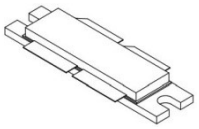
SQ141K0VP GaN TRANSISTOR

Document Number: SQ141K0VP
Preliminary Datasheet V1.1

960-1215MHz, 1000W, GaN RF Power Transistor

SQ141K0VP



Description

The SQ141K0VP is a 1000-watt, high performance, internally matched GaN RF Power transistor, designed for multiple applications with frequencies from 960 to 1400MHz.

It is featured for high power and high ruggedness, suitable for Industrial, Scientific and Medical application, as well as Avionics application, L band pulse amplifier.

It is recommended to use this device under pulse condition only.

Supported by high breakdown voltage, it is also usable at higher voltage up to 65V, with higher output power.

•Typical **short pulse** Performance (On Innogration fixture with device soldered):

V_{DD} = 50 Volts, I_{DQ} = 100 mA, Pulse CW, Pulse width=20us, Duty cycle=10%.

Freq(MHz)	Pin(dBm)	Psat(dBm)	Psat(W)	IDS(A)	Gain(dB)	Eff(%)
960	45	60.72	1180.32	4.61	15.72	51.21
1000	44.9	60.38	1091.44	4.19	15.48	52.10
1050	44.5	60.75	1188.50	4.24	16.25	56.06
1100	44.2	60.69	1172.20	4.05	16.49	57.89
1150	44.59	61	1258.93	4.26	16.41	59.10
1225	44.68	60.27	1064.14	3.69	15.59	57.68

Typical **long pulse** Performance (On Innogration fixture with device soldered):

V_{DD} = 50 Volts, I_{DQ} = 100 mA, Pulse CW, Pulse width=300us, Duty cycle=30%

Freq(MHz)	Pin(dBm)	Psat(dBm)	Psat(W)	IDS(A)	Gain(dB)	Eff(%)
960	45.1	60.2	1047.13	13.31	15.1	47.20
1000	44.46	60.04	1009.25	12	15.58	50.46
1050	44	60.4	1096.48	12.14	16.4	54.19
1100	44	60.3	1071.52	11.74	16.3	54.76
1150	44.6	60.64	1158.78	12.21	16.04	56.94
1225	45.1	60.1	1023.29	11.08	15	55.41

Applications and Features

- Suitable for L band pulse amplifier, wideband amplifier, EMC testing, ISM etc.
- High Efficiency and Linear Gain Operations
- Thermally Enhanced Industry Standard Package
- High Reliability Metallization Process
- Excellent thermal Stability and Excellent Ruggedness
- Compliant to Restriction of Hazardous Substances (RoHS) Directive 2002/95/EC

Important Note: Proper Biasing Sequence for GaN HEMT Transistors

Turning the device ON

1. Set VGS to the pinch--off (VP) voltage, typically –5 V
2. Turn on VDS to nominal supply voltage (50V)
3. Increase VGS until IDS current is attained
4. Apply RF input power to desired level

Turning the device OFF

1. Turn RF power off
2. Reduce VGS down to VP, typically –5 V
3. Reduce VDS down to 0 V
4. Turn off VGS

Table 1. Maximum Ratings

Rating	Symbol	Value	Unit
Drain--Source Voltage	V_{DSS}	+200	Vdc
Gate--Source Voltage	V_{GS}	-8 to 0	Vdc
Operating Voltage	V_{DD}	0 to 60	Vdc
Maximum forward gate current	Igf	158.4	mA
Storage Temperature Range	Tstg	-65 to +150	C
Case Operating Temperature	T_C	-55 to +150	C
Operating Junction Temperature	T_J	+225	C

Table 2. Thermal Characteristics

Characteristic	Symbol	Value	Unit
Thermal Resistance, Junction to Case 85 °C Case backside Temperature Pdiss = 500 W, Pulse: 20 us PW, 10% DC	$R_{\theta JC}$	0.12	C/W

Table 3. Electrical Characteristics (T_C = 25℃ unless otherwise noted)

DC Characteristics

Characteristic	Conditions	Symbol	Min	Typ	Max	Unit
Drain-Source Breakdown Voltage	V_{GS}=-8V; I_{DS}=158.4mA	V_{DSS}		200		V
Gate Threshold Voltage	V_{DS} = 50V, I_D = 158.4mA	V_{GS}(th)	-4		-2	V
Gate Quiescent Voltage	V_{DS} =50V, I_{DS}=100mA, Measured in Functional Test	$V_{GS(Q)}$		-3.37		V

Functional Tests (In Innogration broadband Test Fixture, 50 ohm system) : V_{DD} = 50 Vdc, I_{DQ} = 100 mA, f = 1100 MHz, Pulse CW

Characteristic	Symbol	Min	Typ	Max	Unit
Power Gain @ P3dB	Gp		16		dB
Drain Efficiency@P3dB$_t$	Eff		59		%
3dB Compressed point	P3dB	1000	1150		W
Input Return Loss	IRL		-7		dB
Mismatch stress at all phases(No device damage)	VSWR		10:1		Ψ

Reference Circuit of Test Fixture Assembly Diagram

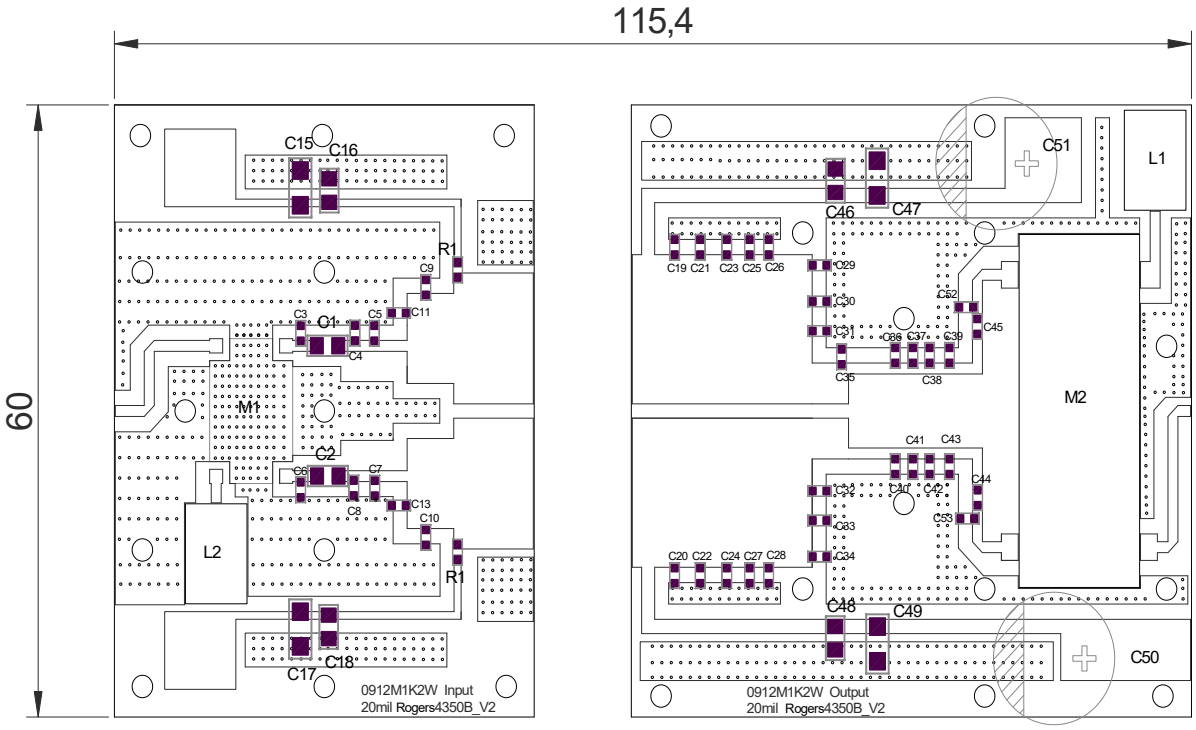


Figure 1. Test Circuit Component Layout

Table 5. Test Circuit Component Designations and Values

Component	Description	Suggested Manufacturer
C1,C2	10pF	ATC600F
C4,C8, C11, C12,C13,C14,C19,C20	3.9pF	ATC600F
C21,C22,C25,C26,C27,C28,C29,C30,C31,C32,C33,C34	2pF	ATC600F
C3,C5,C6,C7, C9,C10,C23,C24,C35,C36, C37,C38,C39,C40,C41,C42,C43,C53	1pF	ATC600F
C52	0.5pF	ATC600F
C16,C18, C45,C44,C46,C48	47pF	ATC800B
C15,C17, C47,C49	Ceramic multilayer capacitor, 10uF, 100V	10uF/100V
C50, C51	1000uF	63V/2200uF
R1,R2	Chip Resistor,10Ω,0603	
M1	HLD-T0129-3	HALOX
M2	HLD-F0129-3.	HALOX
L1,L2	50Ω,100w	
PCB	20mil thick, εr=3.48, Rogers RO4350B, 1 oz. copper	

TYPICAL CHARACTERISTICS

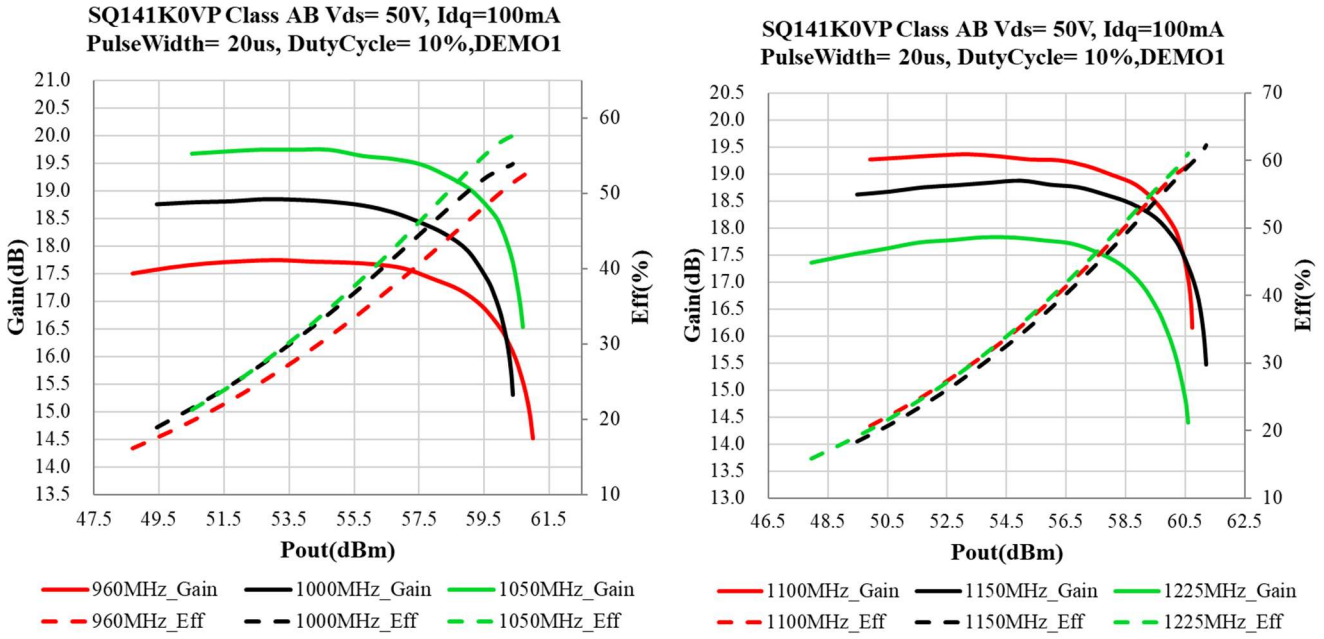


Figure 2. Power Gain and Drain Efficiency as Function of Pulse Output Power（960-1215MHz）

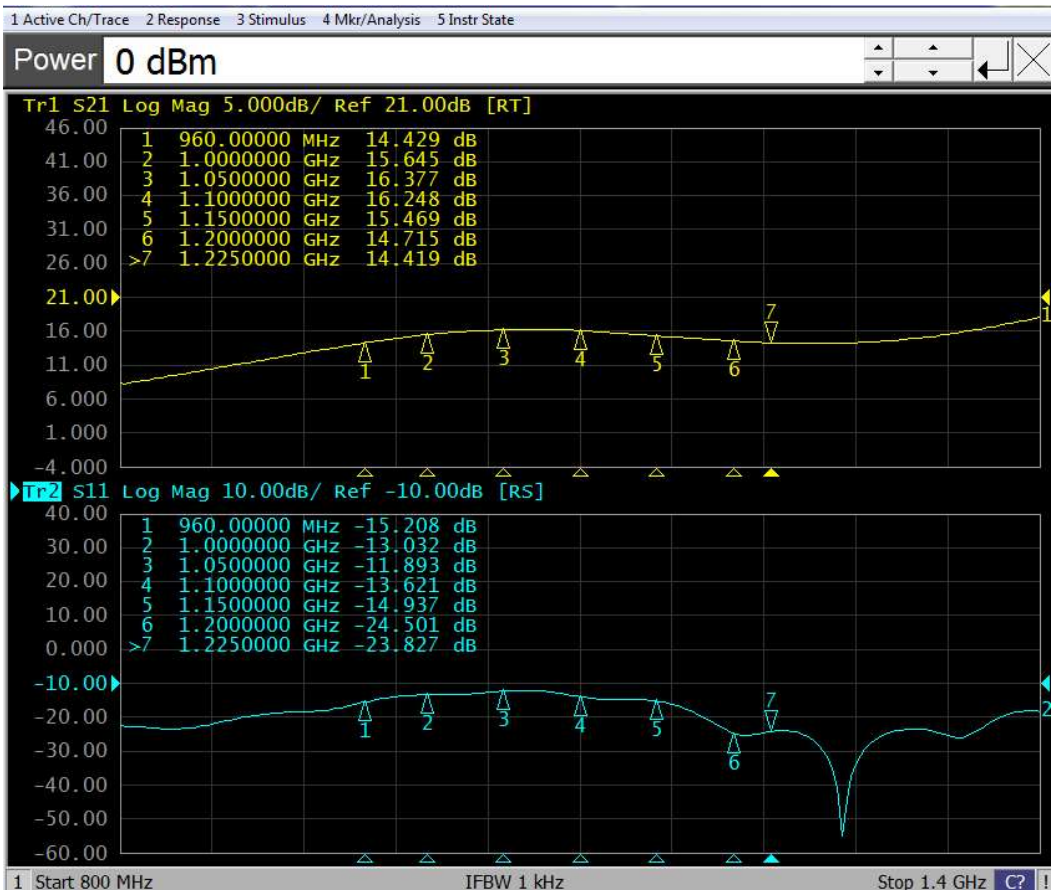
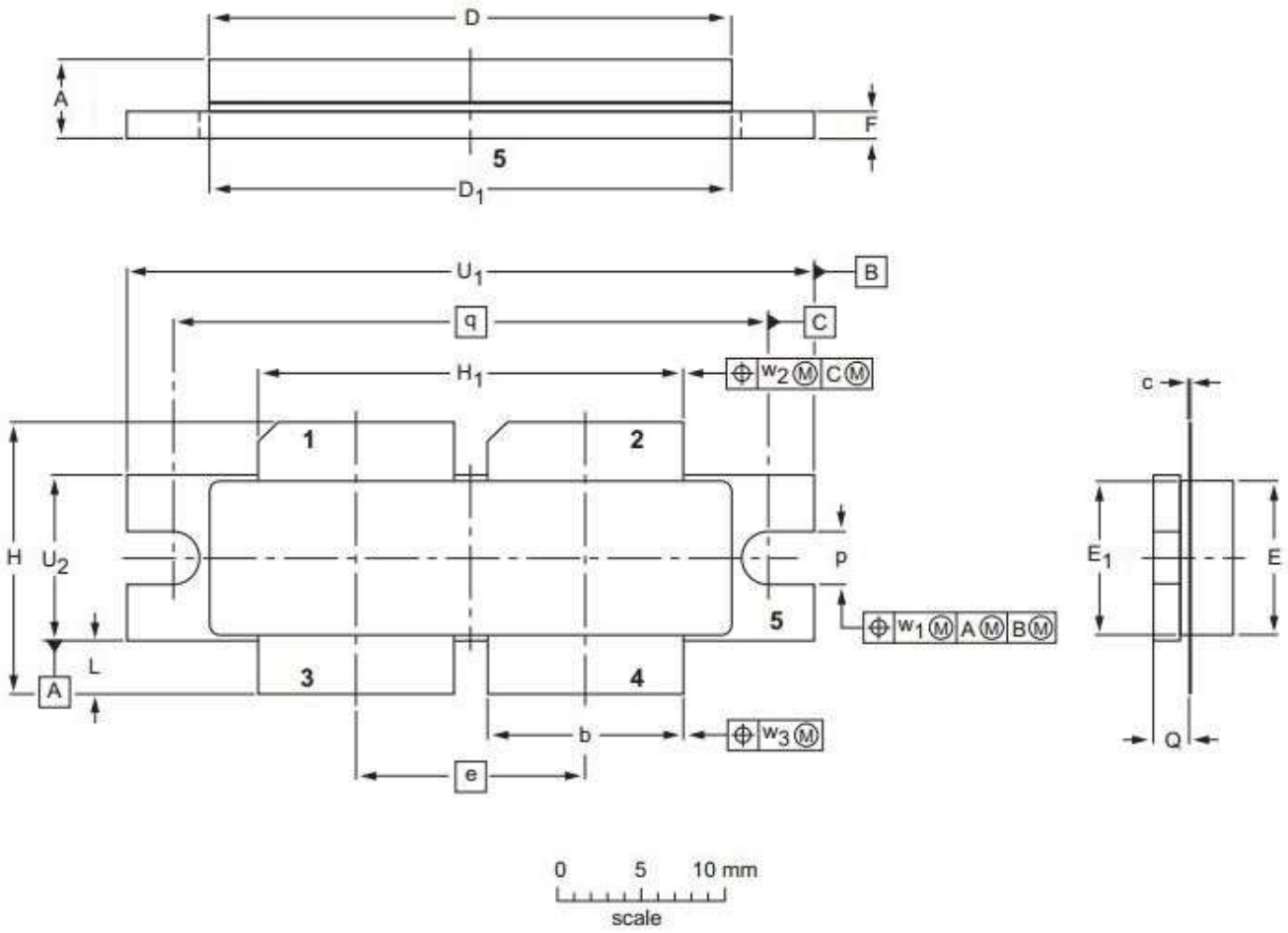


Figure 3. Network analyzer output S11/S21

Package Outline

Flanged ceramic package; 2 mounting holes; 4 leads（1、2—DRAIN、3、4—GATE、5—SOURCE）



UNIT	A	b	c	D	D_1	e	E	E_1	F	H	H_1	L	p	Q	q	U_1	U_2	W_1	W_2	W_2
Mm	4.7 4.2	11.81 11.56	0.18 0.10	31.55 30.94	31.52 30.96	13.72	9.50 9.30	9.53 9.27	1.75 1.50	17.12 16.10	25.53 25.27	3.48 2.97	3.30 3.05	2.26 2.01	35.56	41.28 41.02	10.29 10.03	0.25	0.51	0.25
Inches	0.185 0.165	0.465 0.455	0.007 0.004	1.242 1.218	1.241 1.219	0.540	0.374 0.366	0.375 0.365	0.069 0.059	0.674 0.634	1.005 0.995	0.137 0.117	0.130 0.120	0.089 0.079	1.400	1.625 1.615	0.405 0.395	0.01	0.02	0.01

OUTLINE VERSION	REFERENCE			EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	JEITA		
PKG-D4E					03/12/2013

Revision history

Table 6. Document revision history

Date	Revision	Datasheet Status
2020/8/18	Rev 1.0	Preliminary Datasheet
2021/3/6	Rev 1.1	Correct part type of M2 in BOM

Application data based on YGH-20-23

Disclaimers