

T-39-13

RFM15N12, RFM15N15, RFP15N12, RFP15N15

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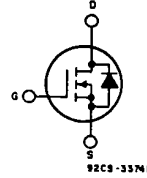
**N-Channel Enhancement-Mode
Power Field-Effect Transistors**

15 A, 120 V — 150 V

$r_{DS(on)}$: 0.15 Ω

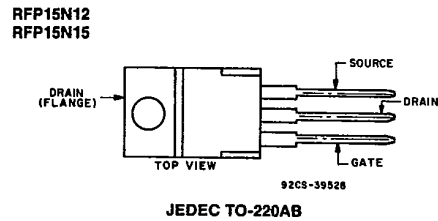
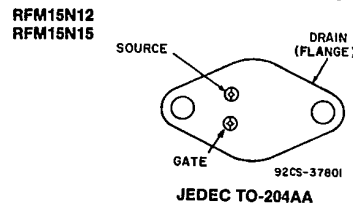
Features:

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



N-Channel Enhancement Mode

TERMINAL DESIGNATIONS



The RFM15N12 and RFM15N15 and the RFP15N12 and RFP15N15* 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 TA9195 and TA9230, respectively.

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

		RFM15N12	RFM15N15		RFP15N12	RFP15N15	
DRAIN-SOURCE VOLTAGE	V_{DS}	120	150		120	150	V
DRAIN-GATE VOLTAGE ($R_{GS}=1\text{ M}\Omega$)	V_{DGR}	120	150		120	150	V
GATE-SOURCE VOLTAGE	V_{GS}	± 20			± 20		V
DRAIN CURRENT RMS Continuous	I_D	15			15		A
Pulsed	I_{DM}	40			40		A
POWER DISSIPATION @ $T_c=25^\circ\text{C}$	P_T	100	100		75	75	W
Derate above $T_c=25^\circ\text{C}$		0.80	0.80		0.6	0.6	W/ $^\circ\text{C}$
OPERATING AND STORAGE TEMPERATURE	T_j, T_{stg}	-55 to +150			-55 to +150		$^\circ\text{C}$

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

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CHARACTERISTICS	SYMBOL	TEST CONDITIONS	LIMITS				UNITS
			RFM15N12 RFP15N12		RFM15N15 RFP15N15		
			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_{GSS}	$V_{GS} = \pm 20 \text{ V}$ $V_{DS} = 0$	—	100	—	100	nA
Drain-Source On Voltage	$V_{DS(on)}^*$	$I_D = 7.5 \text{ A}$ $V_{GS} = 10 \text{ V}$	—	1.125	—	1.125	V
		$I_D = 15 \text{ A}$ $V_{GS} = 10 \text{ V}$	—	3	—	3	
Static Drain-Source On Resistance	$r_{DS(on)}^*$	$I_D = 7.5 \text{ A}$ $V_{GS} = 10 \text{ V}$	—	0.15	—	0.15	Ω
Forward Transconductance	g_m^*	$V_{DS} = 10 \text{ V}$ $I_D = 7.5 \text{ A}$	5	—	5	—	mho
Input Capacitance	C_{iss}	$V_{DS} = 25 \text{ V}$ $V_{GS} = 0 \text{ V}$ $f = 1 \text{ MHz}$	—	1700	—	1700	pF
Output Capacitance	C_{oss}		—	750	—	750	
Reverse Transfer Capacitance	C_{rss}		—	350	—	350	
Turn-On Delay Time	$t_d(on)$	$V_{DD} = 75 \text{ V}$ $I_D = 7.5 \text{ A}$ $R_{\theta en} = R_{\theta cs} = 50 \Omega$ $V_{GS} = 10 \text{ V}$	50(typ.)	75	50(typ.)	75	ns
Rise Time	t_r		150(typ.)	225	150(typ.)	225	
Turn-Off Delay Time	$t_d(off)$		185(typ.)	280	185(typ.)	280	
Fall Time	t_f		125(typ.)	190	125(typ.)	190	
Thermal Resistance Junction-to-Case	$R_{\theta JC}$	RFM15N12, RFM15N15	—	1.25	—	1.25	$^\circ\text{C/W}$
		RFP15N12, RFP15N15	—	1.67	—	1.67	

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

SOURCE-DRAIN DIODE RATINGS AND CHARACTERISTICS

CHARACTERISTIC	SYMBOL	TEST CONDITIONS	LIMITS				UNITS
			RFM15N12 RFP15N12		RFM15N15 RFP15N15		
			MIN.	MAX.	MIN.	MAX.	
Diode Forward Voltage	V_{SD}	$I_{SD} = 7.5 \text{ A}$	—	1.4	—	1.4	V
Reverse Recovery Time	t_{rr}	$I_F = 4 \text{ A}$ $dI_F/dt = 100 \text{ A}/\mu\text{s}$	200(typ)		200(typ)		ns

*Pulse Test: Width $\leq 300 \mu\text{s}$, duty cycle $\leq 2\%$.

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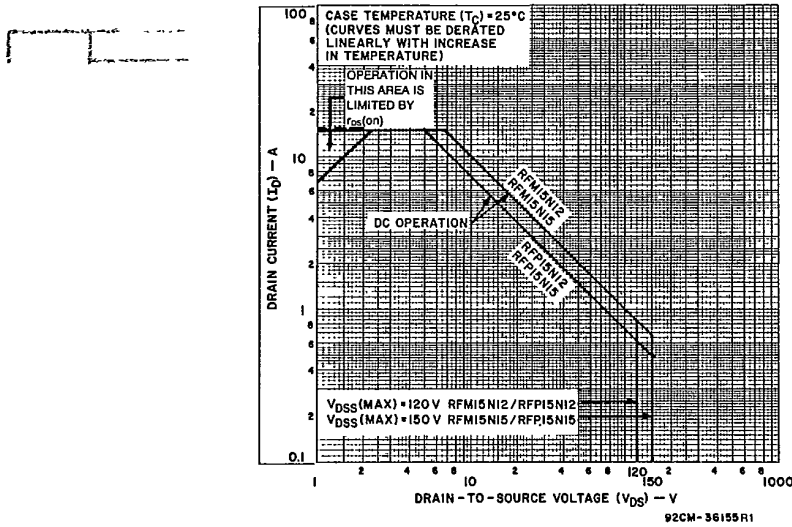


Fig. 1 — Maximum operating areas for all types.

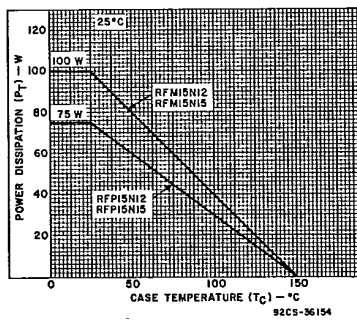


Fig. 2 — Power dissipation vs. case temperature derating curve for all types.

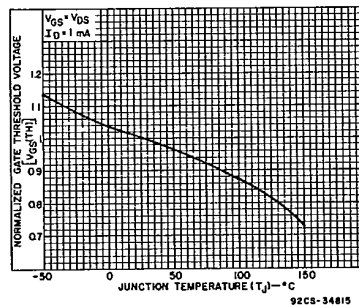


Fig. 3 — Typical normalized gate threshold voltage as a function of junction temperature for all types.

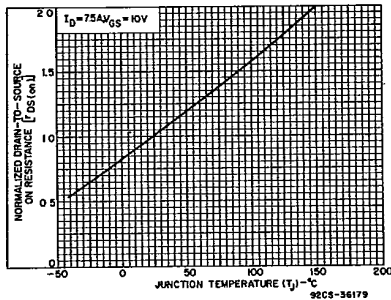


Fig. 4 — Normalized drain-to-source on resistance to junction temperature for all types.

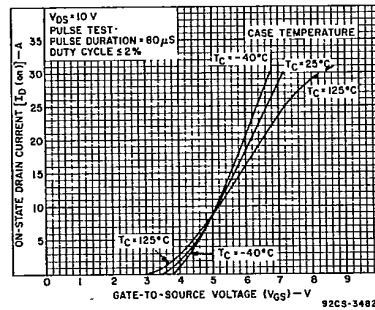


Fig. 5 — Typical transfer characteristics for all types.

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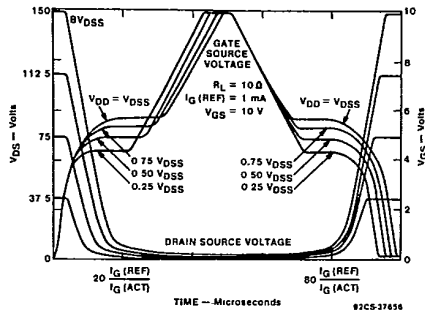


Fig. 6 - Normalized switching waveforms for constant gate-current drive.

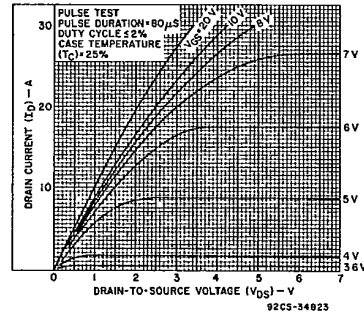


Fig. 7 - Typical saturation characteristics for all types.

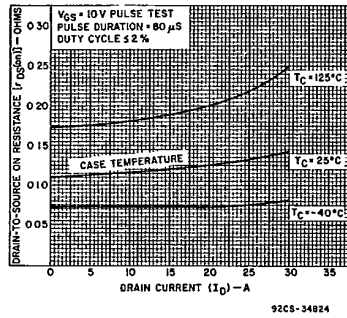


Fig. 8 - Typical drain-to-source on resistance as a function of drain current for all types.

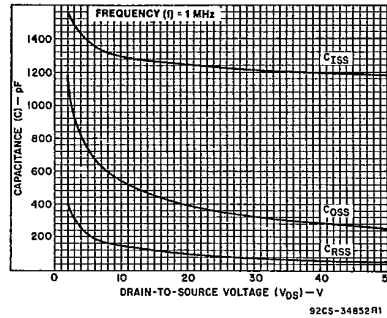


Fig. 9 - Capacitance as a function of drain-to-source voltage for all types.

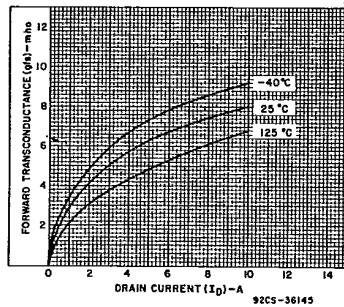


Fig. 10 - Typical forward transconductance as a function of drain current for all types.

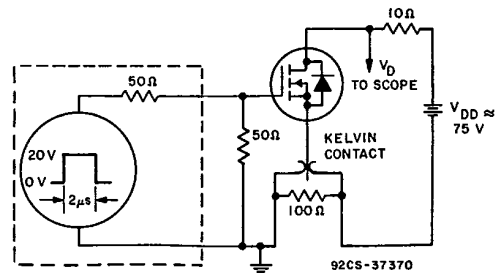


Fig. 11 - Switching Time Test Circuit