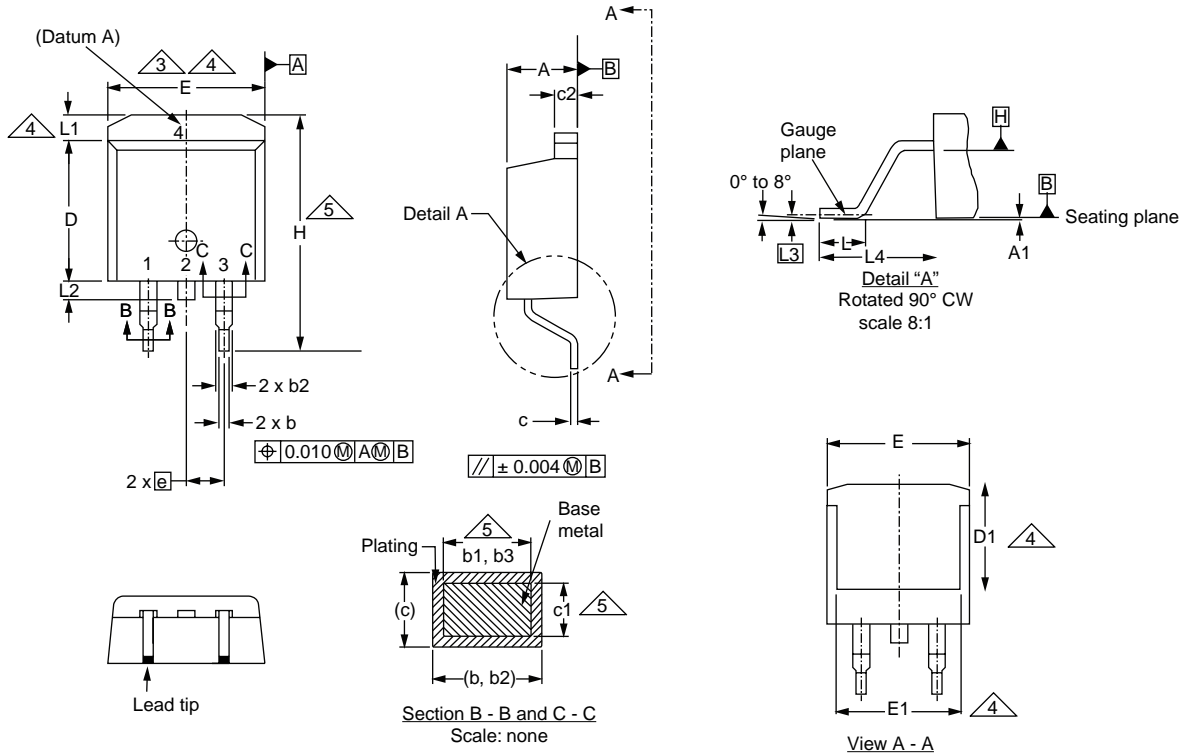


**Safe Operating Area**  
\*  $V_{GS} >$  minimum  $V_{GS}$  at which  $r_{DS(on)}$  is specified



**Normalized Thermal Transient Impedance, Junction-to-Case**

**TO-263AB (HIGH VOLTAGE)**



DIM.	MILLIMETERS		INCHES	
	MIN.	MAX.	MIN.	MAX.
A	4.06	4.83	0.160	0.190
A1	0.00	0.25	0.000	0.010
b	0.51	0.99	0.020	0.039
b1	0.51	0.89	0.020	0.035
b2	1.14	1.78	0.045	0.070
b3	1.14	1.73	0.045	0.068
c	0.38	0.74	0.015	0.029
c1	0.38	0.58	0.015	0.023
c2	1.14	1.65	0.045	0.065
D	8.38	9.65	0.330	0.380

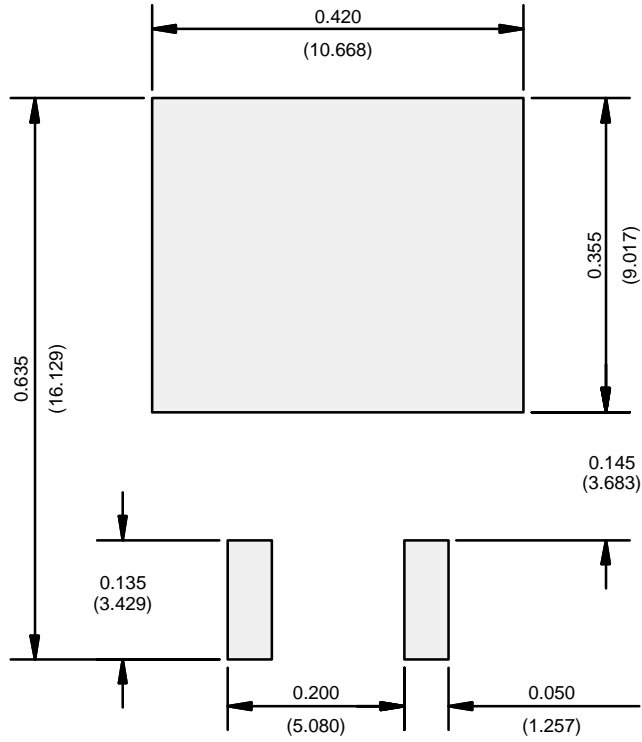
DIM.	MILLIMETERS		INCHES	
	MIN.	MAX.	MIN.	MAX.
D1	6.86	-	0.270	-
E	9.65	10.67	0.380	0.420
E1	6.22	-	0.245	-
e	2.54 BSC		0.100 BSC	
H	14.61	15.88	0.575	0.625
L	1.78	2.79	0.070	0.110
L1	-	1.65	-	0.066
L2	-	1.78	-	0.070
L3	0.25 BSC		0.010 BSC	
L4	4.78	5.28	0.188	0.208

ECN: S-82110-Rev. A, 15-Sep-08  
DWG: 5970

**Notes**

1. Dimensioning and tolerancing per ASME Y14.5M-1994.
2. Dimensions are shown in millimeters (inches).
3. Dimension D and E do not include mold flash. Mold flash shall not exceed 0.127 mm (0.005") per side. These dimensions are measured at the outmost extremes of the plastic body at datum A.
4. Thermal PAD contour optional within dimension E, L1, D1 and E1.
5. Dimension b1 and c1 apply to base metal only.
6. Datum A and B to be determined at datum plane H.
7. Outline conforms to JEDEC outline to TO-263AB.

**RECOMMENDED MINIMUM PADS FOR D<sup>2</sup>PAK: 3-Lead**



Recommended Minimum Pads  
Dimensions in Inches/(mm)

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