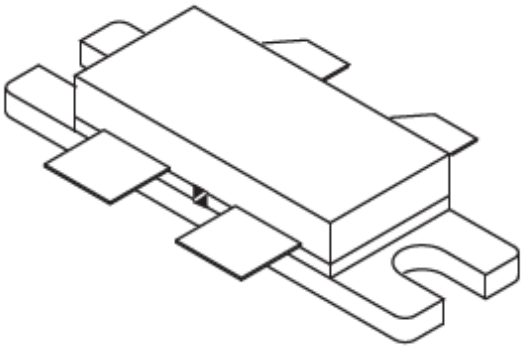
VRF141G

28 V, 300 W, 175 MHz Dual RF Power MOSFET

Product Overview

The VRF141G is designed for broadband commercial and military applications at frequencies to 175 MHz. The high power, high gain, and broadband performance of this device make possible solid state transmitters for FM broadcast or TV channel frequency bands.



Features

- Improved ruggedness $V_{(BR)DSS}$ = 80 V
- 300 W with 14 dB typical gain at 175 MHz, 28 V
- Excellent stability and low IMD
- Common source push-pull configuration
- 5:1 load VSWR capability at specified operating conditions
- Nitride passivated
- Refractory gold metallization
- High voltage replacement for MRF141G
- RoHS compliant

1. Device Specifications

This section shows the specifications of the VRF141G device.

1.1 Absolute Maximum Ratings

The following table shows the absolute maximum ratings of the VRF141G device. T_C = 25 °C unless otherwise specified.

Table 1-1. Absolute Maximum Ratings

Symbol	Parameter	Ratings	Unit
V_{DSS}	Drain source voltage	80	V
I_D	Continuous drain current	40	A
V_{GS}	Gate-source voltage	±40	V
P_D	Total power dissipation	500	W
T_{STG}	Storage temperature range	–65 to 150	°C
T_J	Operating junction temperature	200	

1.2 Electrical Performance

The following table shows the static characteristics of the VRF141G device. T_C = 25 °C unless otherwise specified.

Table 1-2. Static Characteristics

Symbol	Characteristic	Test Conditions	Min	Typ	Max	Unit
$V_{(BR)DSS}$	Drain-source breakdown voltage	V_{GS} = 0 V, I_D = 100 mA	80	90		V
$V_{DS(ON)}$	On-state drain voltage	$I_{D(ON)}$ = 10 A, V_{GS} = 10 V		1.0	1.4	
I_{DSS}	Zero gate voltage drain current	V_{DS} = 60 V, V_{GS} = 0 V			1.0	mA
I_{GSS}	Gate-source leakage current	V_{DS} = ±20 V, V_{DS} = 0 V			1.0	µA
g_{fs}	Forward transconductance	V_{DS} = 10 V, I_D = 5 A	5.0			mhos
$V_{GS(th)}$	Gate-source threshold voltage	V_{DS} = 10 V, I_D = 100 mA	2.9	3.6	4.4	V

The following table shows the thermal characteristics of the VRF141G device.

Table 1-3. Thermal Characteristics

Symbol	Characteristic	Min	Typ	Max	Unit
$R_{\theta JC}$	Junction-to-case thermal resistance			0.35	°C/W

Note: These devices are sensitive to electrostatic discharge. Proper handling procedures should be followed.

The following table shows the dynamic characteristics of the VRF141G device. T_C = 25 °C unless otherwise specified.

Table 1-4. Dynamic Characteristics

Symbol	Characteristic	Test Conditions	Min	Typ	Max	Unit
C_{iss}	Input capacitance	V_{GS} = 0 V, V_{DS} = 28 V, f = 1 MHz		400		pF
C_{oss}	Output capacitance			375		
C_{rss}	Reverse transfer capacitance			50		

The following table shows the functional characteristics of the VRF141G device. T_C = 25 °C unless otherwise specified.

Table 1-5. Functional Characteristics

Symbol	Test Conditions	Min	Typ	Max	Unit
G_{PS}	f_1 = 175 MHz, V_{DD} = 28 V, I_{DQ} = 500 mA, P_{out} = 300 W	12	14		dB
η_D	f_1 = 175 MHz, V_{DD} = 28 V, I_{DQ} = 500 mA, P_{out} = 300 W	45	55		%
Ψ	f_1 = 175 MHz, V_{DD} = 28 V, I_{DQ} = 500 mA, P_{out} = 300 W 5:1 VSWR — all phase angles	No degradation in output power			

1.3 Typical Performance Curves

This section shows the typical performance curves of the VRF141G device.

Figure 1-1. Output Characteristics

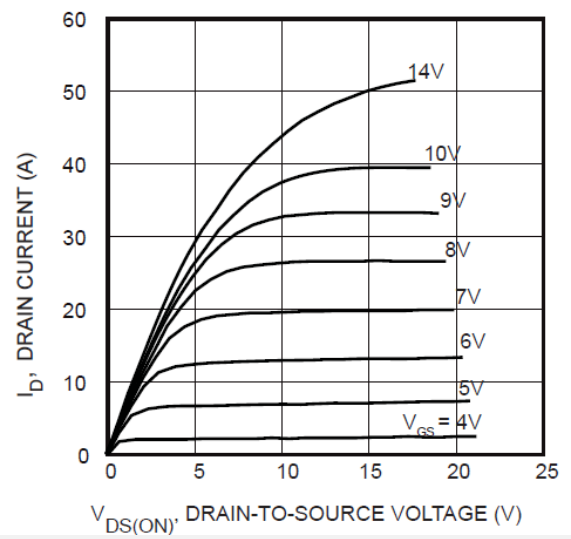


Figure 1-2. Transfer Characteristics

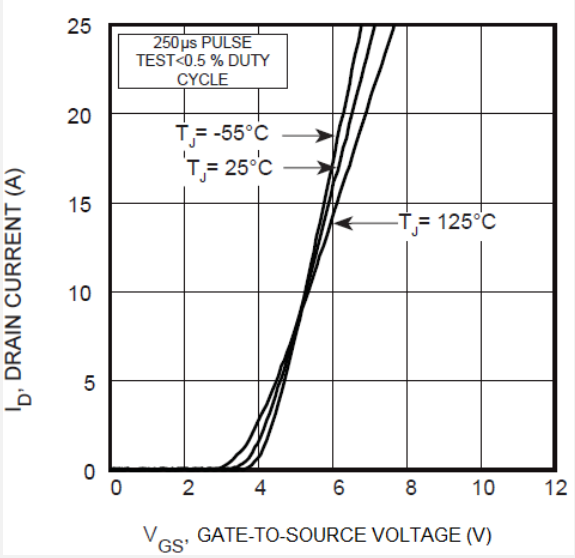


Figure 1-3. Capacitance vs. Drain-to-Source Voltage

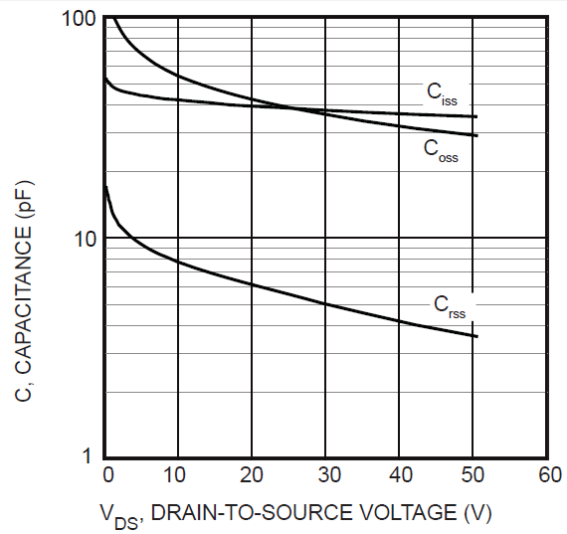


Figure 1-4. Forward Safe Operating Area

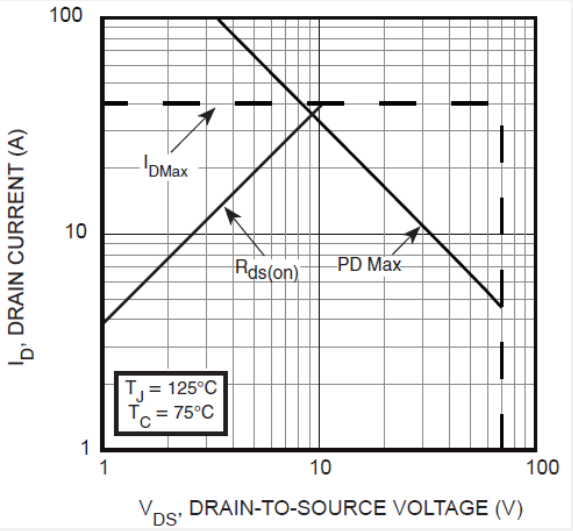
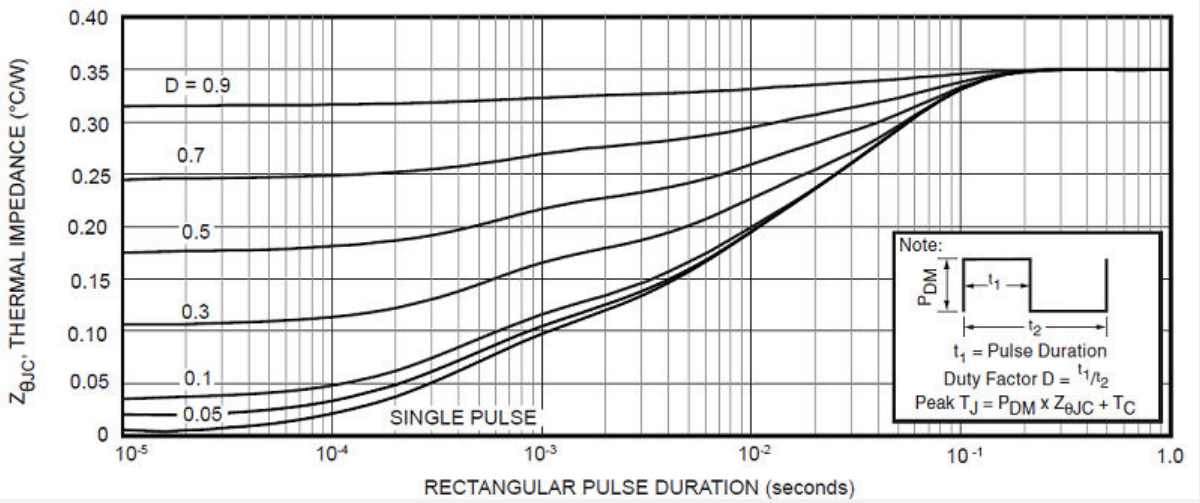


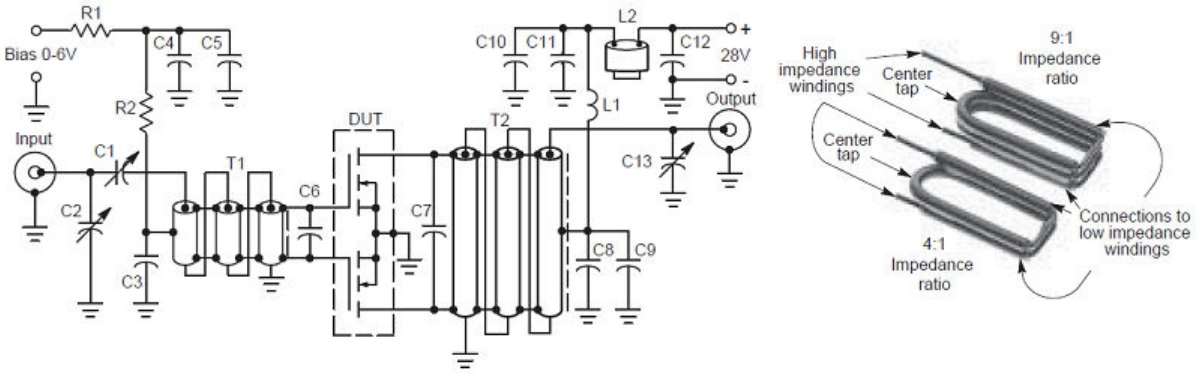
Figure 1-5. Maximum Effective Transient Thermal Impedance Junction-to-Case vs. Pulse Duration



2. Test Circuits

The following figure shows the test circuits of the VRF141G device.

Figure 2-1. 30 MHz Test Circuit



C1 - Arco 402, 1.5 ±20 pF
C2 - Arco 406, 15 ±115 pF
C3, C4, C8, C9, C10 - 1000 pF Chip
C5, C11 - 0.1 mF Chip
C6 - 330 pF Chip
C7 - 200 pF and 180 pF Chips in Parallel
C12 - 0.47 mF Ceramic Chip, Kemet 1215 or Equivalent
C13 - Arco 403, 3.0 ±35 pF
L1 - 10 T urns AWG #16 Enameled Wire, Close Wound, 1/4, I.D.
L2 - Ferrite Beads of Suitable Material for 1.5±2.0 mH Total Inductance
R1 - 100 Ohms, 1/2 W
R2 - 1.0 kOhm, 1/2 W

T1 - 9:1 RF Transformer. Can be made of 15±18 Ohms Semirigid Co-ax, 62 ±90 Mils O.D.
T2 - 1:9 RF Transformer . Can be made of 15±18 Ohms Semirigid Co-ax, 70 ±90 Mils O.D.

Board Material - 0.062 , Fiberglass (G10), 1 oz. Copper Clad, 2 Sides, ϵ_r = 5

NOTE: For stability, the input transformer T1 must be loaded with ferrite toroids or beads to increase the common mode inductance. For operation below 100 MHz. The same is required for the output transformer. See pictures for construction details.

Unless Otherwise Noted, All Chip Capacitors are ATC Type 100B or Equivalent.

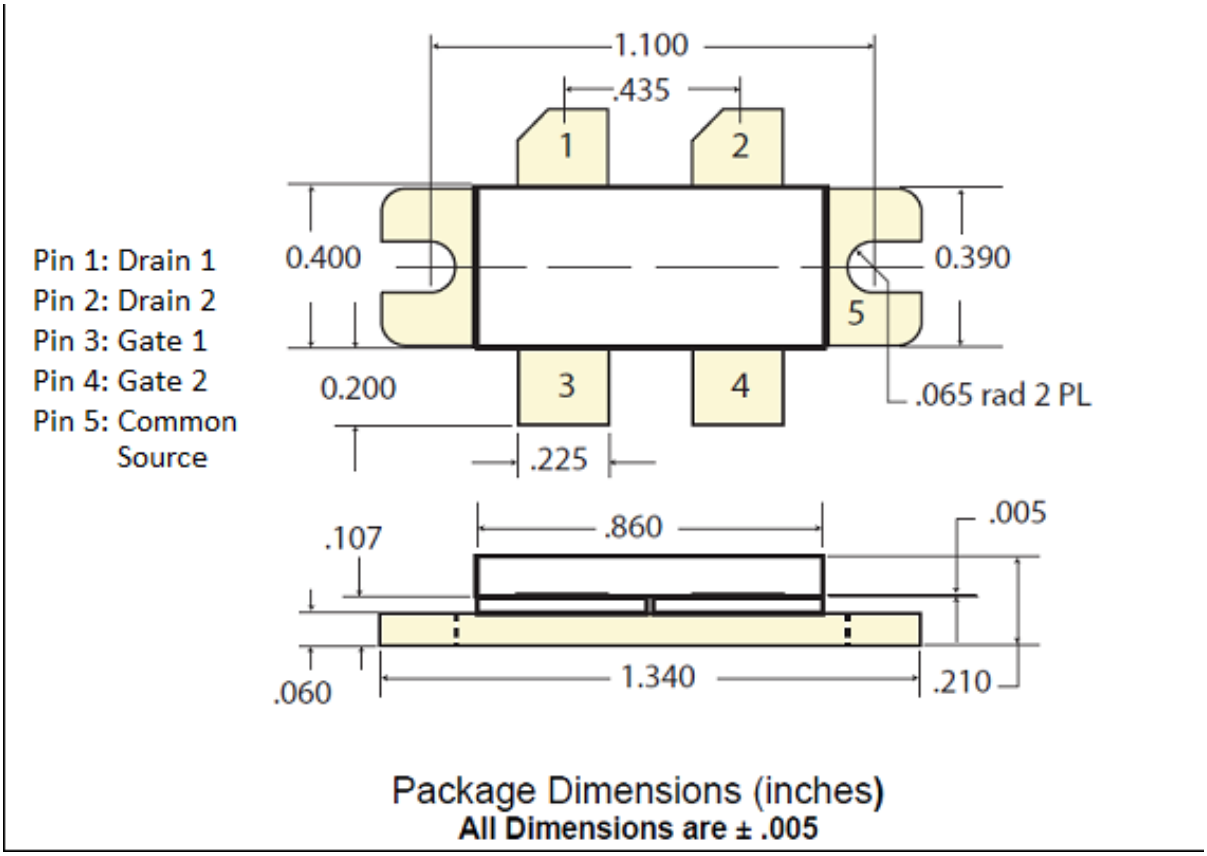
3. Package Specification

This section shows the package specification of the VRF141G device.

3.1 Package Outline Drawing

The following figure illustrates the package outline of the VRF141G device.

Figure 3-1. M208 Package Outline



Note: Hazardous Material Warning!

The ceramic portion of the device between leads and mounting flange is beryllium oxide. Beryllium oxide dust is highly toxic when inhaled. Care must be take during handling and mounting to avoid damage to this area. These devices must never be thrown away with general industrial or domestic waste.

4. Revision History

Table 4-1. Revision History

Revision	Date	Description
A	12/2021	• Document migrated from Microsemi template to Microchip template; Assigned Microchip literature number DS-00004328A,which replaces the previous Microsemi literature number 050-4953. • Increased $V_{DS(on)}$ limit from 1.3V max. to 1.4V max.
Initial releases (Microsemi Revisions A and B)	06/2009 – 12/2020	Previous releases.

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