

RFM15N12/15N15 RFP15N12/15N15

N-Channel Enhancement-Mode Power Field-Effect Transistors

August 1991

Features

- 15A, 120V and 150V
- $r_{DS(on)} = 0.15\Omega$
- SOA is Power-Dissipation Limited
- Nanosecond Switching Speeds
- Linear Transfer Characteristics
- High Input Impedance
- Majority Carrier Device

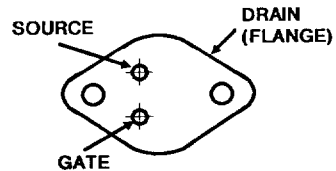
Description

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.

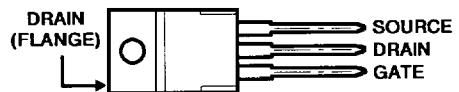
The RFM series types are supplied in the JEDEC TO-204AA steel package and the RFP series types in the JEDEC TO-220AB plastic package.

Packages

TO-204AA
BOTTOM VIEW

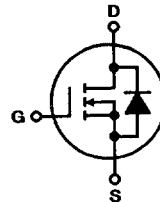


TO-220AB
TOP VIEW



Terminal Diagram

N-CHANNEL ENHANCEMENT MODE



Absolute Maximum Ratings ($T_C = 25^\circ\text{C}$) Unless Otherwise Specified

	RFM15N12	RFM15N15	RFP15N12	RFP15N15	UNITS	
Drain-Source Voltage	V_{DSS}	120	150	120	150	V
Drain-Gate Voltage ($R_{GS} = 1\text{m}\Omega$)	V_{DGR}	120	150	120	150	V
Continuous Drain Current						
RMS Continuous	I_D	15	15	15	15	A
Pulsed Drain Current	I_{DM}	40	40	40	40	A
Gate-Source Voltage	V_{GS}	± 20	± 20	± 20	± 20	V
Maximum Power Dissipation						
$T_C = +25^\circ\text{C}$	P_D	100	100	75	75	W
Above $T_C = +25^\circ\text{C}$, Derate Linearly		0.8	0.8	0.6	0.6	W/ $^\circ\text{C}$
Operating and Storage Junction	T_J, T_{STG}	-55 to +150	-55 to +150	-55 to +150	-55 to +150	$^\circ\text{C}$
Temperature Range						

Specifications RFM15N12, RFM15N15, RFP15N12, RFP15N15

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

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}	$V_{DS} = 100 \text{ V}$ $V_{DS} = 120 \text{ V}$ $T_C = 125^\circ \text{ C}$ $V_{DS} = 100 \text{ V}$ $V_{DS} = 120 \text{ V}$	—	1	—	1	μA
Gate-Source Leakage Current	I_{GSS}	$V_{GS} = \pm 20 \text{ V}$ $V_{DS} = 0$	—	100	—	100	nA
Drain-Source On Voltage	$V_{DS(on)}^a$	$I_D = 7.5 \text{ A}$ $V_{GS} = 10 \text{ V}$ $I_D = 15 \text{ A}$ $V_{GS} = 10 \text{ V}$	—	1.125	—	1.125	V
Static Drain-Source On Resistance	$r_{DS(on)}^a$	$I_D = 7.5 \text{ A}$ $V_{GS} = 10 \text{ V}$	—	0.15	—	0.15	Ω
Forward Transconductance	g_{fs}^a	$V_{DS} = 10 \text{ V}$ $I_D = 7.5 \text{ A}$	5	—	5	—	mho
Input Capacitance	C_{iss}	$V_{DS} = 25 \text{ V}$	—	1700	—	1700	pF
Output Capacitance	C_{oss}	$V_{GS} = 0 \text{ V}$	—	750	—	750	
Reverse Transfer Capacitance	C_{rbs}	$f = 1 \text{ MHz}$	—	350	—	350	
Turn-On Delay Time	$t_d(on)$	$V_{DD} = 75 \text{ V}$	50(typ.)	75	50(typ.)	75	ns
Rise Time	t_r	$I_D = 7.5 \text{ A}$	150(typ.)	225	150(typ.)	225	
Turn-Off Delay Time	$t_d(off)$	$R_{gen} = R_{gs} = 50 \Omega$	185(typ.)	280	185(typ.)	280	
Fall Time	t_f	$V_{GS} = 10 \text{ V}$	125(typ.)	190	125(typ.)	190	
Thermal Resistance Junction-to-Case	$R_{\theta JC}$	RFM15N12, RFM15N15, RFP15N12, RFP15N15	—	1.25	—	1.25	$^\circ\text{C/W}$

^aPulsed: 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}	$I_F = 4 \text{ A}$ $d_I/d_r = 100 \text{ A}/\mu\text{s}$	200(typ)		200(typ)		ns

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

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**N-CHANNEL
POWER MOSFETS**

RFM15N12, RFM15N15, RFP15N12, RFP15N15

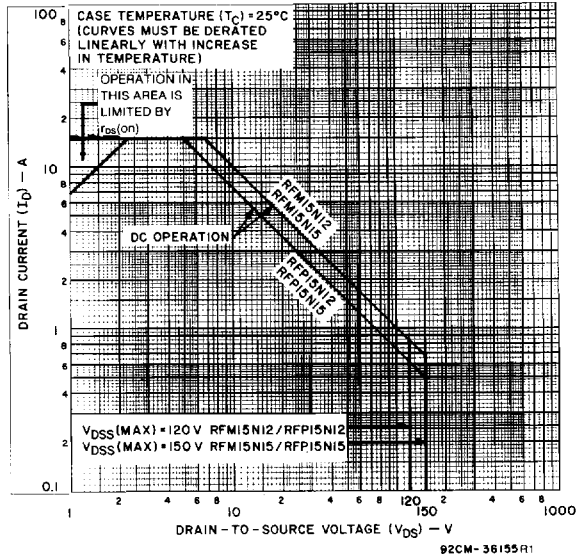


Fig. 1 — Maximum operating areas for all types.

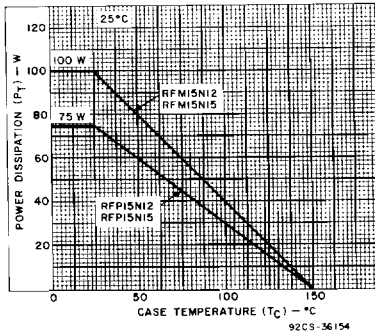


Fig. 2 — Power dissipation vs. case temperature derating curve for all types.

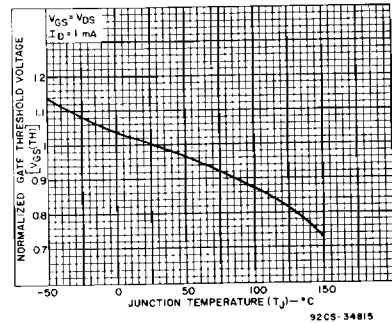


Fig. 3 — Typical normalized gate threshold voltage as a function of junction temperature for all types.

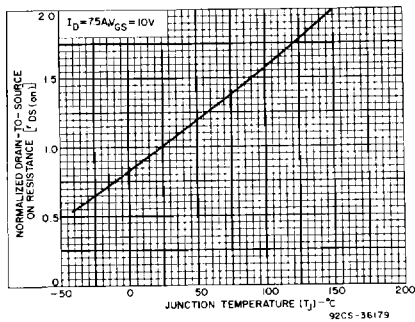


Fig. 4 — Normalized drain-to-source on resistance to junction temperature for all types.

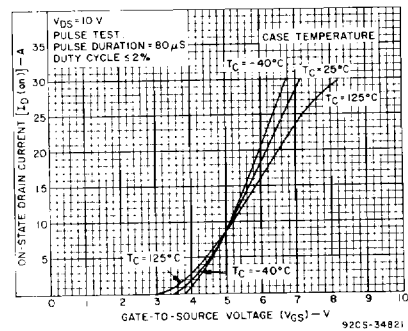


Fig. 5 — Typical transfer characteristics for all types.

RFM15N12, RFM15N15, RFP15N12, RFP15N15

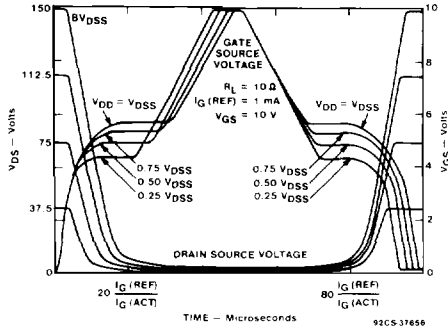


Fig. 6 - Normalized switching waveforms for constant gate-current. Refer to Harris application notes AN-7254 and AN-7260.

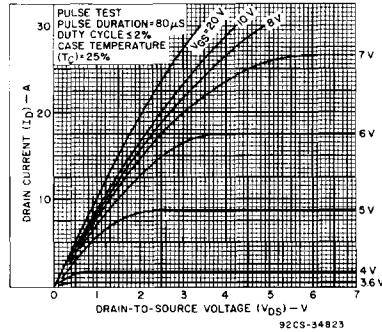


Fig. 7 - Typical saturation characteristics for all types.

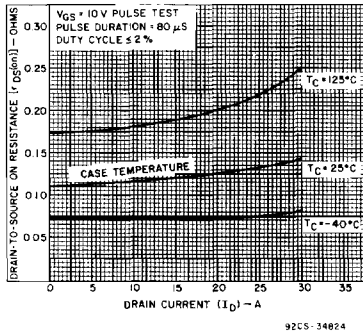


Fig. 8 - Typical drain-to-source on resistance as a function of drain current for all types.

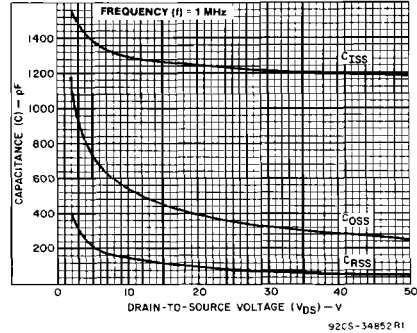


Fig. 9 - Capacitance as a function of drain-to-source voltage for all types.

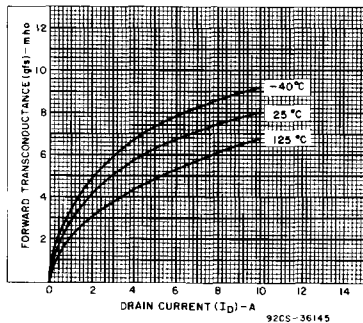


Fig. 10 - Typical forward transconductance as a function of drain current for all types.

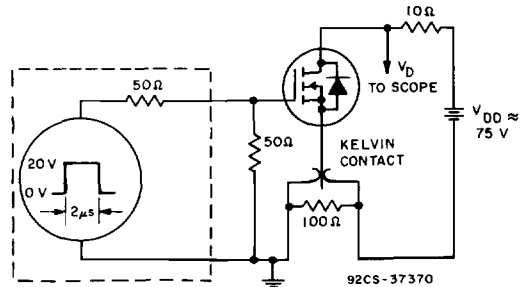


Fig. 11 - Switching Time Test Circuit

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N-CHANNEL
POWER MOSFETS