

## FR1205N-VB Datasheet N-Channel 60-V (D-S) MOSFET

PRODUCT	SUMMARY	
V <sub>DS</sub> (V)	r <sub>DS(on)</sub> (Ω)	I <sub>D</sub> (A) <sup>a</sup>
60	0.025 at V <sub>GS</sub> = 10 V	45
00	0.030 at V <sub>GS</sub> = 4.5 V	40

#### FEATURES

- Trench Power MOSFET
- 175 °C Junction Temperature





Drain Connected to Tab



N-Channel MOSFET

ABSOLUTE MAXIMUM RATINGS $T_{C} = 2$	25 °C, unless othe	rwise noted			
Parameter		Symbol	Limit	Unit	
Gate-Source Voltage	V <sub>GS</sub>	± 20	V		
Continuous Drain Current (T 175 °C)	T <sub>C</sub> = 25 °C	1-	45		
Continuous Drain Current (T <sub>J</sub> = 175 °C) <sup>b</sup>	T <sub>C</sub> = 100 °C	I <sub>D</sub>	35		
Pulsed Drain Current		I <sub>DM</sub>	100	А	
Continuous Source Current (Diode Conduction)		۱ <sub>S</sub>	23		
Avalanche Current		I <sub>AS</sub>	20		
Single Avalanche Energy (Duty Cycle $\leq$ 1 %)	L = 0.1 mH	E <sub>AS</sub>	20	mJ	
Maximum Dawar Dissinction	T <sub>C</sub> = 25 °C	P.	100	w	
Maximum Power Dissipation	T <sub>A</sub> = 25 °C	P <sub>D</sub>	3 <sup>a</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>	18	22	
Maximum Junction-to-Ambient*	Steady State	''thJA	40	50	°C/W
Maximum Junction-to-Case		R <sub>thJC</sub>	3.2	4	

Notes:

a. Surface Mounted on 1" x 1" FR4 board, t  $\leq$  10 sec.

<b>SPECIFICATIONS</b> $T_J = 25$	°C, unless o	otherwise noted					
Parameter	Symbol	Test Conditions	Min	Typ <sup>a</sup>	Max	Unit	
Static	<b>I</b>		1				
Drain-Source Breakdown Voltage	V <sub>(BR)DSS</sub>	$V_{GS} = 0 V, I_D = 250 \mu A$	60			v	
Gate Threshold Voltage	V <sub>GS(th)</sub>	$V_{DS} = V_{GS}, I_D = 250 \ \mu A$	1.0	2.0	3.0	v	
Gate-Body Leakage	I <sub>GSS</sub>	$V_{DS} = 0 V, V_{GS} = \pm 20 V$			± 100	nA	
		$V_{DS} = 60 \text{ V}, V_{GS} = 0 \text{ V}$			1		
Zero Gate Voltage Drain Current	I <sub>DSS</sub>	$V_{DS} = 60 \text{ V}, \text{ V}_{GS} = 0 \text{ V}, \text{ T}_{J} = 125 ^{\circ}\text{C}$			50	μΑ	
		$V_{DS} = 60 \text{ V}, \text{ V}_{GS} = 0 \text{ V}, \text{ T}_{J} = 175 ^{\circ}\text{C}$			250		
On-State Drain Current <sup>b</sup>	I <sub>D(on)</sub>	V <sub>DS</sub> = 5 V, V <sub>GS</sub> = 10 V	50			А	
		V <sub>GS</sub> = 10 V, I <sub>D</sub> = 15 A		0.025		1	
	r	$V_{GS}$ = 10 V, I <sub>D</sub> = 15 A, T <sub>J</sub> = 125 °C		0.055		Ω S	
Drain-Source On-State Resistance <sup>b</sup>	r <sub>DS(on)</sub>	$V_{GS}$ = 10 V, I <sub>D</sub> = 15 A, T <sub>J</sub> = 175 °C		0.069		12	
		$V_{GS} = 4.5 \text{ V}, \text{ I}_{D} = 10 \text{ A}$		0.030			
Forward Transconductance <sup>b</sup>	9 <sub>fs</sub>	V <sub>DS</sub> = 15 V, I <sub>D</sub> = 15 A		20		S	
Dynamic <sup>a</sup>							
Input Capacitance	C <sub>iss</sub>			1500			
Output Capacitance	C <sub>oss</sub>	$V_{GS}$ = 0 V, $V_{DS}$ = 25 V, f = 1 MHz		140		pF	
Reverse Transfer Capacitance	C <sub>rss</sub>			60		-	
Total Gate Charge <sup>c</sup>	Qg			11	17		
Gate-Source Charge <sup>c</sup>	Q <sub>gs</sub>	$V_{DS} = 30 \text{ V}, V_{GS} = 10 \text{ V}, I_D = 23 \text{ A}$		3		nC	
Gate-Drain Charge <sup>c</sup>	Q <sub>gd</sub>			3		1	
Turn-On Delay Time <sup>c</sup>	t <sub>d(on)</sub>			8	15		
Rise Time <sup>c</sup>	t <sub>r</sub>	$V_{DD}$ = 30 V, $R_L$ = 1.3 $\Omega$		15	25	20	
Turn-Off Delay Time <sup>c</sup>	t <sub>d(off)</sub>	$\text{I}_\text{D}\cong$ 23 A, $\text{V}_\text{GEN}$ = 10 V, $\text{R}_\text{g}$ = 2.5 $\Omega$		30	45	ns	
Fall Time <sup>c</sup>	t <sub>f</sub>			25	40		
Source-Drain Diode Ratings and Cha	aracteristics	(T <sub>C</sub> = 25 °C)		_			
Pulsed Current	I <sub>SM</sub>				50	А	
Diode Forward Voltage	$V_{SD}$	$I_{F} = 15 \text{ A}, V_{GS} = 0 \text{ V}$		1.0	1.5	V	
Reverse Recovery Time	t <sub>rr</sub>	I <sub>F</sub> = 15 A, di/dt = 100 A/μs		30	60	ns	

Notes:

a. For design aid only; not subject to production testing.

b. Pulse test; pulse width  $\leq$  300 µs, duty cycle  $\leq$  2 %.

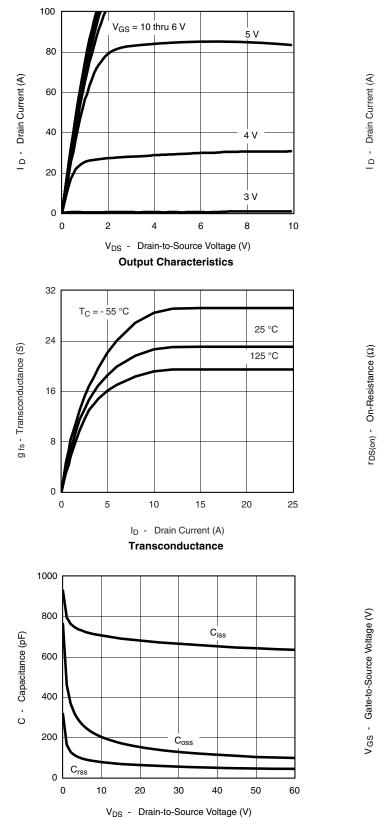
c. Independent of operating temperature.

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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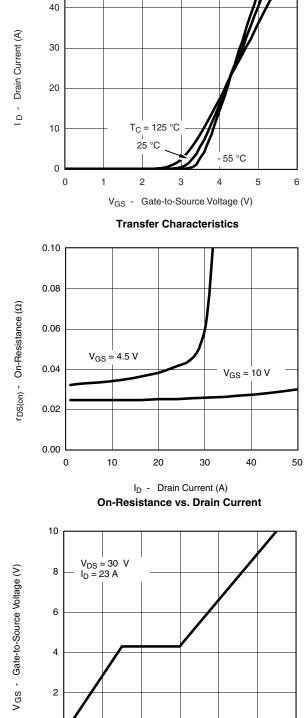
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Capacitance

#### TYPICAL CHARACTERISTICS 25 °C unless noted

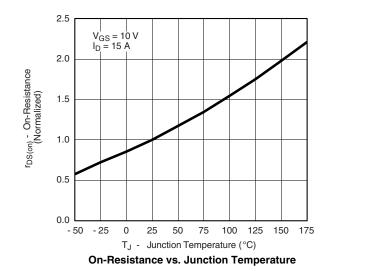


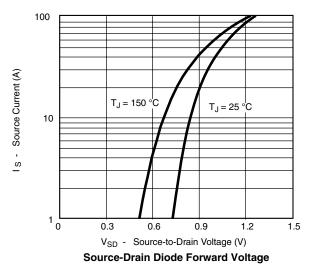
Qg - Total Gate Charge (nC)

Gate Charge



#### TYPICAL CHARACTERISTICS 25 °C unless noted





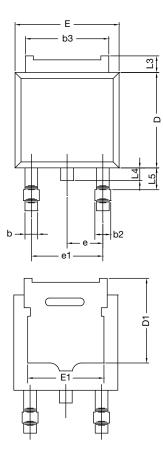


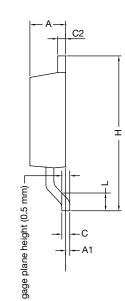
#### **THERMAL RATINGS**





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





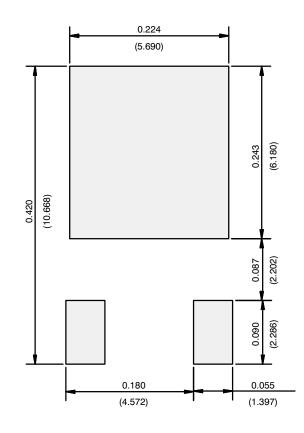
	MILLIN	IETERS	INC	INCHES		
DIM.	MIN.	MAX.	MIN.	MAX.		
А	2.18	2.38	0.086	0.094		
A1	-	0.127	-	0.005		
b	0.64	0.88	0.025	0.035		
b2	0.76	1.14	0.030	0.045		
b3	4.95	5.46	0.195	0.215		
С	0.46	0.61	0.018	0.024		
C2	0.46	0.89	0.018	0.035		
D	5.97	6.22	0.235	0.245		
D1	5.21	-	0.205	-		
E	6.35	6.73	0.250	0.265		
E1	4.32	-	0.170	-		
Н	9.40	10.41	0.370	0.410		
е	2.28 BSC		0.090 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 DWG: 534	-0247-Rev. M, 7	24-Dec-12				

Note

• Dimension L3 is for reference only.



### RECOMMENDED MINIMUM PADS FOR DPAK (TO-252)



Recommended Minimum Pads Dimensions in Inches/(mm)



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