HARRIS

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

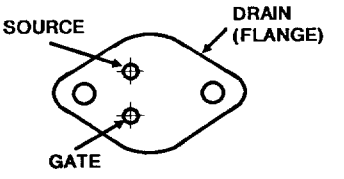
Description

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.

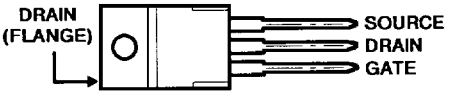
The RFM series types are supplied in the JEDEC TO-204AA steel package and the RFP series types in the JEDEC TO-220AB plastic package.

Packages

TO-204AA
BOTTOM VIEW

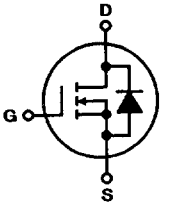


TO-220AB
TOP VIEW



Terminal Diagram

N-CHANNEL ENHANCEMENT MODE



Absolute Maximum Ratings ($T_C = 25^oC$) Unless Otherwise Specified

	RFM15N12	RFM15N15	RFP15N12	RFP15N15	UNITS
Drain-Source Voltage ..... V_{DSS}	120	150	120	150	V
Drain-Gate Voltage ($R_{GS} = 1m\Omega$) ..... 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					
$T_C = +25^oC$ ..... P_D	100	100	75	75	W
Above $T_C = +25^oC$, Derate Linearly	0.8	0.8	0.6	0.6	W/^{o}C
Operating and Storage Junction Temperature Range ..... T_J, T_{STG}	-55 to +150	-55 to +150	-55 to +150	-55 to +150	^{o}C

CAUTION: These devices are sensitive to electrostatic discharge. Proper I.C. handling procedures should be followed.

File Number **1443**

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 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					
		V_{DS} = 100 V	—	50	—	—	
		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 = 7.5 A V_{GS} = 10 V	—	1.125	—	1.125	V
		I_D = 15 A V_{GS} = 10 V	—	3	—	3	
Static Drain-Source On Resistance	$r_{DS}(on)$[a]	I_D = 7.5 A V_{GS} = 10 V	—	0.15	—	0.15	Ω
Forward Transconductance	g_{fs}[a]	V_{DS} = 10 V I_D = 7.5 A	5	—	5	—	mho
Input Capacitance	C_{iss}	V_{DS} = 25 V V_{GS} = 0 V f = 1MHz	—	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 V I_D = 7.5 A R_{gen} = R_{gs} = 50 Ω V_{GS} = 10 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	RθJC	RFM15N12, RFM15N15	—	1.25	—	1.25	°C/W
		RFP15N12, RFP15N15	—	1.67	—	1.67	

[a]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 A	—	1.4	—	1.4	V
Reverse Recovery Time	t_{rr}	I_F=4 A d_{IF}/d_t=100 A/μs	200(typ)		200(typ)		ns

*Pulse Test: Width ≤ 300 μs, duty cycle ≤ 2%.

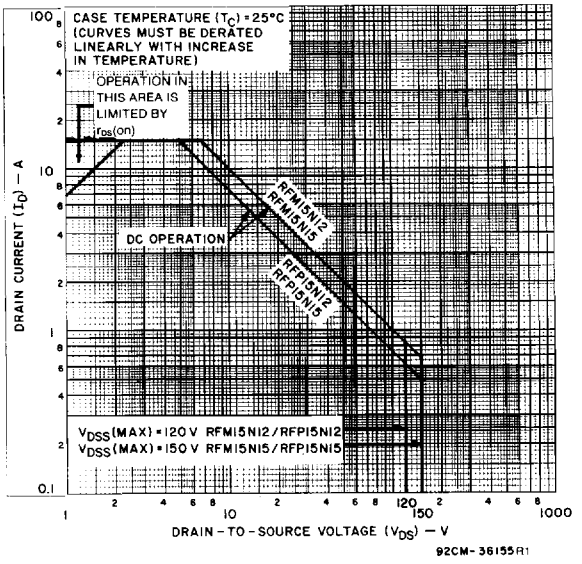


Fig. 1 — Maximum operating areas for all types.

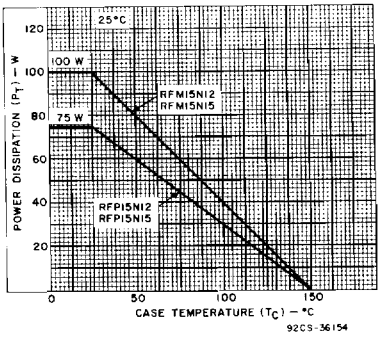


Fig. 2 — Power dissipation vs. case temperature derating curve for all types.

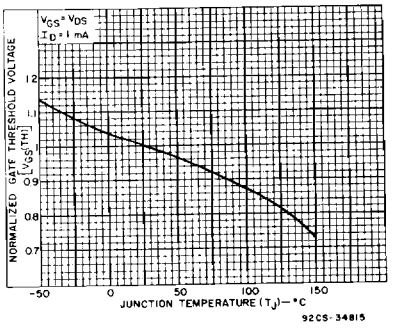


Fig. 3 — Typical normalized gate threshold voltage as a function of junction temperature for all types.

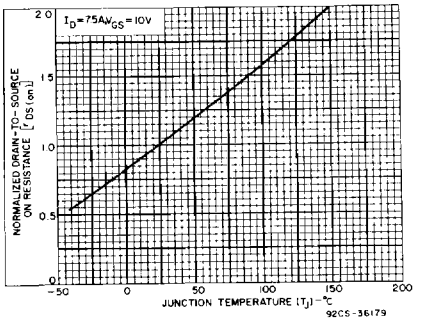


Fig. 4 - Normalized drain-to-source on resistance to junction temperature for all types.

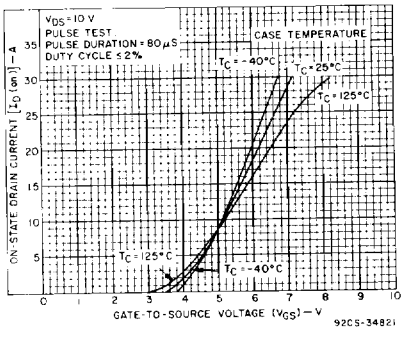


Fig. 5 — Typical transfer characteristics for all types.

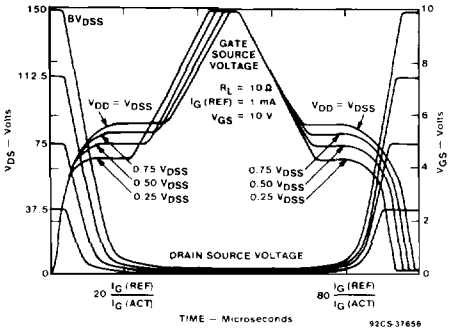


Fig. 6 - Normalized switching waveforms for constant gate-current. Refer to Harris application notes AN-7254 and AN-7260.

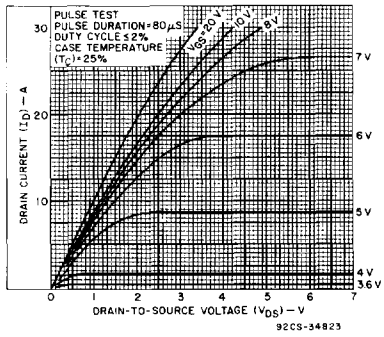


Fig. 7 — Typical saturation characteristics for all types.

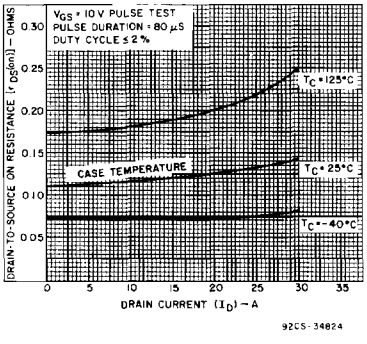


Fig. 8 - Typical drain-to-source on resistance as a function of drain current for all types.

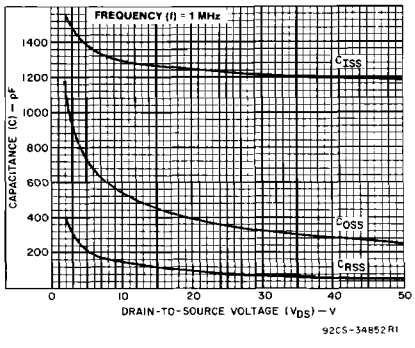


Fig. 9 — Capacitance as a function of drain-to-source voltage for all types.

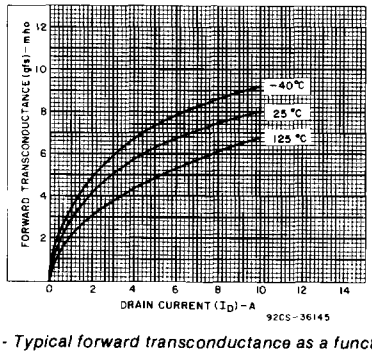


Fig. 10 - Typical forward transconductance as a function of drain current for all types.

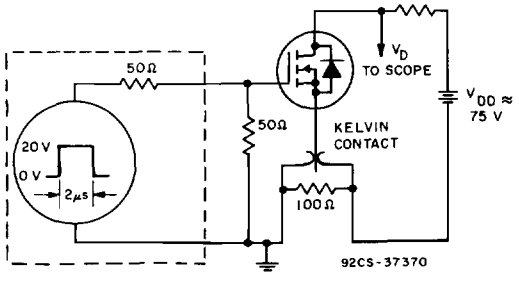


Fig. 11 — Switching Time Test Circuit