

RFM5P12, RFM5P15, RFP5P12, RFP5P15

File Number 1463

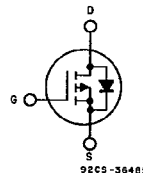
P-Channel Enhancement-Mode Power Field-Effect Transistors

5 A, 120 V — 150 V

$r_{DS(on)}$: 1 Ω

Features:

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

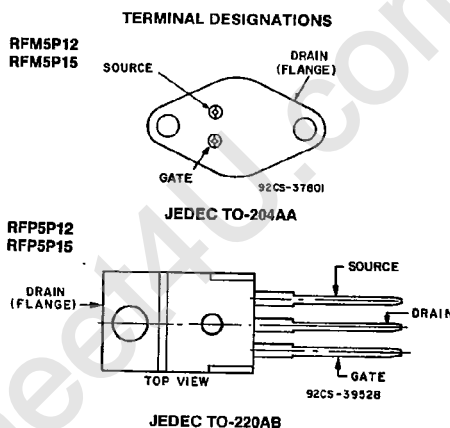


P-CHANNEL ENHANCEMENT MODE

The RFM5P12 and RFM5P15 and the RFP5P12 and RFP5P15* are P-Channel enhancement-mode silicon gate power field-effect transistors designed for high-speed applications such as switching regulators, switching converters, relay drivers, and drivers for high-power bipolar switching transistors.

The RFM-Series types are supplied in the JEDEC TO-204AA metal package and the RFP-Series types in the JEDEC TO-220AB plastic package. All these types are supplied without an internal gate Zener diode.

* The RFM and RFP series were formerly RCA developmental numbers TA9320 and TA9321 respectively.



MAXIMUM RATINGS, Absolute-Maximum Values ($T_C = 25^\circ C$):

| | | RFM5P12 | RFM5P15 | RFP5P12 | RFP5P15 | |
|--|----------------|-------------|---------|---------|---------|---------------|
| DRAIN-SOURCE VOLTAGE | V_{DS} | -120 | -150 | -120 | -150 | V |
| DRAIN-GATE VOLTAGE ($R_{GS} = 1M\Omega$) | V_{DGH} | -120 | -150 | -120 | -150 | V |
| GATE-SOURCE VOLTAGE | V_{GS} | ± 20 | | -120 | -150 | V |
| DRAIN CURRENT RMS Continuous | I_D | 5 | | 5 | | A |
| DRAIN CURRENT RMS Pulsed | I_{DM} | 15 | | 15 | | A |
| POWER DISSIPATION | P_T | 75 | 75 | 60 | 60 | W |
| @ $T_C = 25^\circ C$ | | 0.6 | 0.6 | 0.48 | 0.48 | W/ $^\circ C$ |
| Derate above $T_C = 25^\circ C$ | | | | | | |
| OPERATING AND STORAGE TEMPERATURE | T_I, T_{stg} | -55 to +150 | | | | $^\circ C$ |

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| CHARACTERISTIC | SYMBOL | TEST CONDITIONS | LIMITS | | | | UNITS |
|-------------------------------------|----------------|--|--------------------|---|--------------------|-------|--------------------|
| | | | RFM5P12 RFP5P12 | | RFM5P15 RFP5P15 | | |
| | | | Min. | Max. | Min. | Max. | |
| Drain-Source Breakdown Voltage | BV_{DSS} | $I_D = 1 \text{ mA}$ $V_{GS} = 0$ | -120 | — | -150 | — | V |
| Gate-Threshold Voltage | $V_{GS(th)}$ | $V_{GS} = V_{DS}$ $I_D = 1 \text{ mA}$ | -2 | -4 | -2 | -4 | V |
| Zero-Gate Voltage Drain Current | I_{DSS} | $V_{DS} = -100 \text{ V}$ | — | 1 | — | — | μA |
| | | $V_{DS} = -120 \text{ V}$ | — | — | — | 1 | |
| | | $T_C = 125^\circ\text{C}$ | — | 50 | — | — | |
| | | $V_{DS} = -100 \text{ V}$ $V_{DS} = -120 \text{ V}$ | — | — | — | 50 | |
| Gate-Source Leakage Current | I_{DSS} | $V_{GS} = \pm 20 \text{ V}$ $V_{DS} = 0$ | — | 100 | — | 100 | nA |
| Drain-Source On Voltage | $V_{DS(on)}^a$ | $I_D = 2.5 \text{ A}$ $V_{GS} = -10 \text{ V}$ | — | -2.5 | — | -2.5 | V |
| | | $I_D = 5 \text{ A}$ $V_{GS} = -10 \text{ V}$ | — | -8 | — | -8 | |
| | | Static Drain-Source On Resistance | $r_{DS(on)}^a$ | $I_D = 2.5 \text{ A}$ $V_{GS} = -10 \text{ V}$ | — | 1 | |
| Forward Transconductance | g_{fs}^a | $V_{DS} = 10 \text{ V}$ $I_D = 2.5 \text{ A}$ | 0.75 | — | 0.75 | — | mho |
| Input Capacitance | C_{iss} | $V_{DS} = 25 \text{ V}$ | — | 700 | — | 700 | pF |
| Output Capacitance | C_{oss} | $V_{GS} = 0 \text{ V}$ | — | 300 | — | 300 | |
| Reverse-Transfer Capacitance | C_{rss} | $f = 1 \text{ MHz}$ | — | 100 | — | 100 | |
| Turn-On Delay Time | $t_{d(on)}$ | $V_{DD} = 1/2 BV_{DSS}$ | 20(typ.) | 60 | 20(typ.) | 60 | ns |
| Rise Time | t_r | $I_D = 2.5 \text{ A}$ | 36(typ.) | 100 | 36(typ.) | 100 | |
| Turn-Off Delay Time | $t_{d(off)}$ | $R_{gen} = R_{gs} = 50\Omega$ | 63(typ.) | 150 | 63(typ.) | 150 | |
| Fall Time | t_f | $V_{GS} = 10 \text{ V}$ | 40(typ.) | 100 | 40(typ.) | 100 | |
| Thermal Resistance Junction-to-Case | $R\theta_{JC}$ | RFM5P12, RFM5P15 | — | 1.67 | — | 1.67 | $^\circ\text{C/W}$ |
| | | RFP5P12, RFP5P15 | — | 2.083 | — | 2.083 | |

*Pulsed: Pulse duration = 300 μs max., duty cycle = 2%.

SOURCE-DRAIN DIODE RATINGS AND CHARACTERISTICS

| CHARACTERISTIC | SYMBOL | TEST CONDITIONS | LIMITS | | | | UNITS |
|-----------------------|----------|--|--------------------|------|--------------------|------|-------|
| | | | RFM5P12 RFP5P12 | | RFM5P15 RFP5P15 | | |
| | | | Min. | Max. | Min. | Max. | |
| Diode Forward Voltage | V_{SD} | $I_{SD} = 2.5 \text{ A}$ | — | 1.4 | — | 1.4 | V |
| Reverse Recovery Time | t_{rr} | $I_F = 4 \text{ A}$ $dI_F/dt = 100 \text{ A}/\mu\text{s}$ | 300(typ.) | | 300(typ.) | | ns |

*Pulse Tests: Width $\leq 300 \mu\text{s}$, Duty Cycle $\leq 2\%$.

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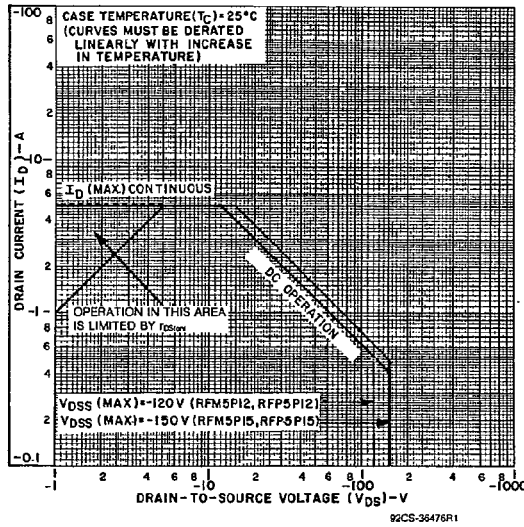


Fig. 1 - Maximum safe operating areas for all types.

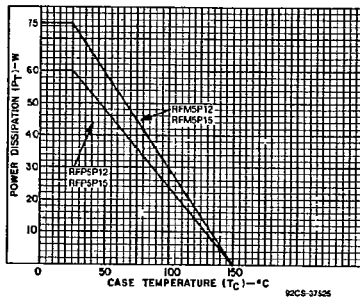


Fig. 2 - Power dissipation vs. temperature derating curve for all types.

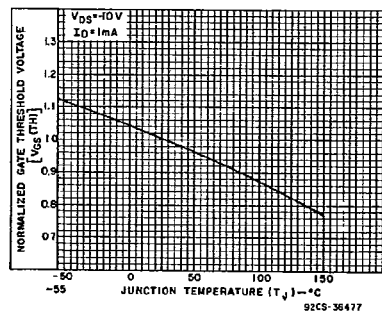


Fig. 3 - Typical normalized gate threshold voltage as a function of junction temperature for all types.

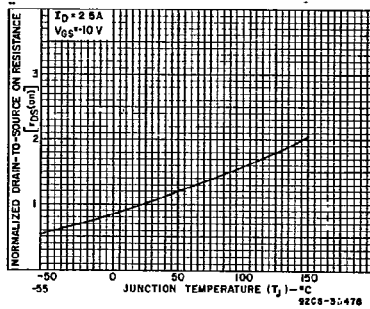


Fig. 4 - Normalized drain-to-source on resistance to junction temperature for all types.

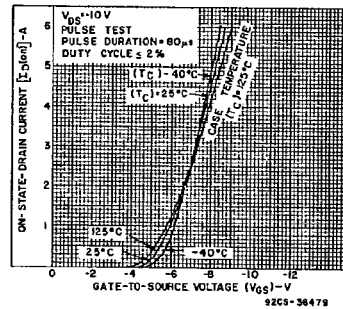


Fig. 5 - Typical transfer characteristics for all types.

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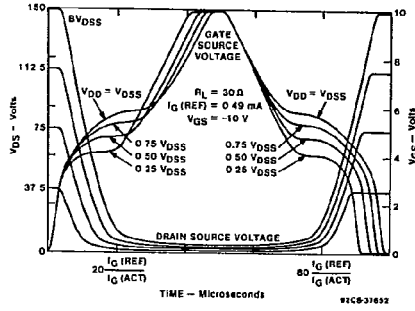


Fig. 6 - Normalized switching waveforms for constant gate-current drive.

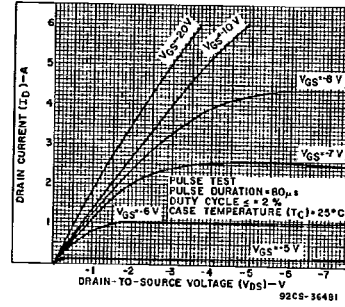


Fig. 7 - Typical saturation characteristics for all types.

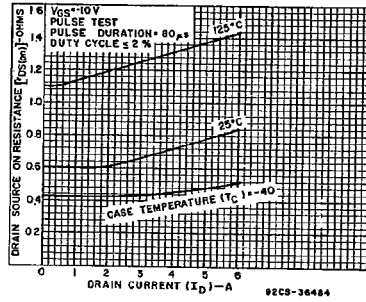


Fig. 8 - Typical drain-to-source on resistance as a function of drain current for all types.

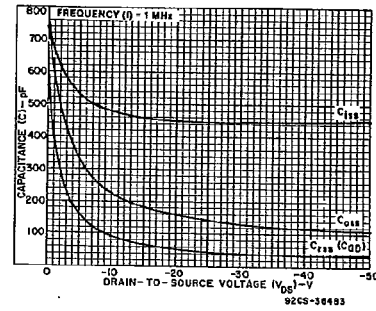


Fig. 9 - Capacitance as a function of drain-to-source voltage for all types.

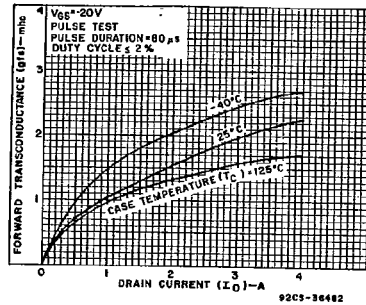


Fig. 10 - Typical forward transconductance as a function of drain current for all types.

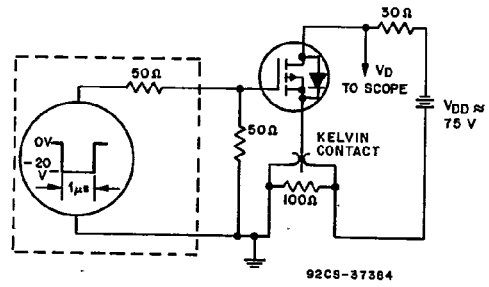


Fig. 11 - Switching Time Test Circuit.