

# IRF510STRL-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 <sub>GS</sub> = 10 V	20		

#### **FEATURES**

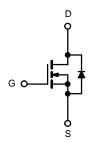
- Trench Power MOSFET
- 175 °C Junction Temperature
- Low Thermal Resistance Package
- 100 % R<sub>g</sub> Tested



#### **APPLICATIONS**

• Isolated DC/DC Converters





N-Channel MOSFET

<b>ABSOLUTE MAXIMUM RATINGS</b>	T <sub>C</sub> = 25 °C, unless oth	erwise noted			
Parameter	Symbol	Limit	Unit		
Drain-Source Voltage	V <sub>DS</sub>	100	V		
Gate-Source Voltage	V <sub>GS</sub>	± 20	7 v		
Continuous Drain Current (T <sub>J</sub> = 175 °C)	T <sub>C</sub> = 25 °C	1-	20		
	T <sub>C</sub> = 125 °C	I <sub>D</sub>	16	_	
Pulsed Drain Current		I <sub>DM</sub>	70	А	
alanche Current		I <sub>AS</sub>	20	1	
Single Pulse Avalanche Energy <sup>b</sup>		E <sub>AS</sub>	200	mJ	
Mariana Barra Biaria di ah	T <sub>C</sub> = 25 °C	D	105	W	
Maximum Power Dissipation <sup>b</sup>	T <sub>A</sub> = 25 °C <sup>d</sup>	P <sub>D</sub>	3.75	] vv	
Operating Junction and Storage Temperature Range		T <sub>J</sub> , T <sub>stg</sub>	- 55 to 175	°C	

THERMAL RESISTANCE RATINGS					
Parameter		Symbol	Limit	Unit	
Junction-to-Ambient	PCB Mount (TO-263) <sup>d</sup>	R <sub>thJA</sub>	40	°C/W	
Junction-to-Case (Drain)		R <sub>thJC</sub>	0.4	C/VV	

#### Notes:

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



Parameter	Symbol	Test Conditions	Min.	Тур.	Max.	Unit	
Static							
Drain-Source Breakdown Voltage	V <sub>(BR)DSS</sub>	$V_{DS} = 0 \text{ V}, I_{D} = 250 \mu\text{A}$	100			V	
Gate-Threshold Voltage	V <sub>GS(th)</sub>	$V_{DS} = V_{GS}, I_D = 250 \mu A$	1		3	V	
Gate-Body Leakage	I <sub>GSS</sub>	$V_{DS} = 0 \text{ V}, V_{GS} = \pm 20 \text{ V}$			± 100	nA	
		$V_{DS} = 100 \text{ V}, V_{GS} = 0 \text{ V}$			1	μA	
Zero Gate Voltage Drain Current	I <sub>DSS</sub>	V <sub>DS</sub> = 100 V, V <sub>GS</sub> = 0 V, T <sub>J</sub> = 125 °C			50		
		V <sub>DS</sub> = 100 V, V <sub>GS</sub> = 0 V, T <sub>J</sub> = 175 °C			250		
On-State Drain Current <sup>a</sup>	I <sub>D(on)</sub>	$V_{DS} \ge 5 \text{ V}, V_{GS} = 10 \text{ V}$	120			Α	
		V <sub>GS</sub> = 10 V, I <sub>D</sub> = 20 A		0.100			
Drain-Source On-State Resistance <sup>a</sup>	r <sub>DS(on)</sub>	V <sub>GS</sub> = 10 V, I <sub>D</sub> = 20 A, T <sub>J</sub> = 125 °C		0.110		Ω	
		V <sub>GS</sub> = 10 V, I <sub>D</sub> = 20 A, T <sub>J</sub> = 175 °C		0.120			
Forward Transconductance <sup>a</sup>	9 <sub>fs</sub>	V <sub>DS</sub> = 15 V, I <sub>D</sub> = 20 A	25			S	
Dynamic <sup>b</sup>							
Input Capacitance	C <sub>iss</sub>			950		pF	
Output Capacitance	C <sub>oss</sub>	$V_{GS} = 0 \text{ V}, V_{DS} = 25 \text{ V}, f = 1 \text{ MHz}$		280			
Reverse Transfer Capacitance	C <sub>rss</sub>			110			
Total Gate Charge <sup>c</sup>	$Q_g$				28	nC	
Gate-Source Charge <sup>c</sup>	$Q_{gs}$	$V_{DS} = 100 \text{ V}, V_{GS} = 10 \text{ V}, I_D = 65 \text{ A}$			4.8		
Gate-Drain Charge <sup>c</sup>	$Q_{gd}$				15		
Gate Resistance	$R_g$		0.5	1.7	3.3	Ω	
Turn-On Delay Time <sup>c</sup>	t <sub>d(on)</sub>			8			
Rise Time <sup>c</sup>	t <sub>r</sub>	$V_{DD} = 100 \text{ V}, R_{L} = 1.5 \Omega$		120		nc	
Turn-Off Delay Time <sup>c</sup>	t <sub>d(off)</sub>	$I_D \cong 65 \text{ A}, V_{GEN} = 10 \text{ V}, R_g = 2.5 \Omega$		25		ns	
Fall Time <sup>c</sup>	t <sub>f</sub>			50			
Source-Drain Diode Ratings and Ch	aracteristics 7	T <sub>C</sub> = 25 °C <sup>b</sup>					
Continuous Current	I <sub>S</sub>				65	۸	
Pulsed Current	I <sub>SM</sub>				140	Α	
Forward Voltage <sup>a</sup>	$V_{SD}$	I <sub>F</sub> = 65 A, V <sub>GS</sub> = 0 V		1.0	1.5	V	
Reverse Recovery Time	t <sub>rr</sub>			130	200	ns	
Peak Reverse Recovery Current	I <sub>RM(REC)</sub>	I <sub>F</sub> = 50 A, di/dt = 100 A/μs		8	12	Α	
Reverse Recovery Charge	Q <sub>rr</sub>			0.52	1.2	иC	

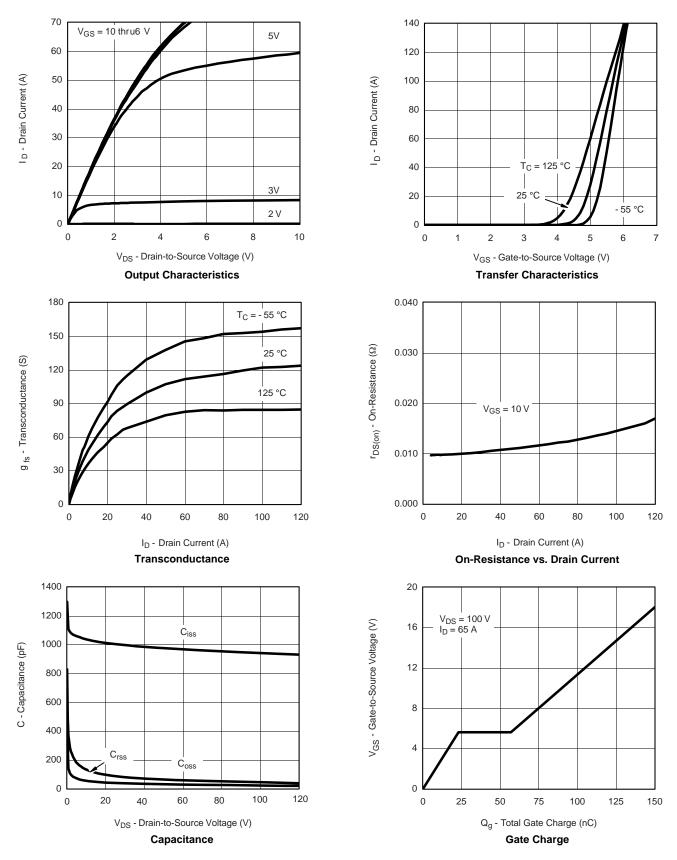
#### Notes

- a. Pulse test; pulse width  $\leq$  300 µs, 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.

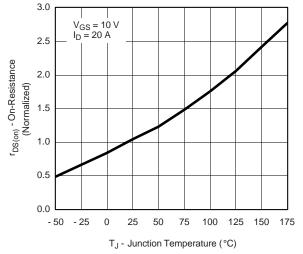


#### TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted

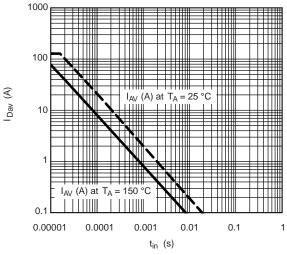




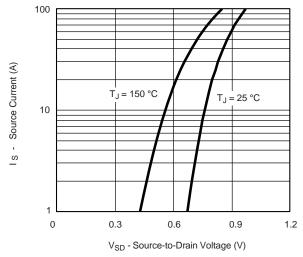
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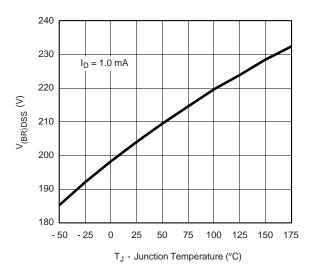
#### On-Resistance vs. Junction Temperature



**Avalanche Current vs. Time** 



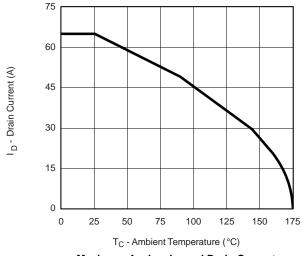
Source-Drain Diode Forward Voltage



Drain Source Breakdown vs. Junction Temperature



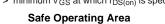
#### **THERMAL RATINGS**

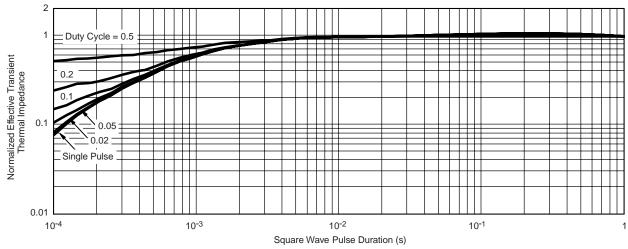


r<sub>DS(on)</sub> Limited 10 µs 100 I<sub>D</sub> - Drain Current (A) 10 T<sub>C</sub> = 25 °C 10 ms 100 ms DC Single Pulse 0.1 0.1 100 1000 10 V<sub>DS</sub> - Drain-to-Source Voltage (V) \*  $V_{GS}$  > minimum  $V_{GS}$  at which  $r_{DS(on)}$  is specified

1000

Maximum Avalanche and Drain Current vs. Case Temperature



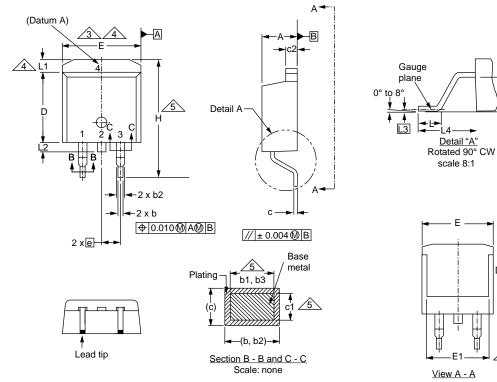


Normalized Thermal Transient Impedance, Junction-to-Case



Seating plane

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



	MILLIN	METERS	INC	HES
DIM.	MIN.	MAX.	MIN.	MAX.
Α	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
С	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

	MILLIN	METERS	INC	HES
DIM.	MIN.	MAX.	MIN.	MAX.
D1	6.86	=	0.270	=
Е	9.65	10.67	0.380	0.420
E1	6.22	-	0.245	-
е	2.54	2.54 BSC 0.100 BSC		
Н	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

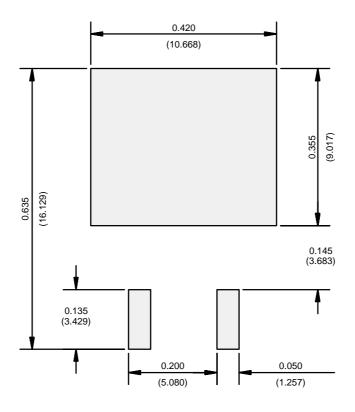
DWG: 5970

#### 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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