

August 1991

Features

- 10A, 120V and 150V
- $r_{DS(on)} = 0.3\Omega$
- SOA is Power-Dissipation Limited
- Nanosecond Switching Speeds
- Linear Transfer Characteristics
- High Input Impedance
- Majority Carrier Device

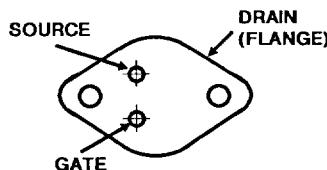
Description

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.

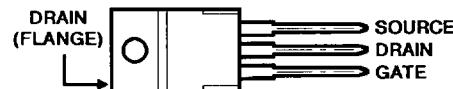
Packages

TO-204AA



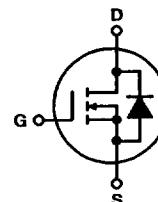
TO-220AB

TOP VIEW



Terminal Diagram

N-CHANNEL ENHANCEMENT MODE



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

	RFM10N12	RFM10N15	RFP10N12	RFP10N15	UNITS
Drain-Source Voltage	V_{DSS}	120	150	120	150
Drain-Gate Voltage ($R_{GS} = 1m\Omega$)	V_{DGR}	120	150	120	150
Continuous Drain Current					
RMS Continuous	I_D	10	10	10	A
Pulsed Drain Current	I_{DM}	25	25	25	A
Gate-Source Voltage	V_{GS}	± 20	± 20	± 20	V
Maximum Power Dissipation					
$T_C = +25^\circ C$	P_D	75	75	60	W
Above $T_C = +25^\circ C$, Derate Linearly		0.6	0.6	0.48	$W/^\circ C$
Operating and Storage Junction	T_J, T_{STG}	-55 to +150	-55 to +150	-55 to +150	$^\circ C$
Temperature Range					

Specifications RFM10N12, RFM10N15, RFP10N12, RFP10N15

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

CHARACTERISTICS	SYMBOL	TEST CONDITIONS	LIMITS				UNITS	
			RFM10N12		RFM10N15			
			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_{GTH}	$V_{GS} = V_{DS}$ $I_D = 2 \text{ mA}$	2	4	2	4	V	
Zero Gate Voltage Drain Current	I_{DSS}	$V_{DS} = 100 \text{ V}$	—	1	—	—	μA	
		$V_{DS} = 120 \text{ V}$	—	—	—	1		
		$T_c = 125^\circ\text{C}$	—	—	—	—		
		$V_{DS} = 100 \text{ V}$ $V_{DS} = 120 \text{ V}$	—	50	—	—		
Gate-Source Leakage Current	I_{GSS}	$V_{GS} = \pm 20 \text{ V}$ $V_{DS} = 0$	—	100	—	100	nA	
Drain-Source On Voltage	$V_{DS(on)}^*$	$I_D = 5 \text{ A}$ $V_{GS} = 10 \text{ V}$	—	1.5	—	1.5	V	
		$I_D = 10 \text{ A}$ $V_{GS} = 10 \text{ V}$	—	4	—	4		
Static Drain-Source On Resistance	$r_{DS(on)}$	$I_D = 5 \text{ A}$ $V_{GS} = 10 \text{ V}$	—	0.3	—	0.3	Ω	
Forward Transconductance	g_{fs}^a	$V_{DS} = 10 \text{ V}$ $I_D = 5 \text{ A}$	2	—	2	—	mho	
Input Capacitance Output Capacitance Reverse Transfer Capacitance	C_{iss} C_{oss} C_{rss}	$V_{DS}=25 \text{ V}$	—	850	—	850	pF	
		$V_{GS} = 0 \text{ V}$	—	230	—	230		
		$f = 1 \text{ MHz}$	—	100	—	100		
Turn-On Delay Time Rise Time Turn-Off Delay Time Fall Time	$t_d(\text{on})$ t_r $t_d(\text{off})$ t_f	$V_{DD}=75 \text{ V}$ $I_D = 5 \text{ A}$	40(typ.) 165(typ.)	60 250	40(typ.) 165(typ.)	60 250	ns	
		$R_{gen} = R_{gs} = 50 \Omega$	90(typ.)	135	90(typ.)	135		
		$V_{GS} = 10 \text{ V}$	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 μs max., duty cycle = 2%.

SOURCE-DRAIN DIODE RATINGS AND CHARACTERISTICS

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

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

RFM10N12, RFM10N15, RFP10N12, RFP10N15

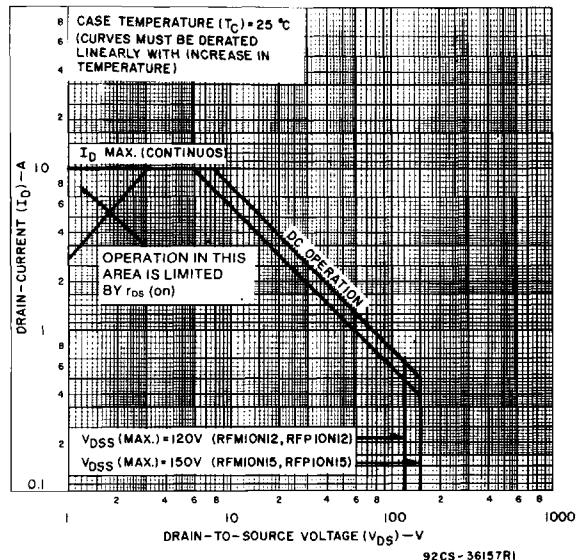


Fig. 1 — Maximum safe operating areas for all types.

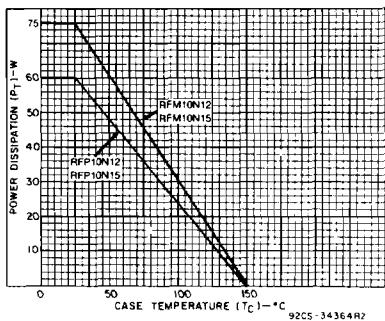


Fig. 2 — Power vs. temperature derating curve for all types.

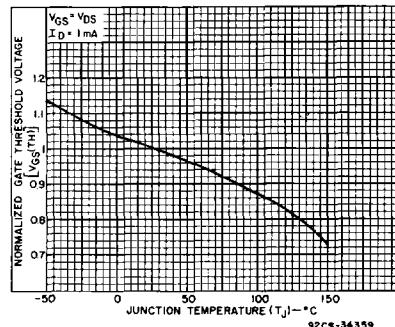


Fig. 3 — Typical normalized gate threshold voltage as a function of junction temperature for all types.

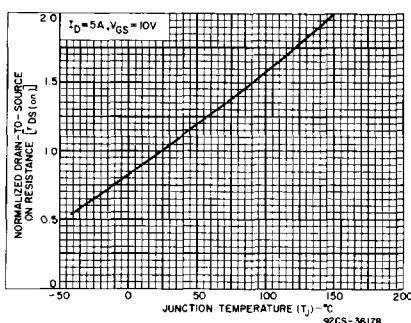


Fig. 4 — Normalized drain-to-source on resistance to junction temperature for all types.

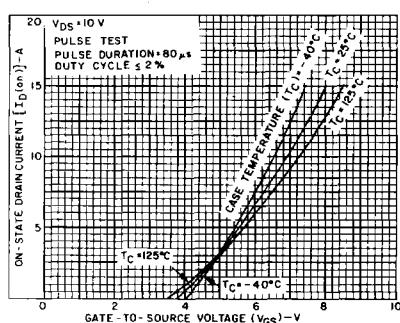


Fig. 5 — Typical transfer characteristics for all types.

RFM10N12, RFM10N15, RFP10N12, RFP10N15

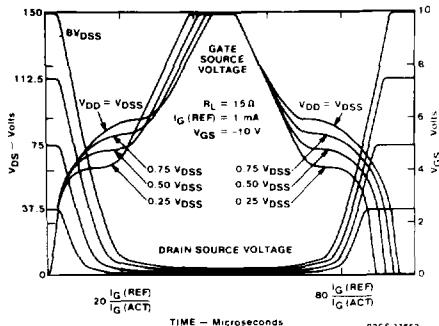


Fig. 6 - Normalized switching waveforms for constant gate-current.
Refer to Harris application notes AN-7254 and AN-7260

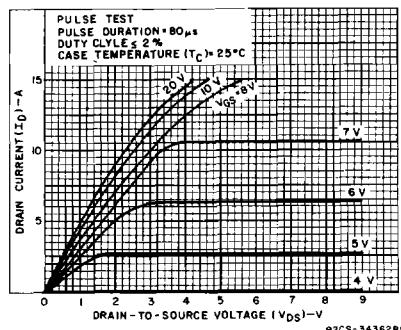


Fig. 7 — Typical saturation characteristics for all types.

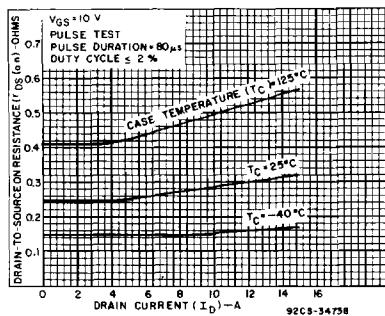


Fig. 8 - Typical drain-to-source on resistance as a function drain current for all types.

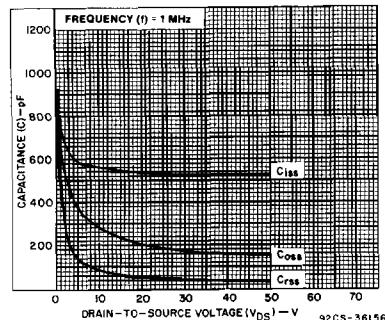


Fig. 9 — Capacitance as a function of drain-to-source voltage for all types.

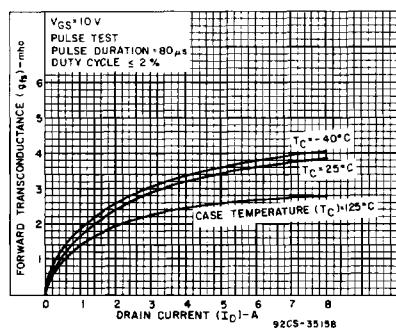


Fig. 10 - Typical forward transconductance as a function of drain current for all types.

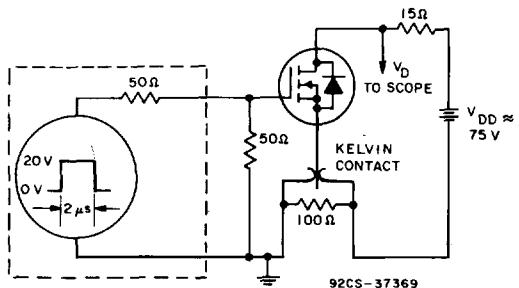


Fig. 11 — Switching Time Test Circuit