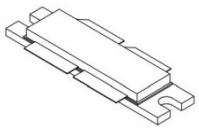
MQ012K0VPX LDMOS TRANSISTOR

Document Number: MQ012K0VPX
Preliminary Datasheet V1.9

2000W, 50V High Power RF LDMOS FETs

MQ012K0VPX



Description

The MQ012K0VPX is a 2000W capable, highly rugged, unmatched LDMOS FET, designed for commercial and industrial applications with frequencies HF to 150MHz.

It is featured for industry leading high power and high ruggedness, suitable for Industrial, Scientific and Medical application, as well as HF communication, VHF TV and Aerospace applications.

- Application data at multiple frequencies

Freq(MHz)	Voltage(V)	Signal type	Pin(dBm)	Pout(W)	Power Gain(dB)	Eff(%)
88-108	50	CW	43.5	1500	18	82
108	50	100us, 10%	43	2300	20.5	82
	50	800us,80%	44.3	2200	19.2	80
81	50	CW	40.5	1750	22	83
128	50	100us,10%	45	2100	18.3	74
40	50	CW	43	1850	19	76
27	50	CW	42.5	1750	20	76
13.56	50	CW	37	2050	26	76
2	50	CW	36	2000	27	75
0.4	50	CW	40	1400	22	82
0.4-10	28/36	CW	30	400/600	26/28	71
2-10	50	CW	40	1400	22	80

Features

- High breakdown voltage enable possible class E operation at lower Vdd
- High Efficiency and Linear Gain Operations
- On chip RC network enable high stability and ruggedness
- Integrated ESD Protection
- Large Positive and Negative Gate/Source Voltage Range for Improved Class C Operation
- Excellent thermal stability, low HCI drift
- Compliant to Restriction of Hazardous Substances (RoHS) Directive 2002/95/EC

Table 1. Maximum Ratings

Rating	Symbol	Value	Unit
Drain—Source Voltage	V_{DSS}	140	Vdc
Gate—Source Voltage	V_{GS}	-10 to +10	Vdc
Operating Voltage	V_{DD}	+55	Vdc
Storage Temperature Range	Tstg	-65 to +150	°C
Case Operating Temperature	T_C	+150	°C
Operating Junction Temperature	T_J	+225	°C

Table 2. Thermal Characteristics

Characteristic	Symbol	Value	Unit
Thermal Resistance, Junction to Case ,Case Temperature 85°C, 2000W CW, 50 Vdc, I_{DQ} = 240 mA	$R_{\theta JC}$	0.1	°C/W

Transient thermal impedance from junction to case Tj = 150° C; tp = 100 us; Duty cycle = 20 %	Zth	0.015	°C/W

Table 3. ESD Protection Characteristics

Test Methodology	Class
Human Body Model (per JESD22—A114)	Class 2

Table 4. Electrical Characteristics (TA = 25 ℃ unless otherwise noted)

Characteristic	Symbol	Min	Typ	Max	Unit
DC Characteristics					
Drain-Source Voltage V_{GS}=0V, I_{DS}=1.0Ma	$V_{(BR)DSS}$		140		V
Zero Gate Voltage Drain Leakage Current (V_{DS} = 50V, V_{GS} = 0 V)	I_{DSS}	——	——	1	μA
Gate—Source Leakage Current (V_{GS} = 10 V, V_{DS} = 0 V)	I_{GSS}	——	——	1	μA
Gate Threshold Voltage (V_{DS} = 50V, I_D = 600 μA)	$V_{GS(th)}$	——	2.54	——	V
Gate Quiescent Voltage (V_{DD} = 50 V, I_D = 240 Ma, Measured in Functional Test)	$V_{GS(Q)}$	——	3	——	V
Drain source on state resistance (V_{DS} = 0.1V, V_{GS} = 10 V) Each section side of device measured	Rds(on)		60		mΩ
Common Source Input Capacitance (V_{GS} = 0V, V_{DS} =50 V, f = 1 MHz) Each section side of device measured	C_{ISS}		930		pF
Common Source Output Capacitance (V_{GS} = 0V, V_{DS} =50 V, f = 1 MHz) Each section side of device measured	C_{OSS}		195		pF
Common Source Feedback Capacitance (V_{GS} = 0V, V_{DS} =50 V, f = 1 MHz) Each section side of device measured	C_{RSS}		4.2		pF

TYPICAL CHARACTERISTICS (108MHz)

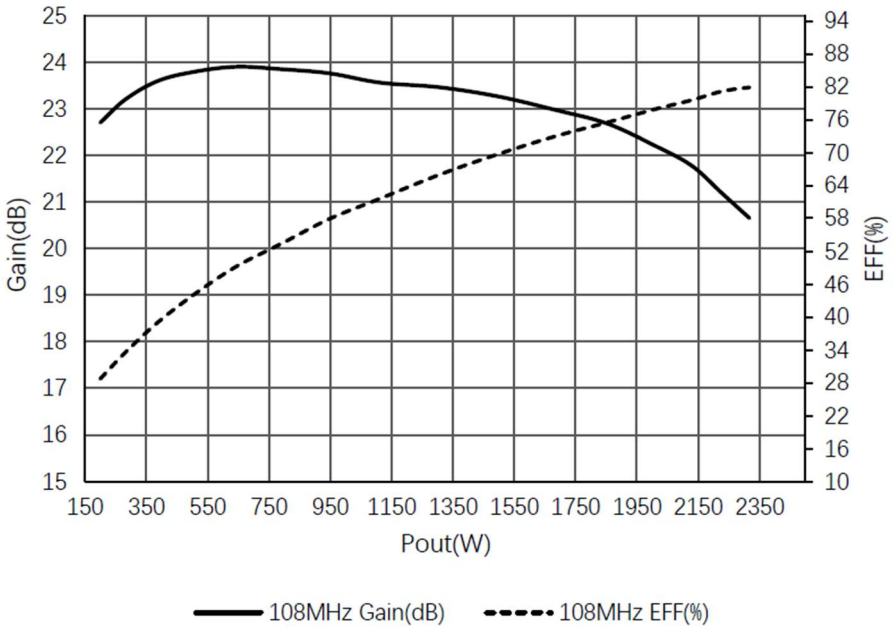


Figure 1: Efficiency and power gain as the function of Pout (Vds=50V, Idq=240Ma,10% duty cycle,100us)

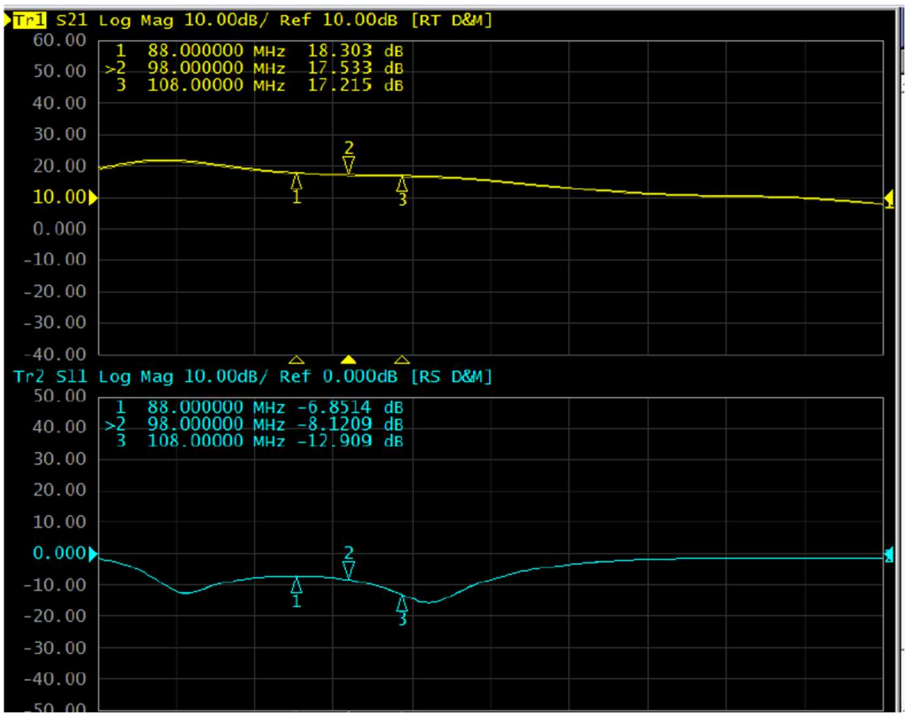
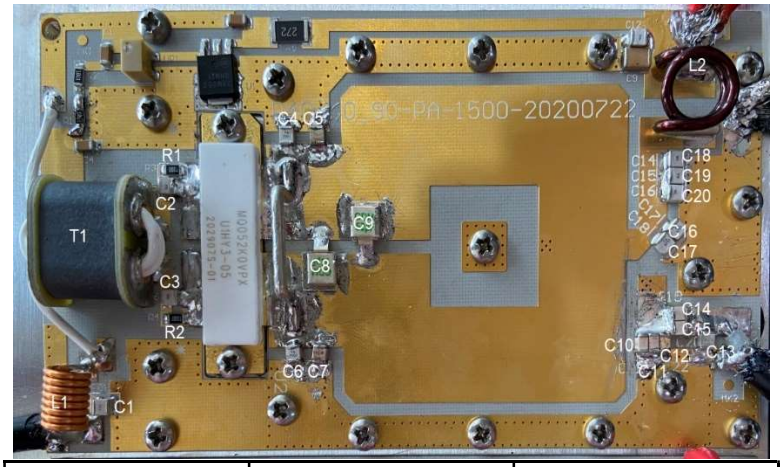
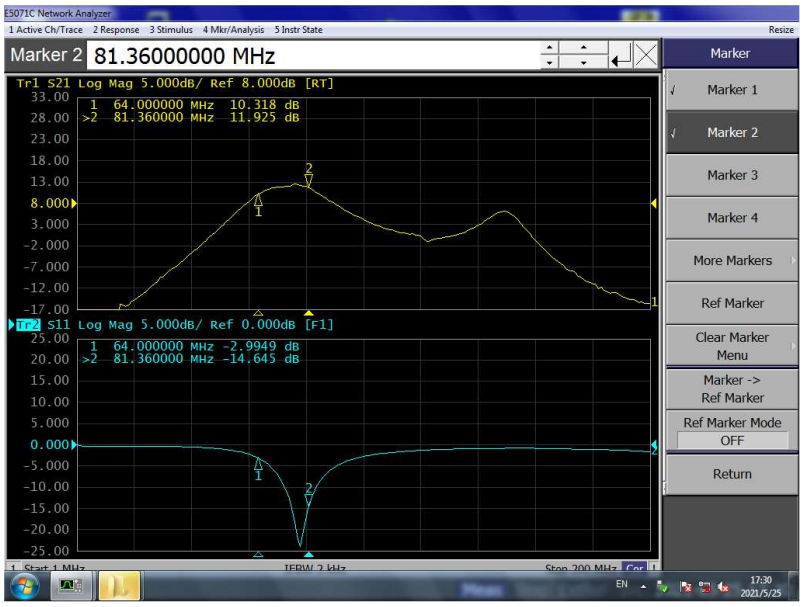


Figure 2: Network analyzer output, S11/S21 (Vds=50V,Idq=1000Ma, Vgs=3.3V)

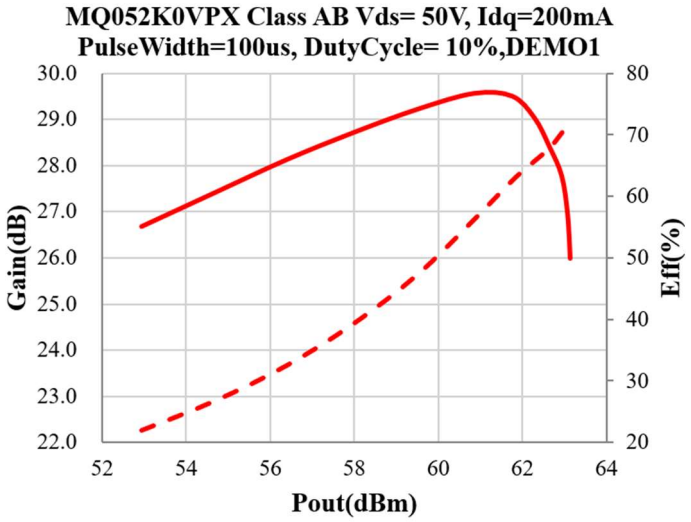
TYPICAL CHARACTERISTICS (81MHz)

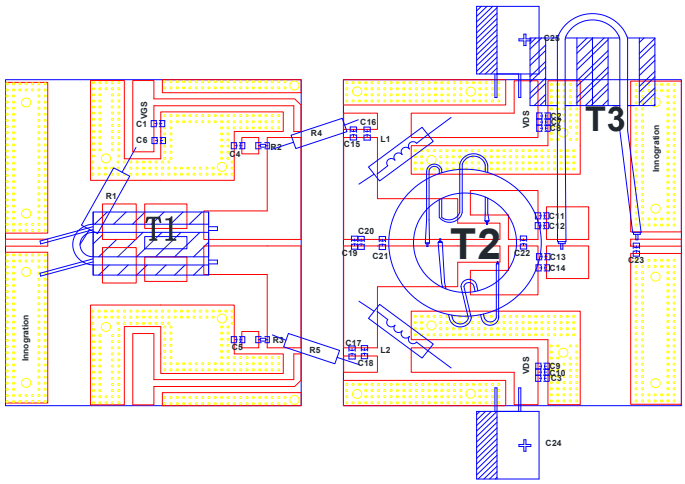


Part	description	Model
C1	10PF	ATC800B
C2,C3,C18,C19,C20	1000PF	ATC800B
C4,C6	20PF	ATC800B
C5,C7	12PF	ATC800B
C8	91PF	MIN02-002EC910J-F
C9	62PF	MIN02-002EC620J-F
C10	1.5PF	DLC70B
C11,C12	5.6PF	DLC70B
C13	2PF	DLC70B
C14,C15,C16,C17	470PF	DLC70B
R1,R2	100Ω	1206
L1	5turns,D=5mm	d=1mm
L2	2turns,D=8.6mm	d2=1mm
T1	9:1	



TYPICAL CHARACTERISTICS (13.56MHz)

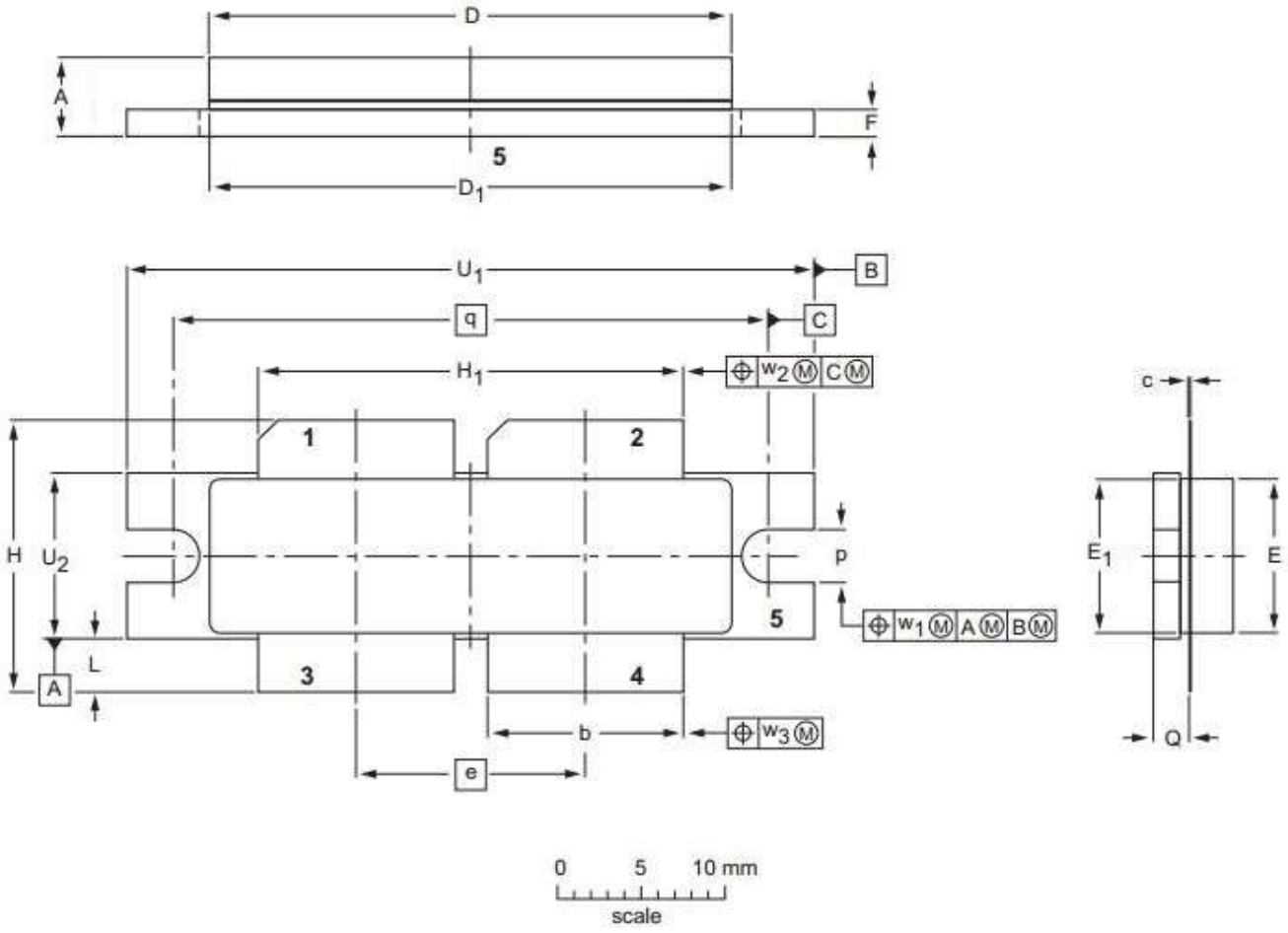




Part	description	Model
C1,C2,C3,C4,C5	10Uf/100V	Ceramic multilayer capacitor
C6~C18	10Nf	Ceramic multilayer capacitor
C19,C20,C21	200Pf	ATC800B
C22	30Pf	ATC800B
C23,C24	4700Uf/63V	Electrolytic Capacitor
R1	135Ω	Plug-in electric resistance
R2,R3	51Ω	Chip Resistor
R4,R5	200Ω	
T1	4:1	BN-43-3312
T2	12.5ohm/450mm	FT-50-43
T3	25ohm/300mm	RF-800-1708
L1，L2	29turns,D=5mm	DIY air core inductance
PCB	0.762mm [0.030"] thick, εr=3.50, Rogers 4350B, 1 oz. copper	

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 5. Document revision history

Date	Revision	Datasheet Status
2020/4/17	Rev 1.0	Objective Datasheet
2020/4/21	Rev 1.0	Preliminary Datasheet
2021/6/17	Rev 1.1	Add 81/128MHz app data
2021/8/10	Rev 1.2	Add 27/40/13.56MHz app data
2021/11/5	Rev 1.3	Finalized as MQ012K0VPX to support <150MHz
2022/11/15	Rev 1.4	Add application data lower to 400KHz
2023/4/4	Rev 1.5	Add application data of 2MHz,Modify 40MHz application data
2023/5/29	Rev 1.6	Add application data of 88-108 full band FM
2023/6/12	Rev 1.7	Add application data of 400KHz
2023/7/19	Rev 1.8	Add application data of 2-10MHz
2023/11/24	Rev 1.9	Modify some typo on table 4

Application data based on GZY-20-16/HL-21-19/21-20 and TK-21-09/10, HL-21-23, SYX-22-26,TC-23-15,SXY-23-12, TC-23-31, HL-23-26, TC-23-46

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