## RFM10P12, RFM10P15, RFP10P12, RFP10P15

File Number **1595**

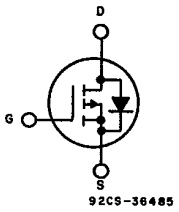
# P-Channel Enhancement-Mode Power Field-Effect Transistors

10 A, -120V and -150 V
$r_{DS(on)}$ = 0.5 Ω

**Features:**

- *SOA is power-dissipation limited*
- *Nanosecond switching speeds*
- *Linear transfer characteristics*
- *High input impedance*
- *Majority carrier device*

**TERMINAL DIAGRAM**




**P-CHANNEL ENHANCEMENT MODE**

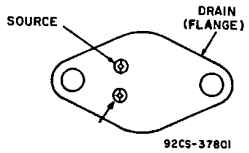
The RFM10P12 and RFM10P15 and the RFP10P12 and RFP10P15* are p-channel enhancement-mode silicon-gate power field-effect transistors designed for applications such as switching regulators, switching converters, motor drivers, relay drivers, and drivers for high-power bipolar switching transistors requiring high speed and low gate-drive power. These types can be operated directly from integrated circuits.

The RFM-types are supplied in the JEDEC TO-204AA steel package and the RFP-types in the JEDEC TO-220AB plastic package.

*The RFM and RFP series were formerly RCA developmental TA9404 and TA9405, respectively.

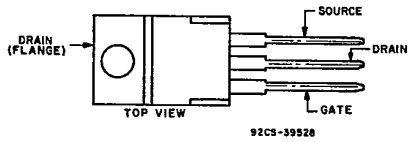
**TERMINAL DESIGNATIONS**

**RFM10P12**
**RFM10P15**




**JEDEC TO-204AA**

**RFP10P12**
**RFP10P15**




**JEDEC TO-220AB**

**MAXIMUM RATINGS,** *Absolute-Maximum Values* ($T_C$ = 25° C):

| | RFM10P12 | RFM10P15 | RFP10P12 | RFP10P15 | |
|---|---|---|---|---|---|
| DRAIN-SOURCE VOLTAGE ..... $V_{DSS}$ | -120 | -150 | -120 | -150 | V |
| DRAIN-GATE VOLTAGE ($R_{GS}$ = 1 MΩ) ..... $V_{DGR}$ | -120 | -150 | -120 | -150 | V |
| GATE-SOURCE VOLTAGE ..... $V_{GS}$ | ±20 | | | | V |
| DRAIN CURRENT, RMS Continuous ..... $I_D$ | 10 | | | | A |
| Pulsed ..... $I_{DM}$ | 30 | | | | A |
| POWER DISSIPATION @ $T_C$ = 25°C ..... $P_T$ | 100 | 100 | 75 | 75 | W |
| Derate above $T_C$ = 25°C | 0.8 | 0.8 | 0.6 | 0.6 | W/°C |
| OPERATING AND STORAGE TEMPERATURE ..... $T_J$, $T_{stg}$ | -55 to +150 | | | | °C |

## RFM10P12, RFM10P15, RFP10P12, RFP10P15

T-39-23

**ELECTRICAL CHARACTERISTICS, At Case Temperature ($T_C$ = 25° C) unless otherwise specified**

| CHARACTERISTIC | SYMBOL | TEST CONDITIONS | LIMITS | | | | UNITS |
|---|---|---|---|---|---|---|---|
| | | | RFM10P12 RFP10P12 | | RFM10P15 RFP10P15 | | |
| | | | MIN. | MAX. | MIN. | MAX. | |
| Drain-Source Breakdown Voltage | $BV_{DSS}$ | $I_D$ = 1 mA<br>$V_{GS}$ = 0 | -120 | — | -150 | — | V |
| Gate-Threshold Voltage | $V_{GS(th)}$ | $V_{GS}$ = $V_{DS}$<br>$I_D$ = 1 mA | -2 | -4 | -2 | -4 | V |
| Zero-Gate Voltage Drain Current | $I_{DSS}$ | $V_{DS}$ = -100 V | — | 1 | — | — | μA |
| | | $V_{DS}$ = -120 V | — | — | — | 1 | |
| | | $T_C$ = 125° C<br>$V_{DS}$ = -100 V | — | 50 | — | — | |
| | | $V_{DS}$ = -120 V | — | — | — | 50 | |
| Gate-Source Leakage Current | $I_{GSS}$ | $V_{GS}$ = ±20 V<br>$V_{DS}$ = 0 | — | 100 | — | 100 | nA |
| Drain-Source On Voltage | $V_{DS(on)}$[a] | $I_D$ = 5 A<br>$V_{GS}$ = -10 V | — | -2.5 | — | -2.5 | V |
| | | $I_D$ = 10 A<br>$V_{GS}$ = -10 V | — | -6.0 | — | -6.0 | |
| Static Drain-Source On Resistance | $r_{DS(on)}$[a] | $I_D$ = 5 A<br>$V_{GS}$ = -10 V | — | 0.5 | — | 0.5 | Ω |
| Forward Transconductance | $g_{fs}$[a] | $V_{DS}$ = -10 V<br>$I_D$ = 5 A | 2 | — | 2 | — | mho |
| Input Capacitance | $C_{iss}$ | $V_{DS}$ = -25 V | — | 1700 | — | 1700 | pF |
| Output Capacitance | $C_{oss}$ | $V_{GS}$ = 0 V | — | 600 | — | 600 | |
| Reverse Transfer Capacitance | $C_{rss}$ | f = 1MHz | — | 150 | — | 150 | |
| Turn-On Delay Time | $t_{d(on)}$ | $V_{DS}$ = -75 V | 24(typ) | 50 | 24(typ) | 50 | ns |
| Rise Time | $t_r$ | $I_D$ = 5 A | 74(typ) | 150 | 74(typ) | 150 | |
| Turn-Off Delay Time | $t_{d(off)}$ | $R_{gen}$ = $R_{gs}$ = 50 Ω | 138(typ) | 225 | 138(typ) | 225 | |
| Fall Time | $t_f$ | $V_{GS}$ = -10 V | 61(typ) | 100 | 61(typ) | 100 | |
| Thermal Resistance Junction-to-Case | $R\theta_{JC}$ | RFM10P12, RFM10P15 | — | 1.25 | — | 1.25 | °C/W |
| | | RFP10P12, RFP10P15 | — | 1.67 | — | 1.67 | |

**SOURCE-DRAIN DIODE RATINGS AND CHARACTERISTICS**

| CHARACTERISTIC | SYMBOL | TEST CONDITIONS | LIMITS | | | | UNITS |
|---|---|---|---|---|---|---|---|
| | | | RFM10P12 RFP10P12 | | RFM10P15 RFP10P15 | | |
| | | | MIN. | MAX. | MIN. | MAX. | |
| Diode Forward Voltage | $V_{SD}$[a] | $I_{SD}$ = 5A | — | 1.4 | — | 1.4 | V |
| Reverse Recovery Time | $t_{rr}$ | $I_F$ = 4A, $d_{IF}/d_t$ = 100A/μs | 210 (typ.) | | 210 (typ.) | | ns |

[a] Pulsed: Pulse duration = 300 μs max., duty cycle = 2%.

## RFM10P12, RFM10P15, RFP10P12, RFP10P15

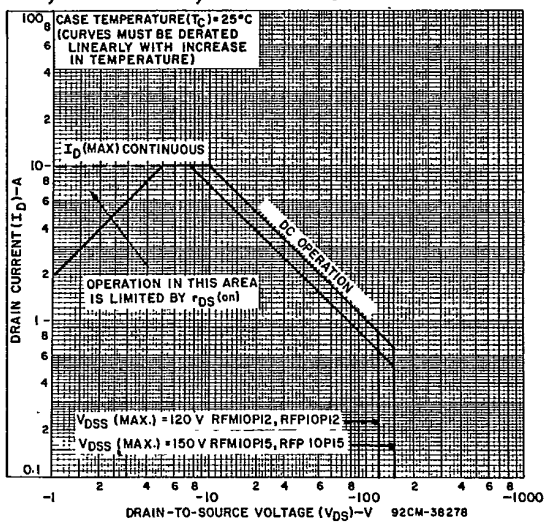



*Fig. 1 - Maximum safe operating areas for all types.*

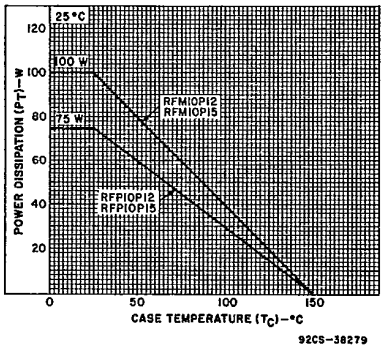



*Fig. 2 - Power dissipation vs. case temperature derating curve for all types.*

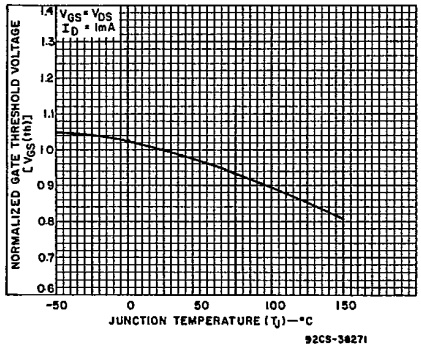



*Fig. 3 - Typical normalized gate threshold voltage as a function of junction temperature for all types.*

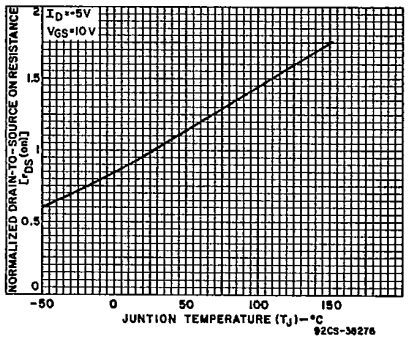



*Fig. 4 - Normalized drain-to-source on resistance as as function of junction temperature for all types.*

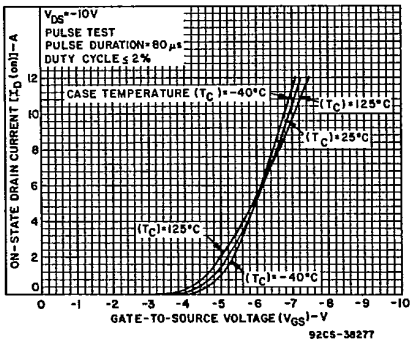



*Fig. 5 - Typical transfer characteristics for all types.*

## RFM10P12, RFM10P15, RFP10P12, RFP10P15

T-39-23

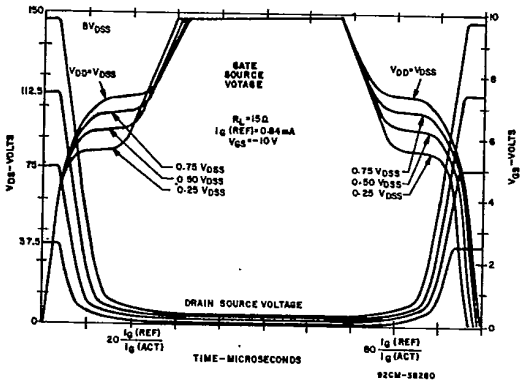



*Fig. 6 - Normalized switching waveforms for constant gate-current drive. Refer to RCA Power MOSFETs PMP411A.*

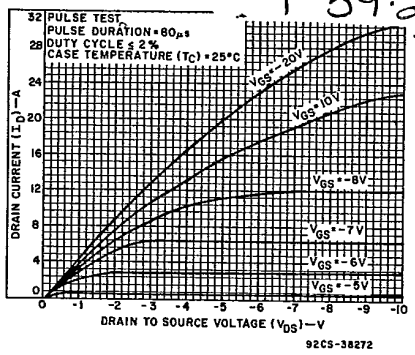



*Fig. 7 - Typical saturation characteristics for all types.*

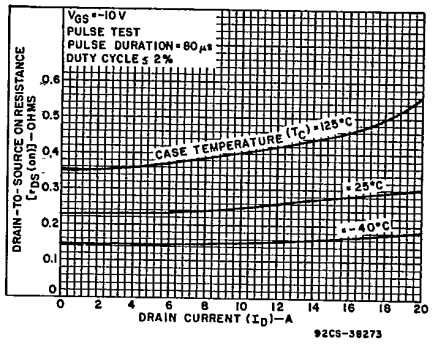



*Fig. 8 - Typical drain-to-source on resistance as a function of drain current for all types.*

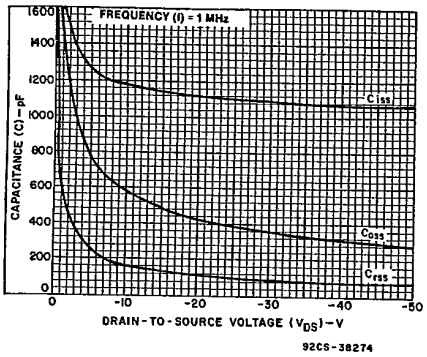



*Fig. 9 - Capacitance as a function of drain-to-source voltage for all types.*

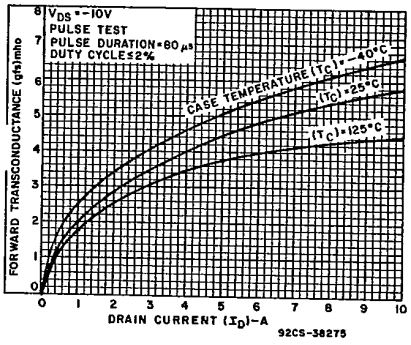



*Fig. 10 - Typical forward transconductance as a function of drain current for all types.*

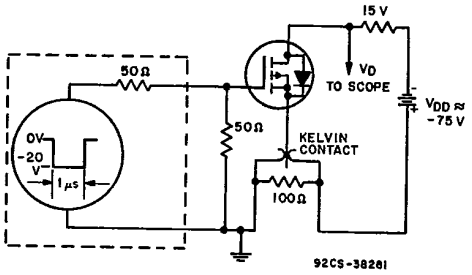



*Fig. 11 - Switching Time Test Circuit.*