

RFM10P12/10P15 RFP10P12/10P15

P-Channel Enhancement-Mode Power Field-Effect Transistors

August 1991

Features

- -10A, -120V and -150V
- $r_{DS(on)} = 0.5\Omega$
- SOA is Power-Dissipation Limited
- Nanosecond Switching Speeds
- Linear Transfer Characteristics
- High Input Impedance
- Majority Carrier Device

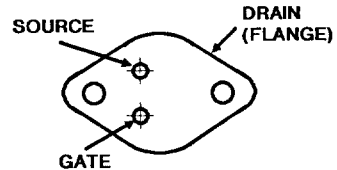
Description

The RFM10P12 and RFM10P15 and the RFP10P12 and RFP10P15 are p-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.

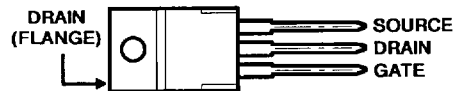
The RFM series types are supplied in the JEDEC TO-204AA steel package and the RFP series types in the JEDEC TO-220AB plastic package.

Packages

TO-204AA
BOTTOM VIEW

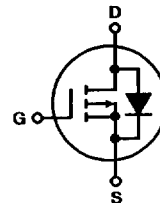


TO-220AB
TOP VIEW



Terminal Diagram

P-CHANNEL ENHANCEMENT MODE



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

	RFM10P12	RFM10P15	RFP10P12	RFP10P15	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}	30	30	30	30	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 RFM10P12, RFM10P15, RFP10P12, RFP10P15

ELECTRICAL CHARACTERISTICS, At Case Temperature ($T_c = 25^\circ\text{C}$) unless otherwise specified

CHARACTERISTIC	SYMBOL	TEST CONDITIONS	LIMITS				UNITS
			RFM10P12 RFP10P12		RFM10P15 RFP10P15		
			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}	$V_{DS} = -100\text{ V}$ $V_{DS} = -120\text{ V}$ $T_c = 125^\circ\text{C}$	—	1	—	—	μA
		$V_{DS} = -100\text{ V}$ $V_{DS} = -120\text{ V}$	—	50	—	50	
Gate-Source Leakage Current	I_{GSS}	$V_{GS} = \pm 20\text{ V}$ $V_{DS} = 0$	—	100	—	100	nA
Drain-Source On Voltage	$V_{DS(on)}^a$	$I_D = 5\text{ A}$ $V_{GS} = -10\text{ V}$	—	-2.5	—	-2.5	V
		$I_D = 10\text{ A}$ $V_{GS} = -10\text{ V}$	—	-6.0	—	-6.0	
Static Drain-Source On Resistance	$r_{DS(on)}^a$	$I_D = 5\text{ A}$ $V_{GS} = -10\text{ V}$	—	0.5	—	0.5	Ω
Forward Transconductance	g_{fs}^a	$V_{DS} = -10\text{ V}$ $I_D = 5\text{ A}$	2	—	2	—	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}		—	600	—	600	
Reverse Transfer Capacitance	C_{rss}		—	350	—	350	
Turn-On Delay Time	$t_{d(on)}$	$R_{gen} = R_{gs} = 50\ \Omega$ $V_{DS} = -75\text{ V}$ $I_D = 5\text{ A}$ $V_{GS} = -10\text{ V}$	24(typ)	50	24(typ)	50	ns
Rise Time	t_r		74(typ)	150	74(typ)	150	
Turn-Off Delay Time	$t_{d(off)}$		138(typ)	225	138(typ)	225	
Fall Time	t_f		61(typ)	100	61(typ)	100	
Thermal Resistance Junction-to-Case	$R\theta_{JC}$	RFM10P12, RFM10P15	—	1.25	—	1.25	$^\circ\text{C/W}$
		RFP10P12, RFP10P15	—	1.67	—	1.67	

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SOURCE-DRAIN DIODE RATINGS AND CHARACTERISTICS

CHARACTERISTIC	SYMBOL	TEST CONDITIONS	LIMITS				UNITS
			RFM10P12 RFP10P12		RFM10P15 RFP10P15		
			MIN.	MAX.	MIN.	MAX.	
Diode Forward Voltage	V_{SD}^a	$I_{SD} = 5\text{ A}$	—	1.4	—	1.4	V
Reverse Recovery Time	t_{rr}	$I_f = 4\text{ A}$, $dI_f/dt = 100\text{ A}/\mu\text{s}$	210 (typ.)		210 (typ.)		ns

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

RFM10P12, RFM10P15, RFP10P12, RFP10P15

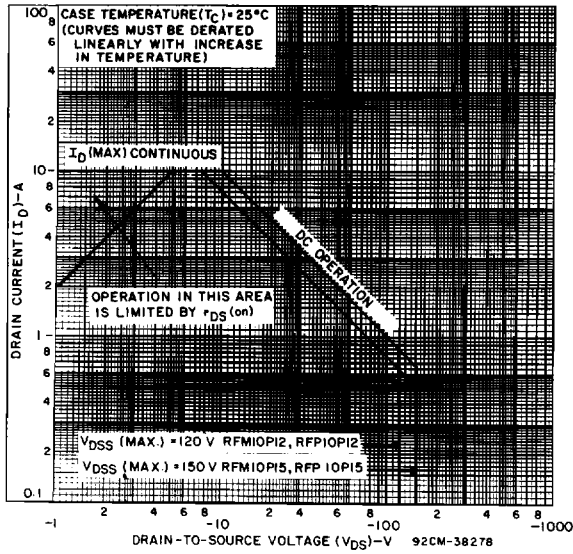


Fig. 1 - Maximum safe operating areas for all types.

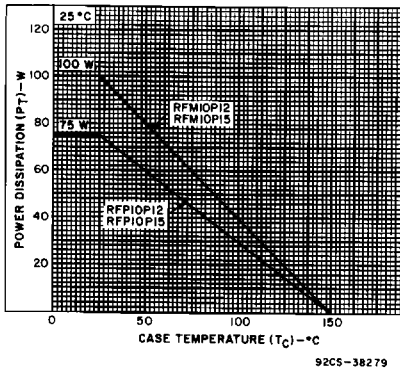


Fig. 2 - Power dissipation vs. case temperature derating curve for all types.

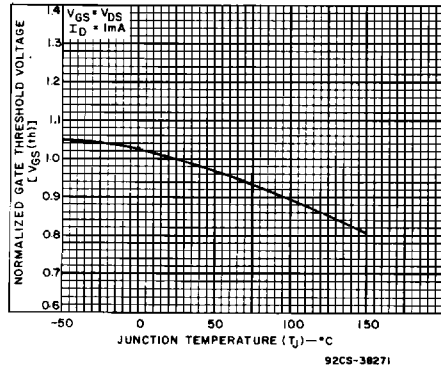


Fig. 3 - Typical normalized gate threshold voltage as a function of junction temperature for all types.

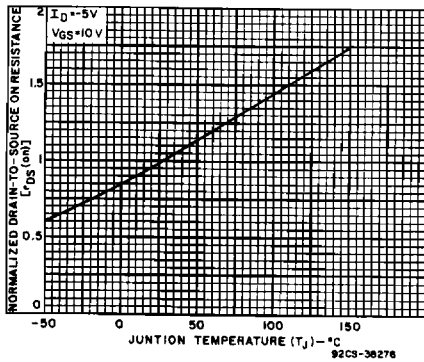


Fig. 4 - Normalized drain-to-source on resistance as a function of junction temperature for all types.

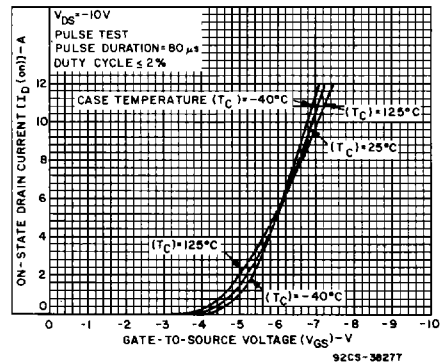


Fig. 5 - Typical transfer characteristics for all types.

RFM10P12, RFM10P15, RFP10P12, RFP10P15

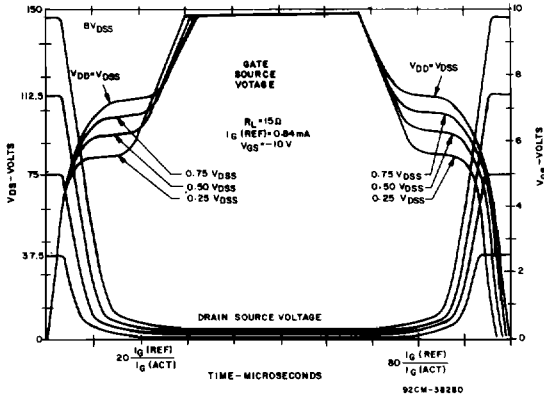


Fig. 6 - Normalized switching waveforms for constant gate-current. Refer to Harris application notes AN-7254 and AN-7260.

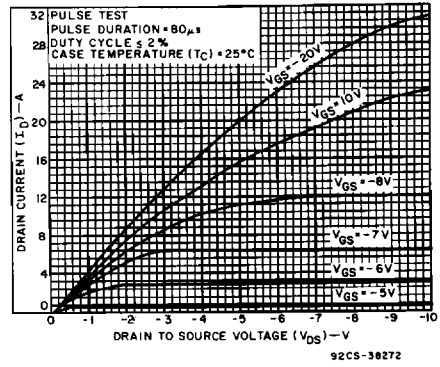


Fig. 7 - Typical saturation characteristics for all types.

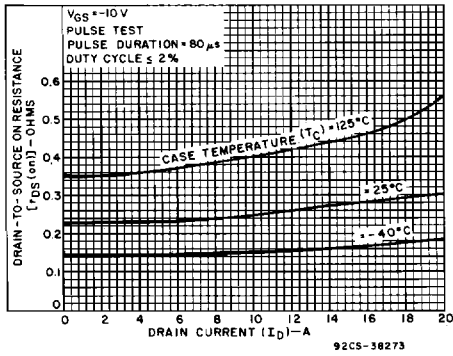


Fig. 8 - Typical drain-to-source on resistance as a function of drain current for all types.

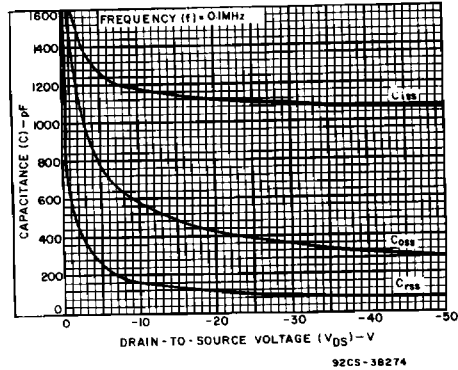


Fig. 9 - Capacitance as a function of drain-to-source voltage for all types.

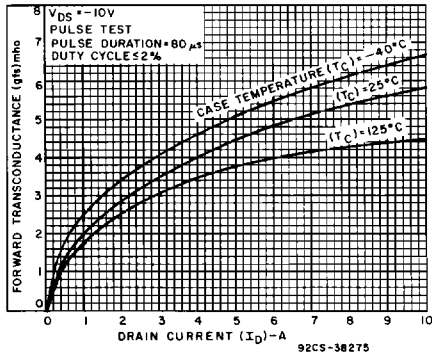


Fig. 10 - Typical forward transconductance as a function of drain current for all types.

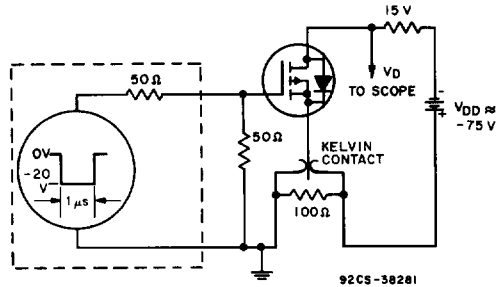


Fig. 11 - Switching Time Test Circuit.

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