

## FR2905Z-VB Datasheet

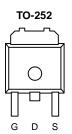
# N-Channel 60 V (D-S) MOSFET

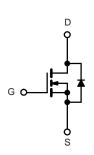
PRODUCT SUMMARY				
V <sub>DS</sub> (V)	$R_{DS(on)}(\Omega)$	I <sub>D</sub> (A) <sup>a</sup>		
60	0.010 at V <sub>GS</sub> = 10 V	58		
60	0.013 at V <sub>GS</sub> = 4.5 V	56		

#### **FEATURES**

- 175 °C Junction Temperature
- Trench Power MOSFET
- Material categorization:







N-Channel MOSFET

<b>ABSOLUTE MAXIMUM RATINGS</b> (T <sub>C</sub> = 25 °C, unless otherwise noted)							
Parameter	Symbol	Limit	Unit				
Gate-Source Voltage	$V_{GS}$	± 20	V				
Continuous Danis Comment /T 475 90\b	T <sub>C</sub> = 25 °C	I-	58				
Continuous Drain Current (T <sub>J</sub> = 175 °C) <sup>b</sup>	T <sub>C</sub> = 100 °C	- I <sub>D</sub>	48 <sup>a</sup>	7			
Pulsed Drain Current	I <sub>DM</sub>	100	A				
Continuous Source Current (Diode Conduction)	I <sub>S</sub>	50 <sup>a</sup>					
Avalanche Current	I <sub>AS</sub> 50						
Single Avalanche Energy (Duty Cycle ≤ 1 %)	L = 0.1 mH	E <sub>AS</sub>	125	mJ			
Maximum Dawar Dissination	T <sub>C</sub> = 25 °C	P <sub>D</sub>	136	W			
Maximum Power Dissipation	T <sub>A</sub> = 25 °C	] 'D	3 <sup>b</sup> , 8.3 <sup>b, c</sup>	] vv			
Operating Junction and Storage Temperature Range		T <sub>J</sub> , T <sub>stg</sub>	- 55 to 175	°C			

THERMAL RESISTANCE RATINGS							
Parameter		Symbol	Typical	Maximum	Unit		
Maximum Junction-to-Ambient <sup>a</sup>	t ≤ 10 sec	R <sub>thJA</sub>	15	18	°C/W		
waximum Junction-to-Ambient*	Steady State		40	50			
Maximum Junction-to-Case		R <sub>thJC</sub>	0.85	1.1			

#### Notes:

- a. Package limited.
- b. Surface mounted on 1" x 1" FR4 board.
- c.  $t \le 10$  s.

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<b>SPECIFICATIONS</b> (T <sub>J</sub> = 25 °C, unless otherwise noted)							
Parameter	Symbol	Test Conditions	Min.	Typ.a	Max.	Unit	
Static	•		•				
Drain-Source Breakdown Voltage	V <sub>DS</sub>	$V_{GS} = 0 \text{ V}, I_D = 250 \mu\text{A}$	60			V	
Gate Threshold Voltage	V <sub>GS(th)</sub>	$V_{DS} = V_{GS}, I_{D} = 250 \mu A$	1	2	3		
Gate-Body Leakage	I <sub>GSS</sub>	$V_{DS} = 0 \text{ V}, V_{GS} = \pm 20 \text{ V}$			± 100	nA	
		V <sub>DS</sub> = 60 V, V <sub>GS</sub> = 0 V	1		1		
Zero Gate Voltage Drain Current	I <sub>DSS</sub>	V <sub>DS</sub> = 60 V, V <sub>GS</sub> = 0 V, T <sub>J</sub> = 125 °C			50	μΑ	
		$V_{DS} = 60 \text{ V}, V_{GS} = 0 \text{ V}, T_{J} = 175 \text{ °C}$			250		
On-State Drain Current <sup>b</sup>	I <sub>D(on)</sub>	$V_{DS} = 5 \text{ V}, V_{GS} = 10 \text{ V}$	60			Α	
		V <sub>GS</sub> = 10 V, I <sub>D</sub> = 20 A		0.010		Ω	
Desir Ossans Os Otata Desirta anh	P	V <sub>GS</sub> = 10 V, I <sub>D</sub> = 20 A, T <sub>J</sub> = 125 °C		0.016			
Drain-Source On-State Resistance <sup>b</sup>	R <sub>DS(on)</sub>	V <sub>GS</sub> = 10 V, I <sub>D</sub> = 20 A, T <sub>J</sub> = 175 °C		0.020			
		V <sub>GS</sub> = 4.5 V, I <sub>D</sub> = 15 A		0.013			
Forward Transconductance <sup>b</sup>	9 <sub>fs</sub>	V <sub>DS</sub> = 15 V, I <sub>D</sub> = 20 A		60		S	
Dynamic							
Input Capacitance	C <sub>iss</sub>			2650			
Output Capacitance	C <sub>oss</sub>	$V_{GS} = 0 \text{ V}, V_{DS} = 25 \text{ V}, f = 1 \text{ MHz}$		470		pF	
Reverse Transfer Capacitance	C <sub>rss</sub>			225			
Total Gate Charge <sup>c</sup>	$Q_g$			47	70		
Gate-Source Charge <sup>c</sup>	$Q_{gs}$	$V_{DS} = 30 \text{ V}, V_{GS} = 10 \text{ V}, I_{D} = 50 \text{ A}$		10		nC	
Gate-Drain Charge <sup>c</sup>	$Q_{gd}$			12			
Turn-On Delay Time <sup>c</sup>	t <sub>d(on)</sub>			10	20		
Rise Time <sup>c</sup>	t <sub>r</sub>	$V_{DD} = 30 \text{ V}, R_L = 0.6 \Omega$		15	25	no	
Turn-Off Delay Time <sup>c</sup>	t <sub>d(off)</sub>	$I_D \cong 50 \text{ A}, V_{GEN} = 10 \text{ V}, R_g = 2.5 \Omega$		35	50	ns	
Fall Time <sup>c</sup>	t <sub>f</sub>			20	30		
Source-Drain Diode Ratings and Cha	aracteristics (	T <sub>C</sub> = 25 °C)					
Pulsed Current	I <sub>SM</sub>				60	Α	
Diode Forward Voltage	$V_{SD}$	$I_F = 20 \text{ A}, V_{GS} = 0 \text{ V}$		1	1.5	V	
Reverse Recovery Time	t <sub>rr</sub>	$I_F = 20 \text{ A}, \text{ di/dt} = 100 \text{ A/}\mu\text{s}$		45	100	ns	

#### Notes:

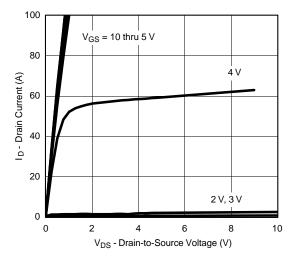
- a. For design aid only; not subject to production testing.
- b. Pulse test; pulse width  $\leq 300~\mu s,$  duty cycle  $\leq 2~\%.$
- c. Independent of operating temperature.

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.

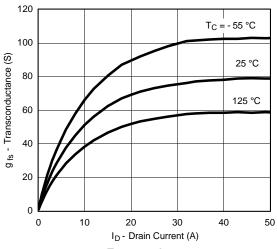
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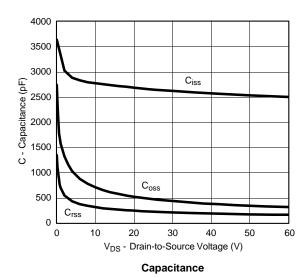
### TYPICAL CHARACTERISTICS (25 °C unless noted)



### **Output Characteristics**

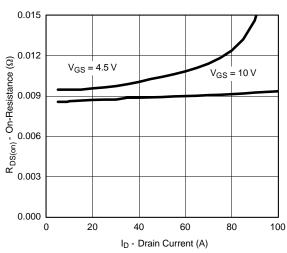


#### Transconductance

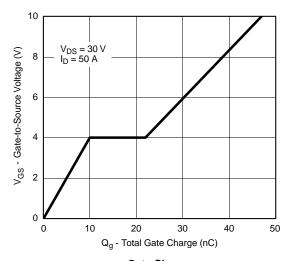


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**Transfer Characteristics** 



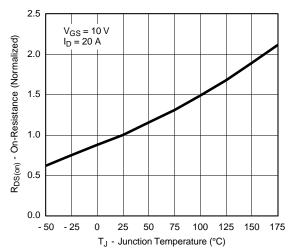
On-Resistance vs. Drain Current



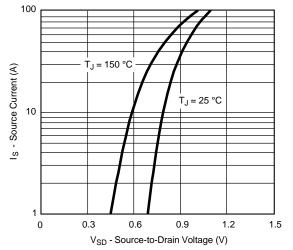
Gate Charge



## TYPICAL CHARACTERISTICS (25 °C unless noted)



On-Resistance vs. Junction Temperature

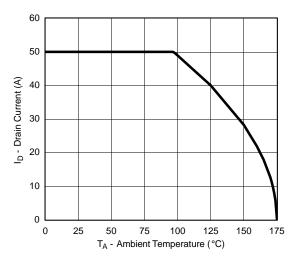


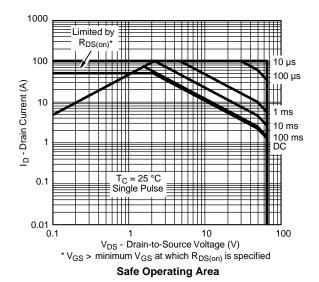
Source-Drain Diode Forward Voltage

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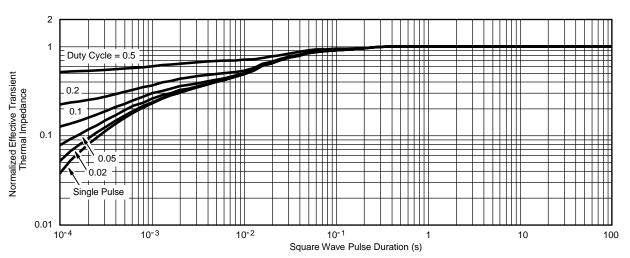


#### THERMAL RATINGS





Maximum Drain Current vs. Ambient Temperature



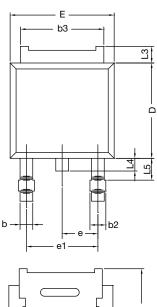
Normalized Thermal Transient Impedance, Junction-to-Case

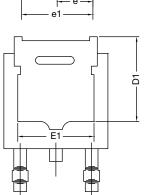
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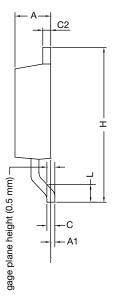
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## **TO-252AA CASE OUTLINE**







	MILLIMETERS		INC	HES		
DIM.	MIN.	MAX.	MIN.	MAX.		
Α	2.18	2.38	0.086	0.094		
A1	-	0.127	-	0.005		
b	0.64	0.88	0.025	0.035		
b2	0.76	1.14	0.030	0.045		
b3	4.95	5.46	0.195	0.215		
С	0.46	0.61	0.018	0.024		
C2	0.46	0.89	0.018	0.035		
D	5.97	6.22	0.235	0.245		
D1	5.21	-	0.205	-		
Е	6.35	6.73	0.250	0.265		
E1	4.32	=	0.170	-		
Н	9.40	10.41	0.370	0.410		
е	2.28	BSC 0.090 BS		2.28 BSC 0.090 BSC		BSC
e1	4.56 BSC		0.180 BSC			
L	1.40	1.78	0.055	0.070		
L3	0.89	1.27	0.035	0.050		
L4	-	1.02	-	0.040		
L5	1.14	1.52	0.045	0.060		
ECN: X12-0247-Rev. M, 24-Dec-12						

ECN: X12-0247-Rev. M, 24-Dec-12 DWG: 5347

#### Note

• Dimension L3 is for reference only.

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