

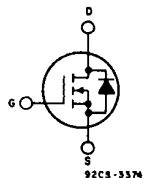
# N-Channel Enhancement-Mode Power Field-Effect Transistors

10 A, 120 V — 150 V

$r_{DS(on)}$ : 0.3  $\Omega$

**Features:**

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



N-Channel Enhancement Mode

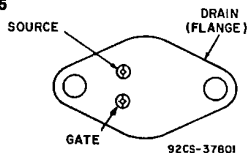
The RFM10N12 and RFM10N15 and the RFP10N12 and RFP10N15\* are n-channel enhancement-mode silicon-gate power field-effect transistors designed for applications such as switching regulators, switching converters, motor drivers, relay drivers, and drivers for high-power bipolar switching transistors requiring 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 numbers TA9192 and TA9212, respectively.

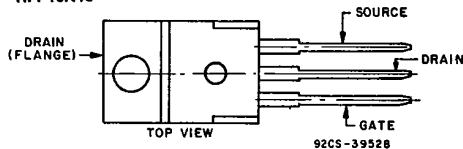
**TERMINAL DESIGNATIONS**

**RFM10N12  
RFM10N15**



JEDEC TO-204AA

**RFP10N12  
RFP10N15**



JEDEC TO-220AB

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

	RFM10N12	RFM10N15		RFP10N12	RFP10N15	
DRAIN-SOURCE VOLTAGE ..... $V_{DSS}$	120	150		120	150	V
DRAIN-GATE VOLTAGE ( $R_{GS}=1 M\Omega$ ) ... $V_{DGS}$	120	150		120	150	V
GATE-SOURCE VOLTAGE ..... $V_{GS}$	_____		$\pm 20$	_____		V
DRAIN CURRENT, RMS Continuous ..... $I_D$	_____		10	_____		A
Pulsed ..... $I_{DM}$	_____		25	_____		A
POWER DISSIPATION @ $T_C=25^\circ C$ ..... $P_T$	75	75		60	60	W
Derate above $T_C=25^\circ C$	0.6	0.6		0.48	0.48	W/ $^\circ C$
<b>OPERATING AND STORAGE</b>						
TEMPERATURE ..... $T_j, T_{stg}$	_____		-55 to +150	_____		$^\circ C$

# RFM10N12, RFM10N15, RFP10N12, RFP10N15

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

CHARACTERISTICS	SYMBOL	TEST CONDITIONS	LIMITS				UNITS
			RFM10N12 RFP10N12		RFM10N15 RFP10N15		
			MIN.	MAX.	MIN.	MAX.	
Drain-Source Breakdown Voltage	$BV_{DSS}$	$I_D = 1 \text{ mA}$ $V_{GS} = 0$	120	—	150	—	V
Gate Threshold Voltage	$V_{GS(th)}$	$V_{GS} = V_{DS}$ $I_D = 2 \text{ mA}$	2	4	2	4	V
Zero Gate Voltage Drain Current	$I_{DSS}$	$V_{DS} = 100 \text{ V}$ $V_{GS} = 120 \text{ V}$	—	1	—	—	$\mu\text{A}$
		$T_c = 125^\circ\text{C}$ $V_{DS} = 100 \text{ V}$ $V_{GS} = 120 \text{ V}$	—	50	—	50	
Gate-Source Leakage Current	$I_{GSS}$	$V_{GS} = \pm 20 \text{ V}$ $V_{DS} = 0$	—	100	—	100	nA
Drain-Source On Voltage	$V_{DS(on)}^a$	$I_D = 5 \text{ A}$ $V_{GS} = 10 \text{ V}$	—	1.5	—	1.5	V
		$I_D = 10 \text{ A}$ $V_{GS} = 10 \text{ V}$	—	4	—	4	
Static Drain-Source On Resistance	$r_{DS(on)}^a$	$I_D = 5 \text{ A}$ $V_{GS} = 10 \text{ V}$	—	0.3	—	0.3	$\Omega$
Forward Transconductance	$g_{fs}^a$	$V_{DS} = 10 \text{ V}$ $I_D = 5 \text{ A}$	2	—	2	—	mho
Input Capacitance	$C_{iss}$	$V_{DS} = 25 \text{ V}$	—	650	—	650	pF
Output Capacitance	$C_{oss}$	$V_{GS} = 0 \text{ V}$	—	230	—	230	
Reverse Transfer Capacitance	$C_{rss}$	$f = 1 \text{ MHz}$	—	60	—	60	
Turn-On Delay Time	$t_d(on)$	$V_{DD} = 75 \text{ V}$	40(typ.)	60	40(typ.)	60	ns
Rise Time	$t_r$	$I_D = 5 \text{ A}$	165(typ.)	250	165(typ.)	250	
Turn-Off Delay Time	$t_d(off)$	$R_{gen} = R_{gs} = 50 \Omega$	90(typ.)	135	90(typ.)	135	
Fall Time	$t_f$	$V_{GS} = 10 \text{ V}$	90(typ.)	135	90(typ.)	135	
Thermal Resistance Junction-to-Case	$R\theta_{JC}$	RFM10N12, RFM10N15	—	1.67	—	1.67	$^\circ\text{C/W}$
		RFP10N12, RFP10N15	—	2.083	—	2.083	

\*Pulsed: Pulse duration = 300  $\mu\text{s}$  max., duty cycle = 2%.

## SOURCE-DRAIN DIODE RATINGS AND CHARACTERISTICS

CHARACTERISTIC	SYMBOL	TEST CONDITIONS	LIMITS				UNITS
			RFM10N12 RFP10N12		RFM10N15 RFP10N15		
			MIN.	MAX.	MIN.	MAX.	
Diode Forward Voltage	$V_{SD}$	$I_{SD} = 5 \text{ A}$	—	1.4	—	1.4	V
Reverse Recovery Time	$t_{rr}$	$I_F = 4 \text{ A}$ $d_{ir}/d_i = 100 \text{ A}/\mu\text{s}$	200(typ)		200(typ)		ns

<sup>a</sup> Pulse Test: Width  $\leq 300 \mu\text{s}$ , Duty Cycle  $\leq 2\%$ .

# RFM10N12, RFM10N15, RFP10N12, RFP10N15

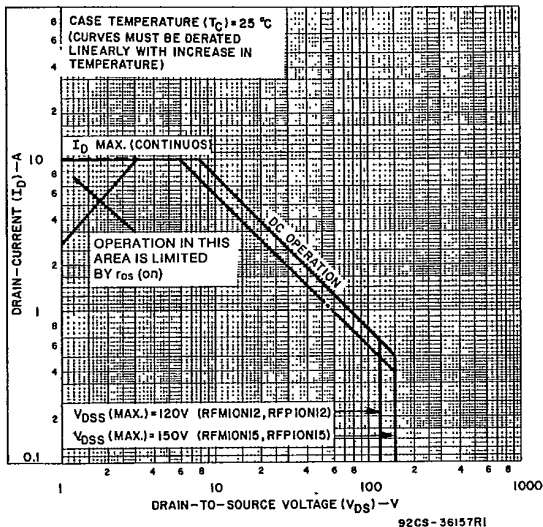


Fig. 1 — Maximum safe operating areas for all types.

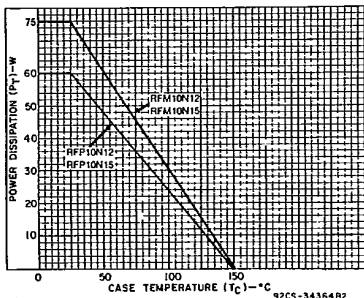


Fig. 2 — Power vs. temperature derating curve for all types.

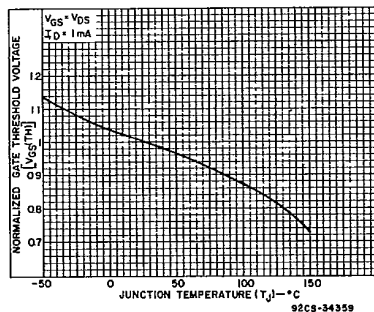


Fig. 3 — Typical normalized gate threshold voltage as a function of junction temperature for all types.

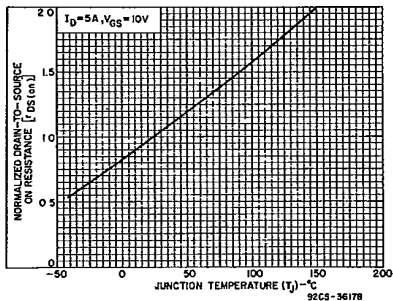


Fig. 4 — Normalized drain-to-source on resistance to junction temperature for all types.

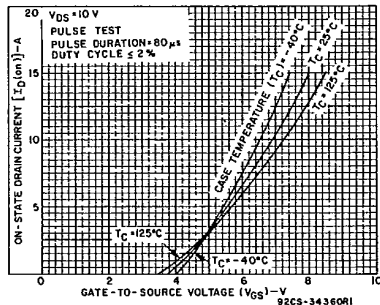


Fig. 5 — Typical transfer characteristics for all types.

# RFM10N12, RFM10N15, RFP10N12, RFP10N15

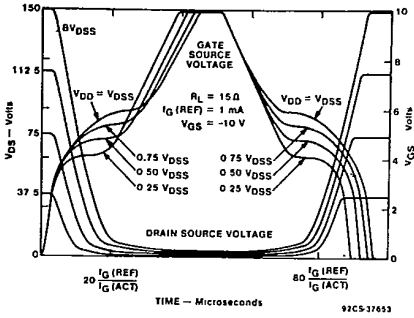


Fig. 6 - Normalized switching waveforms for constant gate-current drive.

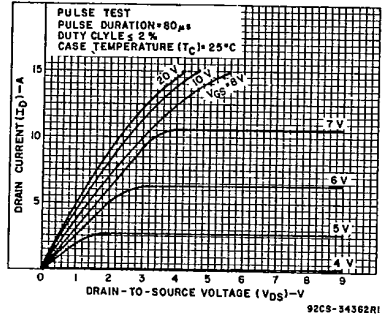


Fig. 7 - Typical saturation characteristics for all types.

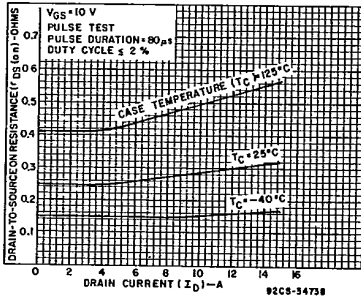


Fig. 8 - Typical drain-to-source on resistance as a function of drain current for all types.

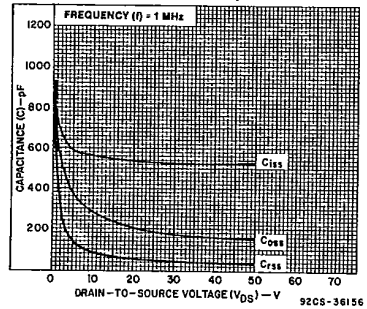


Fig. 9 - Capacitance as a function of drain-to-source voltage for all types.

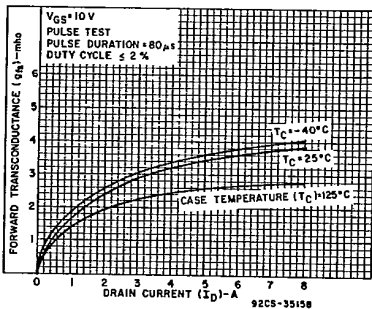


Fig. 10 - Typical forward transconductance as a function of drain current for all types.

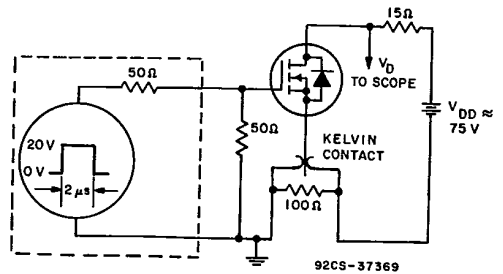


Fig. 11 - Switching Time Test Circuit