

RFM5P12, RFM5P15, RFP5P12, RFP5P15

File Number 1463

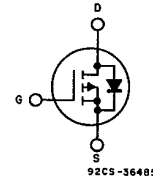
P-Channel Enhancement-Mode
Power Field-Effect Transistors

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



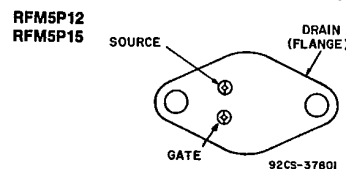
P-CHANNEL ENHANCEMENT MODE

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.

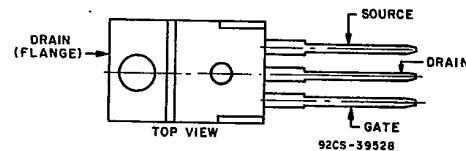
The RFM-Series types are supplied in the JEDEC TO-204AA metal package and the RFP-Series types in the JEDEC TO-220AB plastic package. All these types are supplied without an internal gate Zener diode.

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

TERMINAL DESIGNATIONS



JEDEC TO-204AA

RFP5P12
RFP5P15

JEDEC TO-220AB

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

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

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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 mA V _{GS} = 0 | -120 | — | -150 | — | V |
| Gate-Threshold Voltage | V _{GS(th)} | V _{GS} = V _{DS} 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 | — | 50 | — | — | |
| | | V _{DS} = -100 V V _{DS} = -120 V | — | — | — | 50 | |
| Gate-Source Leakage Current | I _{GSS} | V _{GS} = ±20 V V _{DS} = 0 | — | 100 | — | 100 | nA |
| Drain-Source On Voltage | V _{DS(on)} ^a | I _D = 2.5 A V _{GS} = -10 V | — | -2.5 | — | -2.5 | V |
| | | I _D = 5A V _{GS} = -10 V | — | -8 | — | -8 | |
| | | | | | | | |
| Static Drain-Source On Resistance | r _{DS(on)} ^a | I _D = 2.5 A V _{GS} = -10 V | — | 1 | — | 1 | Ω |
| Forward Transconductance | g _{fs} ^a | V _{DS} = 10 V I _D = 2.5 A | 0.75 | — | 0.75 | — | mho |
| Input Capacitance | C _{iss} | V _{DS} = 25 V | — | 700 | — | 700 | pF |
| Output Capacitance | C _{oss} | V _{GS} = 0 V | — | 300 | — | 300 | |
| Reverse-Transfer Capacitance | C _{rss} | f = 1MHz | — | 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 A | 36(typ.) | 100 | 36(typ.) | 100 | |
| Turn-Off Delay Time | t _{d(off)} | R _{gen} = R _{gs} = 50Ω | 63(typ.) | 150 | 63(typ.) | 150 | |
| Fall Time | t _f | V _{GS} = 10 V | 40(typ.) | 100 | 40(typ.) | 100 | |
| Thermal Resistance Junction-to-Case | Rθ _{JC} | RFM5P12, RFM5P15 | — | 1.67 | — | 1.67 | °C/W |
| | | RFP5P12, RFP5P15 | — | 2.083 | — | 2.083 | |

^aPulsed: 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} = 2.5A | — | 1.4 | — | 1.4 | V |
| Reverse Recovery Time | t _{rr} | I _F = 4A dI _F /dt = 100A/μs | 300(typ.) | | 300(typ.) | | ns |

^aPulse Test: Width $\leq 300 \mu\text{s}$, Duty Cycle $\leq 2\%$.

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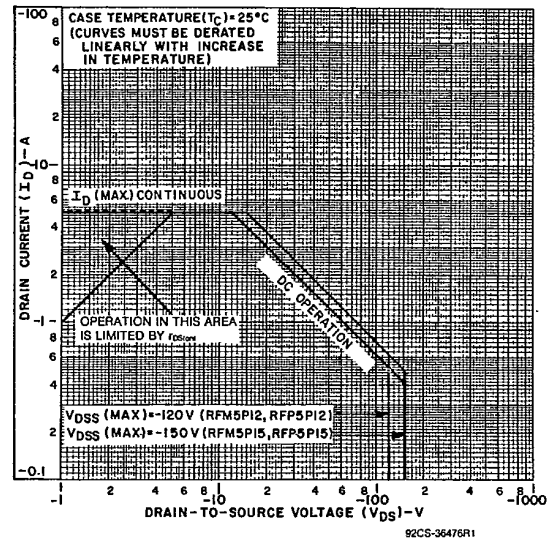


Fig. 1 - Maximum safe operating areas for all types.

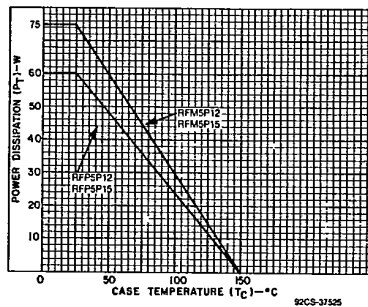


Fig. 2 - Power dissipation vs. temperature derating curve for all types.

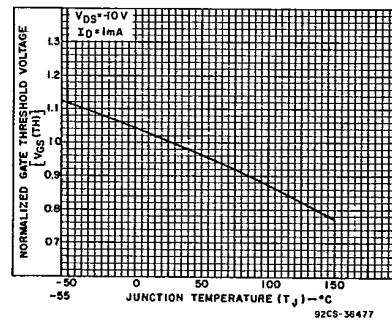


Fig. 3 - Typical normalized gate threshold voltage as a function of junction temperature for all types.

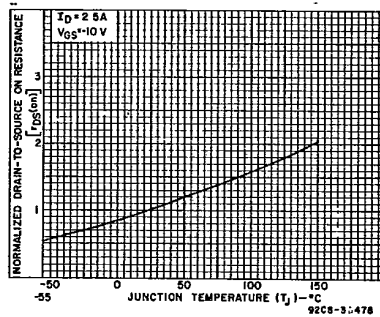


Fig. 4 - Normalized drain-to-source on resistance to junction temperature for all types.

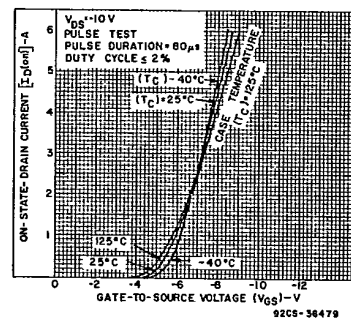


Fig. 5 - Typical transfer characteristics for all types.

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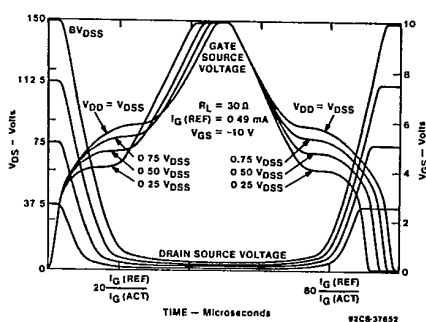


Fig. 6 - Normalized switching waveforms for constant gate-current drive.

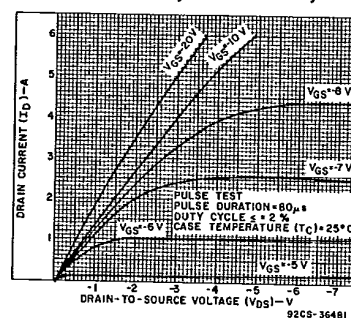


Fig. 7 - Typical saturation characteristics for all types.

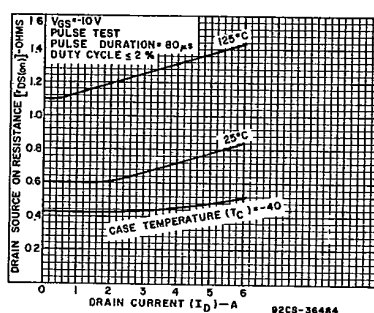


Fig. 8 - Typical drain-to-source on resistance as a function of drain current for all types.

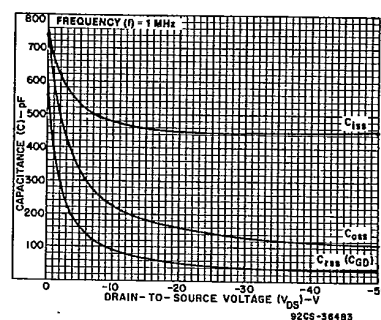


Fig. 9 - Capacitance as a function of drain-to-source voltage for all types.

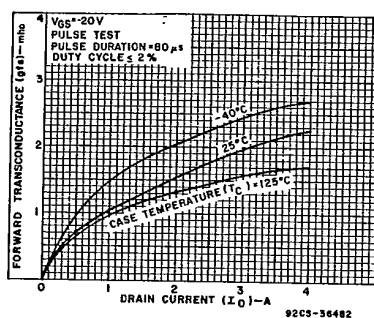


Fig. 10 - Typical forward transconductance as a function of drain current for all types.

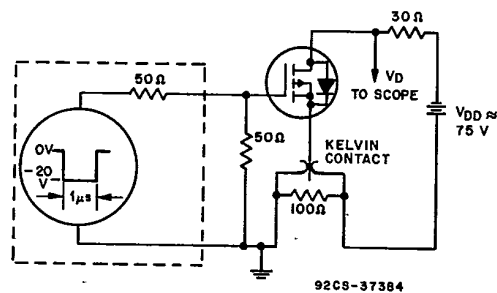


Fig. 11 - Switching Time Test Circuit.