## Product Features

- DC ~ 6000MHz
- 34W CW Psat @ 50V, 2450MHz
- 67% Drain Efficiency @ 50V, 2450MHz
- Excellent Ruggedness
- Excellent Thermal Stability
- Internally Matched

## Applications

- Industrial Heating and Drying
- Scientific
- Medical : Skin Treatment, Blood Therapy
- Plasma Lighting

Package Type : RF01501KR3

## Description

The 28W CW RF Power Transistor is designed for Industrial, Scientific, Medical (ISM) and Plasma Lighting applications at 2450MHz. 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 industrial heating, drying, plasma lighting and medical systems.

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

| Frequency [MHz] | Signal Type | Pin [W] | Power Gain [dB] | Drain Efficiency [%] | Pout [W] |
|---|---|---|---|---|---|
| 2400.0 | CW | 1.0 | 15.9 | 67.3 | 38.2 |
| 2450.0 | | 0.9 | 16.0 | 68.8 | 36.2 |
| 2500.0 | | 1.1 | 15.2 | 71.0 | 36.1 |

## 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** | $I_{GMAX}$ | 4 | mA | Tc=25°C |
| **Maximum Drain Current**[*1] | $I_{DMAX}$ | 1.5 | A | Tc=25°C |
| **Power Dissipation** | $P_{DISS}$ | 18 | 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** | $R_{\theta JC}$ | 7.61 [*1] | °C/W | Tc=85°C |

**Note**
*1 Measured for the ET43028P at dissipation power is 18.4W

## Electrical Characteristics (Tc=25℃ unless otherwise noted)

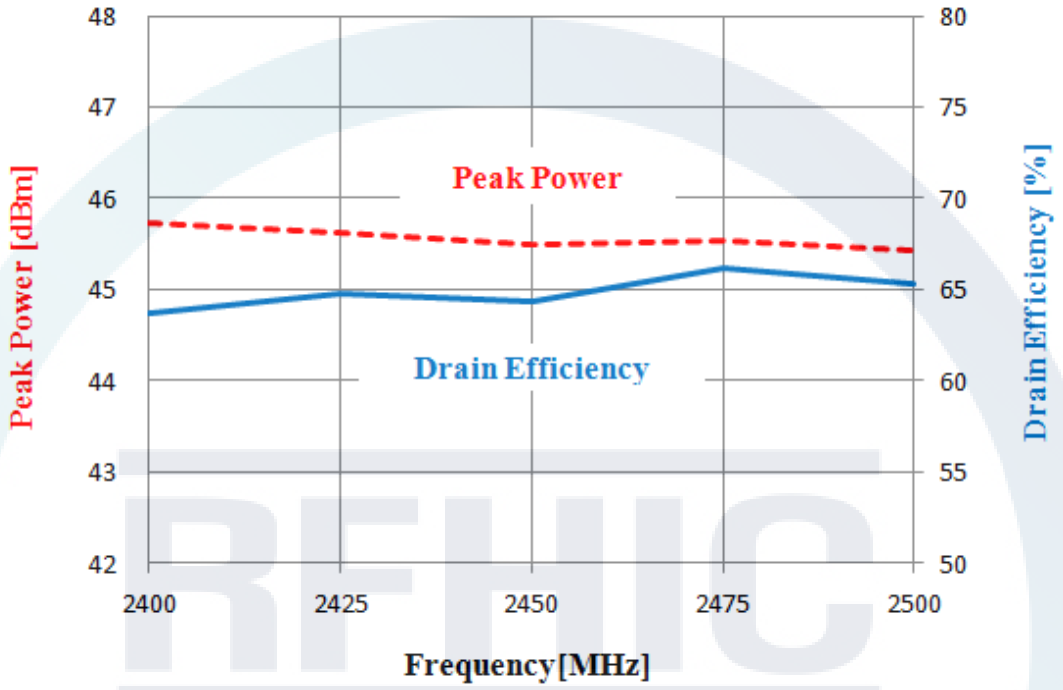
| Characteristics | Conditions | Symbol | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| **DC Characteristics*1** | | | | | | |
| **Gate Threshold Voltage** | **$V_{DS}$ = 10V**<br>**$I_D$ = 3.6mA** | $V_{GS(TH)}$ | -3.8 | -3.0 | -2.3 | $V_{DC}$ |
| **Gate Quiescent Voltage** | **$V_{DS}$ = 50V**<br>**$I_D$ = 50mA** | $V_{GS(Q)}$ | - | -3.0 | - | $V_{DC}$ |
| **Saturated Drain Current*2** | **$V_{DS}$ = 6V**<br>**$V_{GS}$ = 2V** | $I_{DS}$ | 2.9 | 3.5 | - | A |
| **Drain-Source Breakdown Voltage** | **$V_{GS}$ = -8V**<br>**$I_D$ = 3.6mA** | $V_{BR}$ | 150 | - | - | V |
| **Gate Leakage Current** | **$V_{GS}$ = -8V**<br>**$V_{DS}$ = 120V** | $I_{GLKG}$ | -0.79 | - | - | mA |
| **Drain Leakage Current** | **$V_{GS}$ = -8V**<br>**$V_{DS}$ = 120V** | $I_{DLKG}$ | - | - | 1.44 | mA |
| **RF Characteristics** (Fc = 2450MHz unless otherwise noted) | | | | | | |
| **Saturated Output Power*3** | **$V_{DS}$ = 50V**<br>**$I_{DQ}$ = 50mA** | $P_{SAT}$ | 28 | 34 | - | W |
| **CW Drain Efficiency*3** | **$V_{DS}$ = 50V**<br>**$I_{DQ}$ = 50mA**<br>**$P_{OUT}$ = $P_{SAT}$ CW** | η | 63 | 67 | - | % |
| **Output Mismatch Stress*4, 5** | **$V_{DS}$ = 50V**<br>**$I_{DQ}$ = 50mA**<br>**$P_{OUT}$ = $P_{SAT}$ Pulsed** | VSWR | - | - | 10:1 | ψ |

**Note**
*1 Measured on wafer prior to packaging.
*2 Scaled from PCM data.
*3 CW(Continuous Wave) signal operation condition.
*4 Pulse width 100usec, Duty Cycle 10%.
*5 Measured in the ET43028P-2450MHz test board amplifier circuit, No damage at all phase angles.

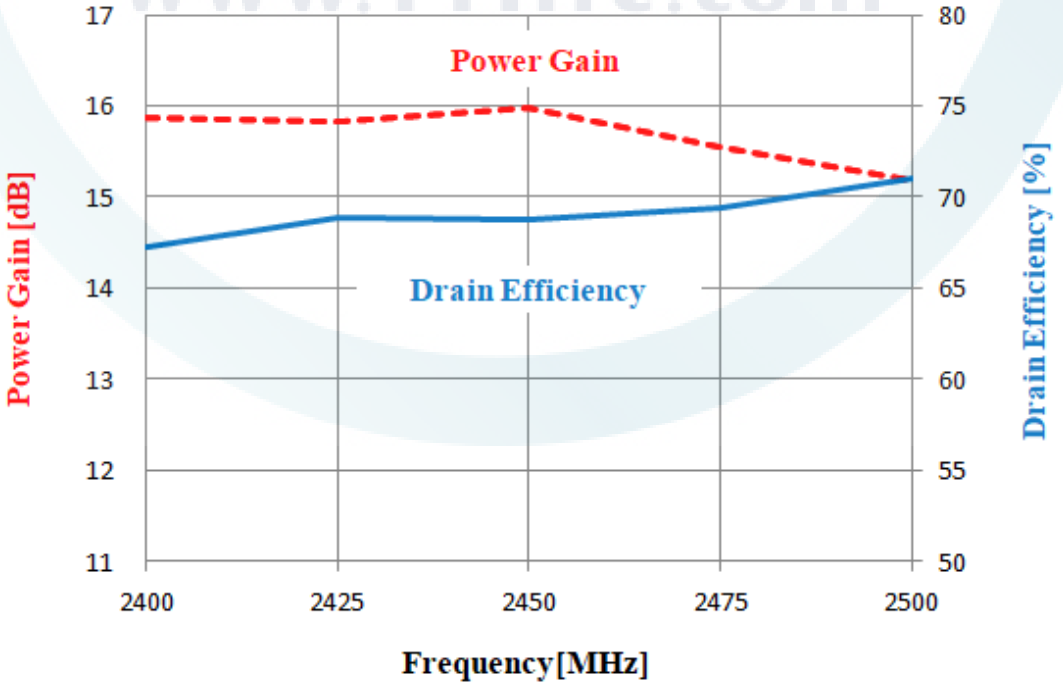
## Typical CW Performance Charts

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

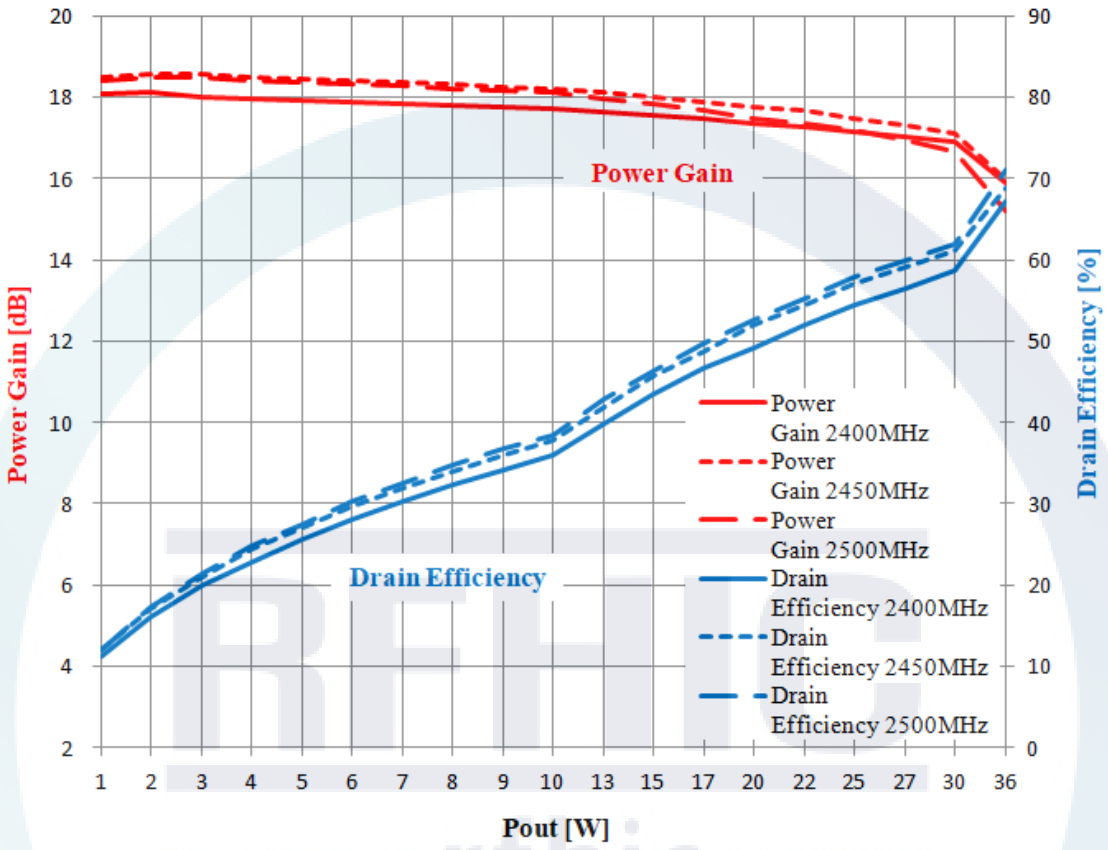
**Peak Power, Drain Efficiency vs. Frequency**



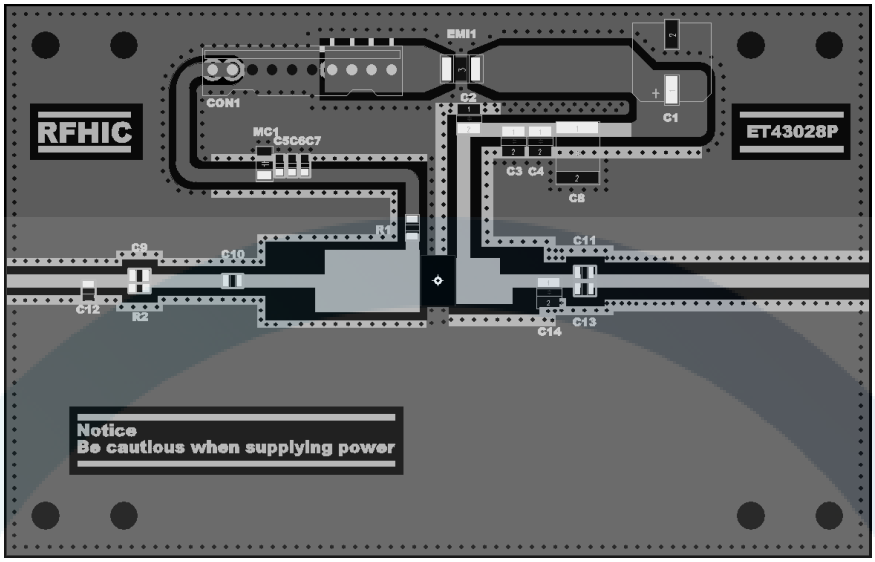

**Power Gain, Drain Efficiency vs. Frequency**



## Power Gain, Drain Efficiency vs. Output Power



## Application Circuit




## Part List

| Part | Description | Part Number | Manufacturer |
|---|---|---|---|
| **R1** | 100 Ohm Chip Resistor, 2012 | MCR10EZHJ101 | ROHM |
| **R2** | 10 Ohm Chip Resistor, 1608 | MCR03EZPJ100 | ROHM |
| **C1** | 33uF Aluminum Capacitor | BDS100VC33MJ10TP | SAMYOUNG |
| **C2** | 2.2uF, 100V MLCC | GRM32ER72A225KA35L | MURATA |
| **C3** | 10pF High Q Capacitor | 501CHB100JSLE | TEMEX |
| **C4** | 100pF High Q Capacitor | 501CHB101JSLE | TEMEX |
| **C5** | 1nF Chip Capacitor | GRM188R71H102KA01D | MURATA |
| **C6** | 100pF Chip Capacitor | GRM1885C1H101JA01D | MURATA |
| **C7** | 10pF Chip Capacitor | GRM1885C1H100JA01D | MURATA |
| **C8** | 10uF, 100V MLCC | RS80R2A106M | MARUWA |
| **C9** | 10pF High Q Capacitor | 201CHB100JSLE | TEMEX |
| **C10, C12** | 1.5pF High Q Capacitor | 201CHA1R5BSLE | TEMEX |
| **C11, C13** | 3.3pF High Q Capacitor | 201CHA3R3CSLE | TEMEX |
| **C14** | 1.2pF High Q Capacitor | 501CHB1R2CSLE | TEMEX |
| **MC1** | 10uF, 16V MLCC | C3216X7R1C106K | TDK |
| **EMI1** | EMI FILTER | CTH32R102S20A-TM | MARUWA |
| **CON1** | DC Connector | 22-04-1101 | MOLEX |
| **PCB** | εr=3.5 ± 0.05, 0.030" (0.762mm) | RF-35TC | TACONIC. |
| **TR1** | 28W GaN Transistor | ET43028P | RFHIC |

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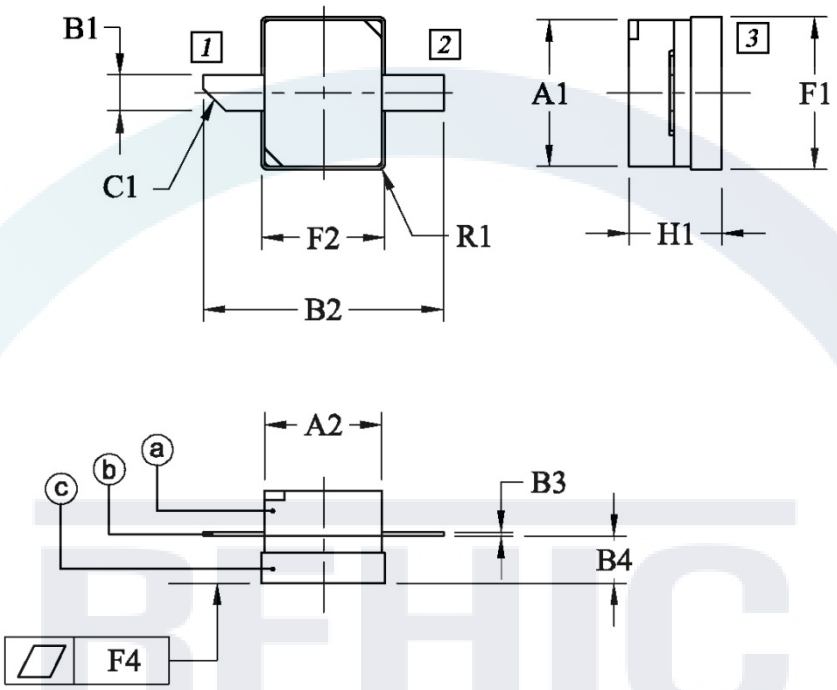
## Package Dimensions (Type : RF01501KR3)

* Unit: mm[inch] | Tolerance ±0.15 [.006]

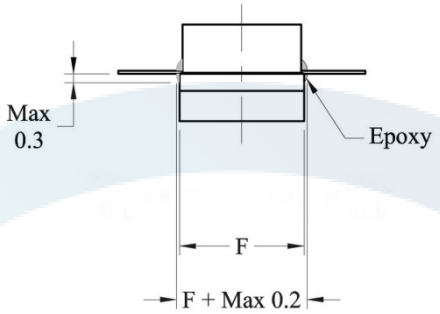



| Pin Description | |
|---|---|
| Pin No | Function |
| 1 | Gate |
| 2 | Drain |
| 3 | Source |

ⓐ- Lid
ⓑ- Lead Frame
ⓒ- Flange

| Dim. | INCH | | | MILLIMETER | | |
|---|---|---|---|---|---|---|
| | MIN | TYP | MAX | MIN | TYP | MAX |
| A1 | .188 | .193 | .198 | 4.77 | 4.90 | 5.03 |
| A2 | .148 | .154 | .159 | 3.77 | 3.90 | 4.03 |
| B1 | .042 | .047 | .052 | 1.07 | 1.20 | 1.33 |
| B2 | .295 | .315 | .335 | 7.50 | 8.00 | 8.50 |
| B3 | .003 | .005 | .007 | 0.08 | 0.13 | 0.18 |
| B4 | .057 | .062 | .067 | 1.445 | 1.570 | 1.695 |
| C1 (Chamfer) | .024 | .030 | .035 | 0.62 | 0.75 | 0.88 |
| F1 | .196 | .201 | .206 | 4.97 | 5.10 | 5.23 |
| F2 | .156 | .161 | .167 | 3.97 | 4.10 | 4.23 |
| F3 | - | - | - | - | - | - |
| F4 | - | .001 | - | - | 0.03 | - |
| H1 | .104 | .126 | .148 | 2.65 | 3.20 | 3.75 |
| L1 | - | - | - | - | - | - |
| L2 | - | - | - | - | - | - |
| R1 (Radius) | .004 | .008 | .012 | 0.10 | 0.20 | 0.30 |

**Sealing Epoxy Tolerance** (Type : RF01501KR3)




**Note**
Unit : mm
F is maximum size of flange

## Revision History

| Part Number | Release Date | Version | Description | Data Sheet Status |
|---|---|---|---|---|
| ET43028P | June, 2017 | 0.1 | Initial Release of DataSheet | Preliminary |
| ET43028P | October, 2017 | 1.0 | Revision : Update Test Data | Final |
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