

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

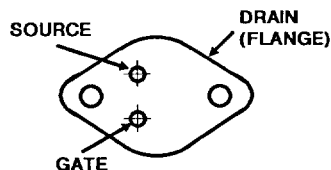
Description

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.

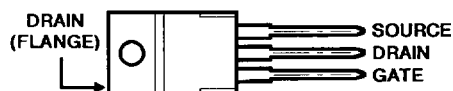
The RFM-types are supplied in the JEDEC TO-204AA steel package and the RFP-types in the JEDEC TO-220AB plastic package.

Packages

TO-204AA

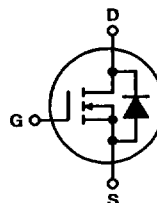


TO-220AB
TOP VIEW



Terminal Diagram

N-CHANNEL ENHANCEMENT MODE



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

	RFM10N12	RFM10N15	RFP10N12	RFP10N15	UNITS	
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
Continuous Drain Current						
RMS Continuous	I_D	10	10	10	10	A
Pulsed Drain Current	I_{DM}	25	25	25	25	A
Gate-Source Voltage	V_{GS}	± 20	± 20	± 20	± 20	V
Maximum Power Dissipation						
$T_C = +25^\circ\text{C}$	P_D	75	75	60	60	W
Above $T_C = +25^\circ\text{C}$, Derate Linearly		0.6	0.6	0.48	0.48	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 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 mA V _{GS} = 0	120	—	150	—	V
Gate Threshold Voltage	V _{GS(th)}	V _{GS} = V _{DS} I _D = 2 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	—	50	—	—	
		V _{DS} = 100 V 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 = 5 A V _{GS} = 10 V	—	1.5	—	1.5	V
		I _D = 10 A V _{GS} = 10 V	—	4	—	4	
Static Drain-Source On Resistance	r _{DS(on)} ^a	I _D = 5 A V _{GS} = 10 V	—	0.3	—	0.3	Ω
Forward Transconductance	g _{fs} ^a	V _{DS} = 10 V I _D = 5 A	2	—	2	—	mho
Input Capacitance	C _{iss}	V _{DS} =25 V	—	850	—	850	pF
Output Capacitance	C _{oss}	V _{GS} = 0 V	—	230	—	230	
Reverse Transfer Capacitance	C _{rss}	f = 1MHz	—	100	—	100	
Turn-On Delay Time	t _{d(on)}	V _{DD} =75 V	40(typ.)	60	40(typ.)	60	ns
Rise Time	t _r	I _D = 5 A	165(typ.)	250	165(typ.)	250	
Turn-Off Delay Time	t _{d(off)}	R _{gen} = R _{gs} = 50 Ω	90(typ.)	135	90(typ.)	135	
Fall Time	t _f	V _{GS} = 10 V	90(typ.)	135	90(typ.)	135	
Thermal Resistance Junction-to-Case	RθJC	RFM10N12, RFM10N15	—	1.67	—	1.67	°C/W
		RFP10N12, RFP10N15	—	2.083	—	2.083	

^aPulsed: Pulse duration = 300 μs 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 A	—	1.4	—	1.4	V
Reverse Recovery Time	t _{rr}	I _F =4 A d _I F/d _t =100 A/μs	200(typ)		200(typ)		ns

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

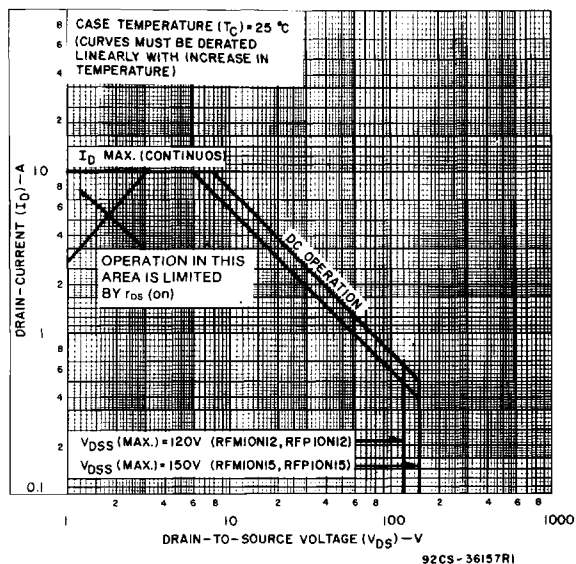


Fig. 1 — Maximum safe operating areas for all types.

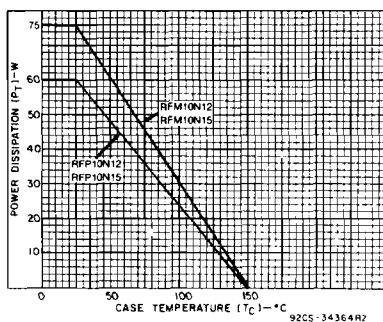


Fig. 2 — Power vs. temperature derating curve for all types.

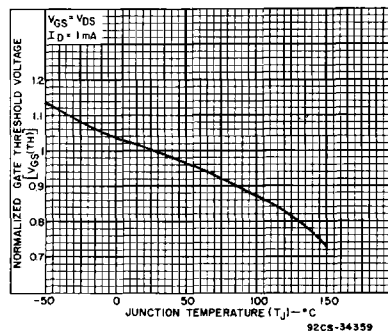


Fig. 3 — Typical normalized gate threshold voltage as a function of junction temperature for all types.

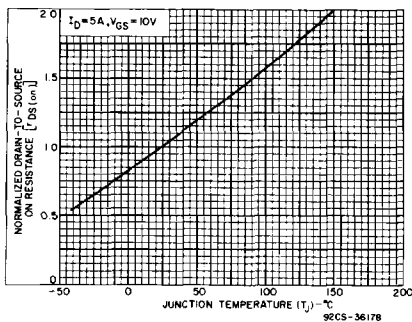


Fig. 4 — Normalized drain-to-source on resistance to junction temperature for all types.

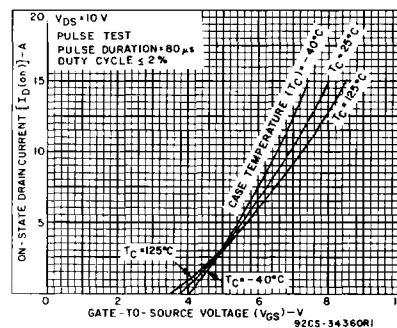


Fig. 5 — Typical transfer characteristics for all types.

RFM10N12, RFM10N15, RFP10N12, RFP10N15

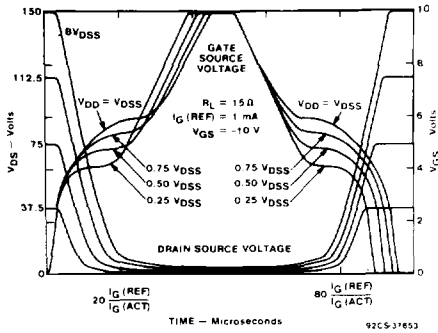


Fig. 6 - Normalized switching waveforms for constant gate-current. Refer to Harris application notes AN-7254 and AN-7260

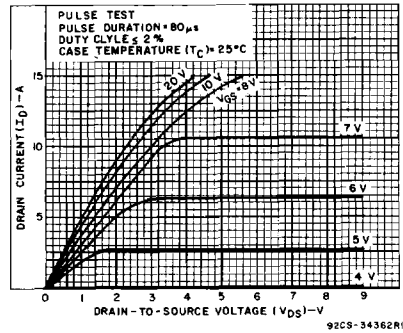


Fig. 7 - Typical saturation characteristics for all types.

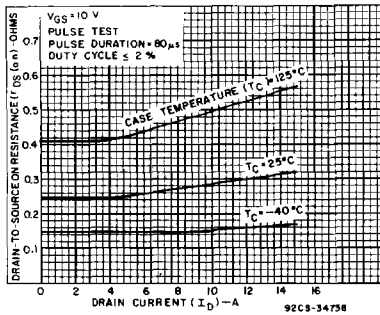


Fig. 8 - Typical drain-to-source on resistance as a function drain current for all types.

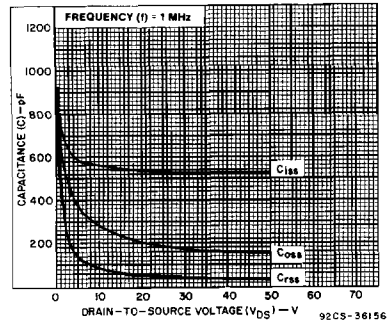


Fig. 9 - Capacitance as a function of drain-to-source voltage for all types.

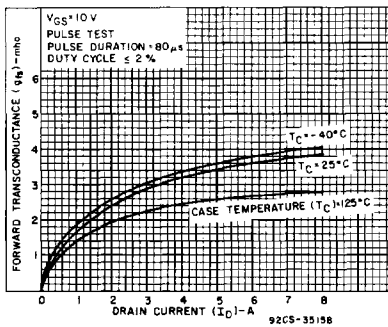


Fig. 10 - Typical forward transconductance as a function of drain current for all types.

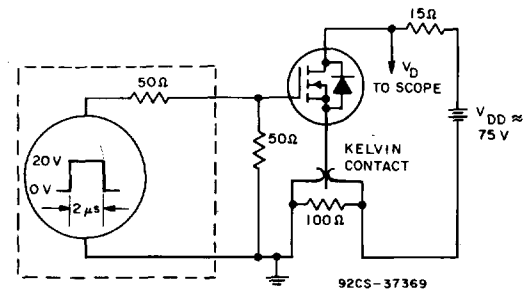


Fig. 11 - Switching Time Test Circuit