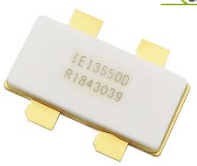
Product Features

- 1295 ~ 1305MHz
- 570W CW Psat @ 50V
- 79% Drain Efficiency @ 50V
- GaN on SiC
- Excellent Ruggedness
- Excellent Thermal Stability
- Internally Matched

Applications

- Linear Accelerator Applications
- Particle Accelerators
- Free Electron Laser



Package Type : RF24001DKR3

Description

The 570W CW RF Power Transistor is designed for particle accelerator and microwave energy applications at 1300MHz. This device is suitable for use in CW, pulse and linear applications. This high efficiency rugged device is targeted to replace industrial magnetrons and other vacuum tubes currently powering particle accelerator, and medical systems.

Typical CW Peak Power Performance*1 (V_{DS}=+50V, Tc=25°C, 50Ω)

Frequency [MHz]	Signal Type	Pin [W]	Power Gain [dB]	Drain Efficiency [%]	Pout [W]
1295.0	CW	19.0	15.0	79.5	580.0
1300.0		19.6	14.9	79.2	572.0
1305.0		19.0	14.8	79.0	563.0

Note
*1 Measured in the IE13550D test board amplifier circuit.

Absolute Maximum Ratings

Rating	Symbol	Value	Unit	Condition
Drain to Source Voltage	V_{DSS}	150	V	Tc=25°C
Gate to Source Voltage	V_{GS}	-10, +2	V	Tc=25°C
Operating Voltage	V_{DD}	52	V_{DC}	-
Maximum Forward Gate Current	I_{GMAX}	84	mA	Tc=25°C
Maximum Drain Current*1	I_{DMAX}	20	A	Tc=25°C
Power Dissipation	P_{DISS}	240	W	Tc=85°C
Storage Temperature	T_{STG}	-65, +150	°C	-
Case Operating Temperature	T_C	-40, +150	°C	-
Operating Junction Temperature*2	T_J	225	°C	-
Soldering Temperature*3	T_S	245	°C	-

Note
*1 Current Limit for long term, reliable operation.
*2 Continuous use at maximum temperature will affect MTTF.
*3 Refer to the Application Note(AN-002) on soldering - "Solder Condition for RFHIC's GaN Device"

Thermal Characteristics

Rating	Symbol	Value	Unit	Condition
Thermal Resistance, Junction to Case	$R_{\theta JC}$	0.69 *1	°C/W	Tc=85°C

Note
*1 Measured for the IE13550D at dissipation power is 200W

Electrical Characteristics (Tc=25℃ unless otherwise noted)

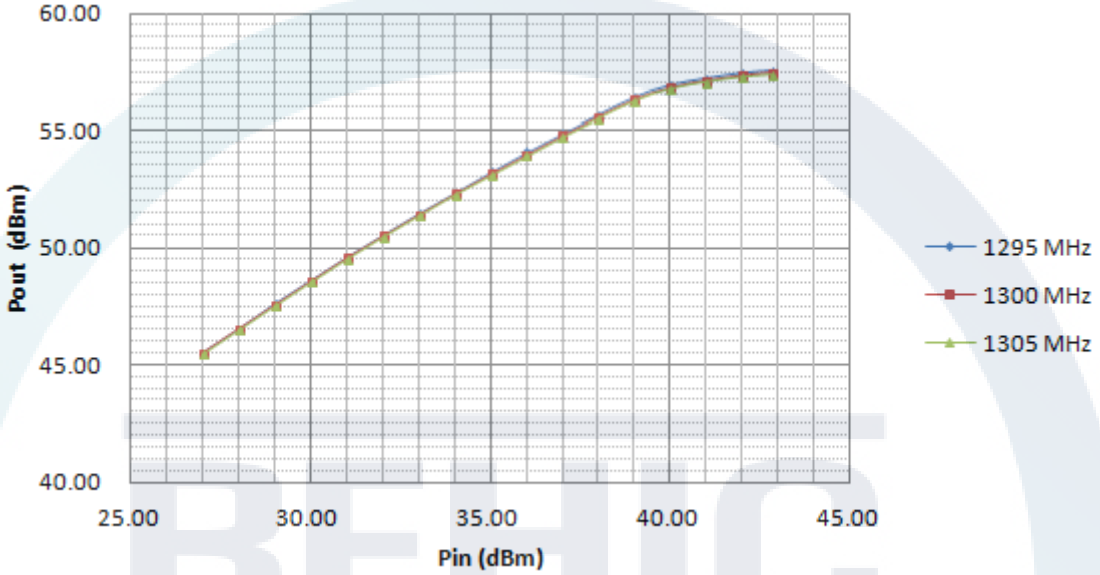
Characteristics	Conditions	Symbol	Min	Typ	Max	Unit
DC Characteristics*1						
Gate Threshold Voltage	**V_{DS} = 10V** **I_D = 100mA**	$V_{GS(TH)}$	-3.8	-3.0	-2.3	V_{DC}
Gate Quiescent Voltage*2	**V_{DS} = 50V** **I_D = 100mA**	$V_{GS(Q)}$	-	-3.3	-	V_{DC}
Saturated Drain Current*3	**V_{DS} = 6V** **V_{GS} = 2V**	I_{DS}	69.6	83.6	-	A
Drain-Source Breakdown Voltage	**V_{GS} = -8V** **I_D = 41.8mA**	V_{BR}	150	-	-	V
Gate Leakage Current	**V_{GS} = -8V** **V_{DS} = 120V**	I_{GLKG}	-18.4	-	-	mA
Drain Leakage Current	**V_{GS} = -8V** **V_{DS} = 120V**	I_{DLKG}	-	-	33.4	mA
RF Characteristics (Fc = 1300MHz unless otherwise noted)						
CW Saturated Output Power*4	**V_{DS} = 50V** **I_{DQ} = 100mA**	P_{SAT}	-	550	-	W
CW Drain Efficiency*4	**V_{DS} = 50V** **I_{DQ} = 100mA** **P_{OUT} = P_{SAT} CW**	η	-	78	-	%
Output Mismatch Stress*5, 6	**V_{DS} = 50V** **I_{DQ} = 100mA** **P_{OUT} = P_{SAT} Pulsed**	VSWR	-	-	5:1	ψ

Note
*1 Measured on wafer prior to packaging.
*2 Voltage should be separately applied to the gate I_{DQ} = 50mA each.
*3 Scaled from PCM data.
*4 With different output matching conditions, output power or efficiency can be optimized.
*5 Pulse width 100usec, Duty Cycle 10%.
*6 Measured in the IE13550D-1300MHz test board amplifier circuit, No damage at all phase angles.

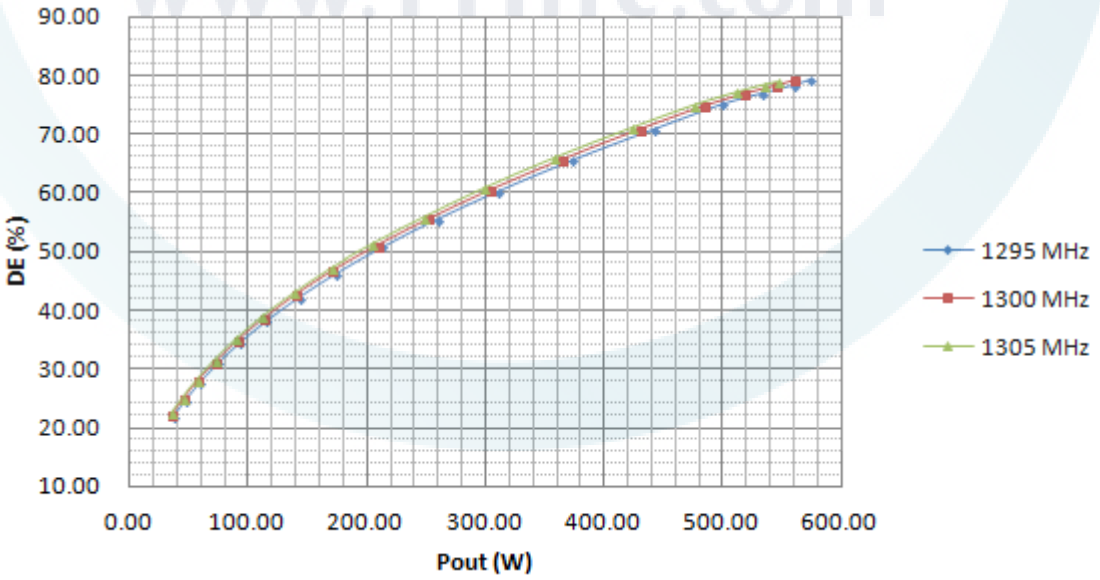
Typical CW Performance Charts

*** Bias condition** (I_{DQ}=50mA each @ V_{DS}=50V, Tc=25°C)

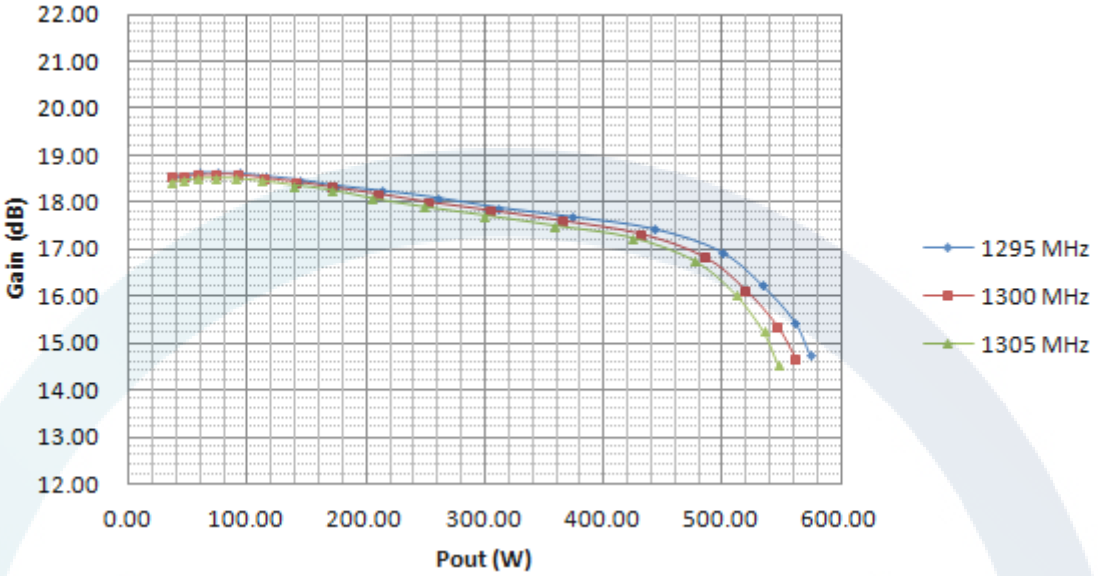
Input power vs Output power



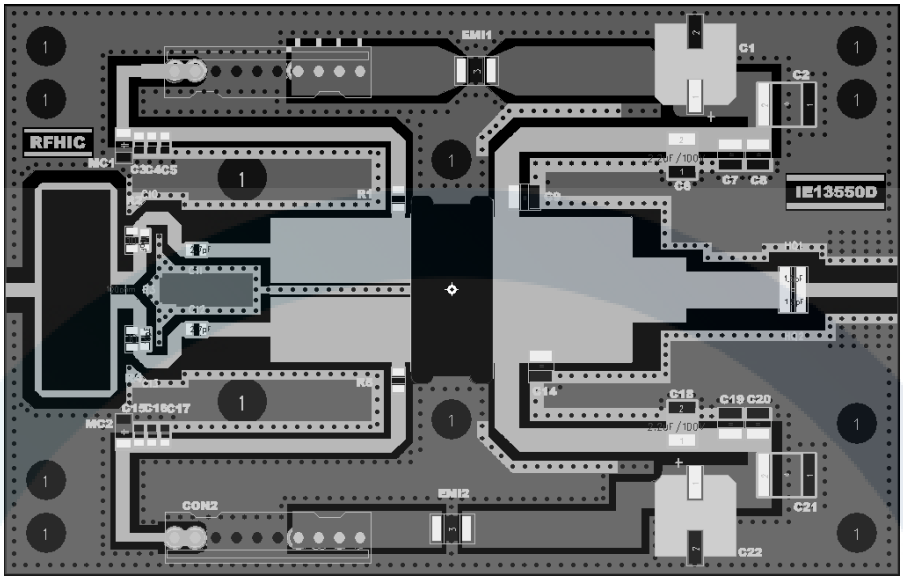
Output power vs Drain Efficiency



Output power vs Gain



Test Board Component Layout

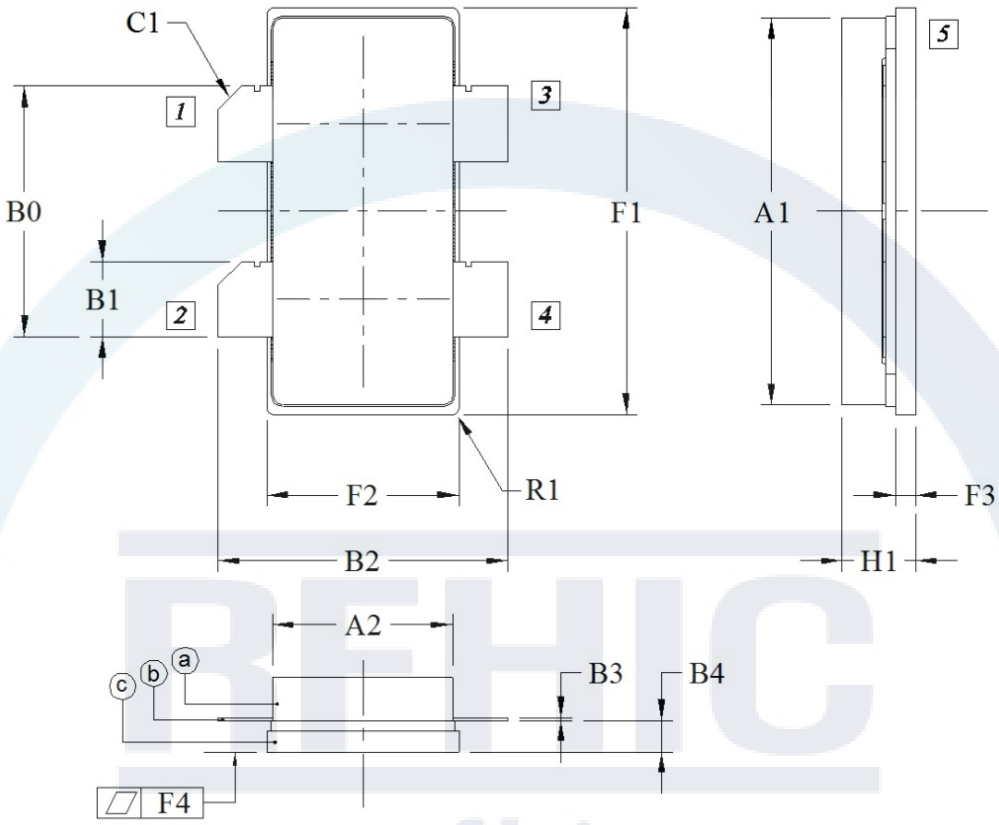


Part List

Part	Description	Part Number	Manufacturer
R1, R2, R4, R5	10 Ohm Chip Resistor, 2012	MCR10EZHJ100	ROHM
R3	100 Ohm Chip Resistor, 3216	MCR18 EZHFL1000	ROHM
C1, C22	33uF Aluminum Capacitor	BDS100VC33MJ10TP	SAMYOUNG
C2, C21	22uF, 100V MLCC	RS80R2A226M-TPNT	MARUWA
C3, C15	1nF Chip Capacitor	GRM188R71H102KA01D	MURATA
C4, C16	100pF Chip Capacitor	GRM1885C1H101JA01D	MURATA
C5, C17	10pF Chip Capacitor	GRM1885C1H100JA01D	MURATA
C6, C18	2.2uF, 100V MLCC	RC70R2A225K-TPN	MARUWA
C7, C19	10pF High Q Capacitor	501CHB100JSLE	TEMEX
C8, C20	100pF High Q Capacitor	501CHB101JSLE	TEMEX
C9	1.5pF High Q Capacitor	501CHB1R5CSLE	TEMEX
C10, C13	10pF High Q Capacitor	201CHA100JSLE	TEMEX
C11, C12	2.7pF High Q Capacitor	201CHA2R7CSLE	TEMEX
C14	2.7pF High Q Capacitor	501CHB2R7CSLE	TEMEX
MC1, MC2	10uF, 16V MLCC	C3216X7R1C106K	TDK
EMI1, EMI2	EMI FILTER	CTH32R102S20A-TM	MARUWA
HQ1, HQ2	1.5pF High Q Capacitor	800R1R5CT500XT	ATC
CON1, CON2	DC Connector	22-04-1101	MOLEX
PCB	εr=3.5 ± 0.05, 0.030" (0.762mm)	ZYF350CA-T	ZYST
TR1	550W GaN Transistor	IE13550D	RFHIC

Package Dimensions (Type : RF24001DKR3)

* Unit: mm[inch] | Tolerance ±0.1 [.004]



Pin Description	
Pin No	Function
1	Path A Gate
2	Path B Gate
3	Path A Drain
4	Path B Drain
5	Source

ⓐ- Lid
ⓑ- Lead Frame
ⓒ- Flange

Dim.	INCH			MILLIMETER		
	MIN	TYP	MAX	MIN	TYP	MAX
A1	0.767	0.772	0.777	19.48	19.61	19.74
A2	0.357	0.362	0.367	9.07	9.2	9.33
B0	0.495	0.5	0.505	12.57	12.7	12.83
B1	0.145	0.15	0.155	3.68	3.81	3.94
B2	0.579	0.584	0.589	14.72	14.84	14.97
B3	0.003	0.005	0.007	0.08	0.13	0.18
B4	0.057	0.062	0.067	1.45	1.57	1.7
C1 (Chamfer)	0.042	0.047	0.052	1.07	1.2	1.33
F1	0.806	0.811	0.816	20.47	20.6	20.73
F2	0.381	0.386	0.391	9.67	9.8	9.93
F3	0.031	0.036	0.041	0.79	0.92	1.05
F4	-	0.002	-	-	0.04	-
H1	0.127	0.148	0.17	3.22	3.77	4.32
R1 (Radius)	0.022	0.026	0.03	0.55	0.65	0.75

Revision History

Part Number	Release Date	Version	Description	Data Sheet Status
IE13550P	September, 2018	0.1	Initial Release of DataSheet	Preliminary
IE13550D	April, 2019	0.2	Revision of Specifications	Preliminary
IE13550D	May, 2019	0.3	Update of Thermal Resistance	Preliminary
IE13550D	October, 2019	0.4	Revision of Evaluation Board	Preliminary