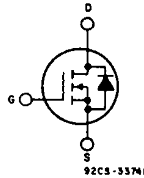
N-Channel Enhancement-Mode Power Field-Effect Transistors

10 A, 120 V — 150 V

r_{DS}(on): 0.3 Ω

Features:

- *SOA is power-dissipation limited*
- *Nanosecond switching speeds*
- *Linear transfer characteristics*
- *High input impedance*
- *Majority carrier device*



N-Channel Enhancement Mode

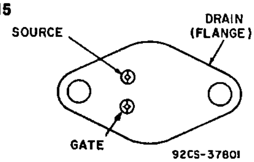
The RFM10N12 and RFM10N15 and the RFP10N12 and RFP10N15* are n-channel enhancement-mode silicon-gate power field-effect transistors designed for applications such as switching regulators, switching converters, motor drivers, relay drivers, and drivers for high-power bipolar switching transistors requiring 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.

*The RFM and RFP series were formerly RCA developmental numbers TA9192 and TA9212, respectively.

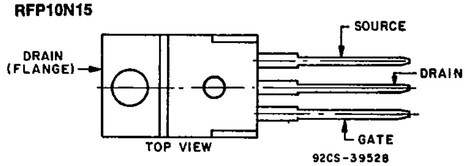
TERMINAL DESIGNATIONS

RFM10N12
RFM10N15



JEDEC TO-204AA

RFP10N12
RFP10N15



JEDEC TO-220AB

MAXIMUM RATINGS, *Absolute-Maximum Values (T_C=25° C):*

		RFM10N12	RFM10N15		RFP10N12	RFP10N15	
DRAIN-SOURCE VOLTAGE	V_{DSS}	120	150		120	150	V
DRAIN-GATE VOLTAGE (R_{gs}=1 MΩ) ...	V_{DGR}	120	150		120	150	V
GATE-SOURCE VOLTAGE	V_{GS}			±20			V
DRAIN CURRENT, RMS Continuous	I_D			10			A
Pulsed	I_{DM}			25			A
POWER DISSIPATION @ T_C=25°C	P_T	75	75		60	60	W
Derate above T_C=25°C		0.6	0.6		0.48	0.48	W/°C
OPERATING AND STORAGE TEMPERATURE	T_j, T_{stg}			-55 to +150			°C

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

CHARACTERISTICS	SYMBOL	TEST CONDITIONS	LIMITS RFM10N12 RFP10N12 MIN.	MAX.	LIMITS RFM10N15 RFP10N15 MIN.	MAX.	UNITS
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	
		$T_C = 125°C$, $V_{DS} = 100$ V	—	50	—	—	
		$V_{DS} = 120$ V	—	—	—	50	
Gate-Source Leakage Current	I_{GSS}	$V_{GS} = \pm 20$ 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	—	650	—	650	pF
Output Capacitance	C_{oss}	$V_{GS} = 0$ V	—	230	—	230	
Reverse Transfer Capacitance	C_{rss}	f = 1MHz.	—	60	—	60	
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	$t_d(off)$	$R_{gen} = R_{gs} = 50\ \Omega$	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	$R\theta JC$	RFM10N12, RFM10N15	—	1.67	—	1.67	°C/W
		RFP10N12, RFP10N15	—	2.083	—	2.083	

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

SOURCE-DRAIN DIODE RATINGS AND CHARACTERISTICS

CHARACTERISTIC	SYMBOL	TEST CONDITIONS	LIMITS RFM10N12 RFP10N12 MIN.	MAX.	LIMITS RFM10N15 RFP10N15 MIN.	MAX.	UNITS
Diode Forward Voltage	V_{SD}	I_{SD}=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

[a] Pulse Test: Width ≤ 300 μs, Duty Cycle ≤ 2%.

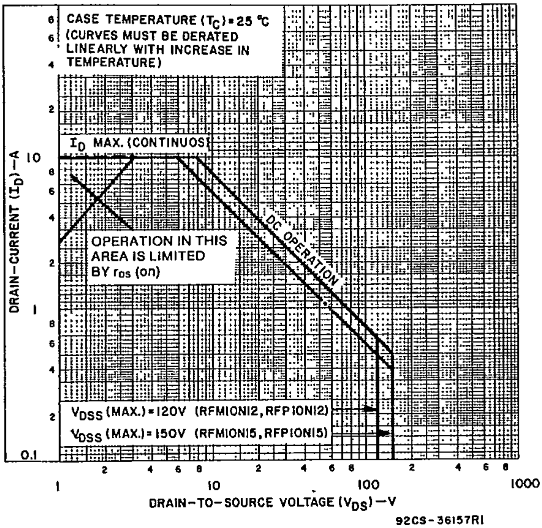


Fig. 1 — Maximum safe operating areas for all types.

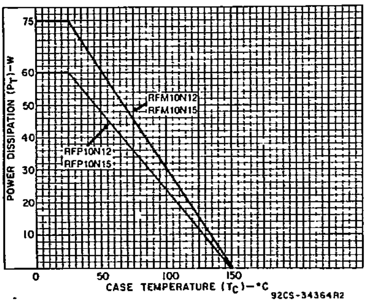


Fig. 2 — Power vs. temperature derating curve for all types.

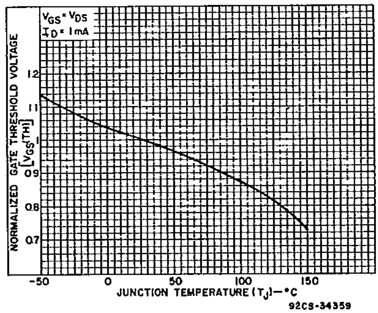


Fig. 3 — Typical normalized gate threshold voltage as a function of junction temperature for all types.

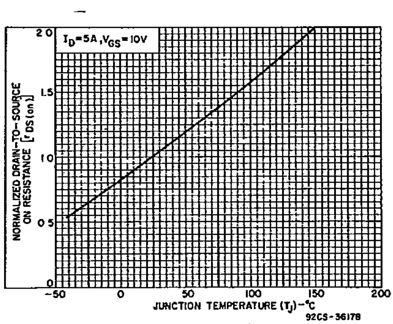


Fig. 4 - Normalized drain-to-source on resistance to junction temperature for all types.

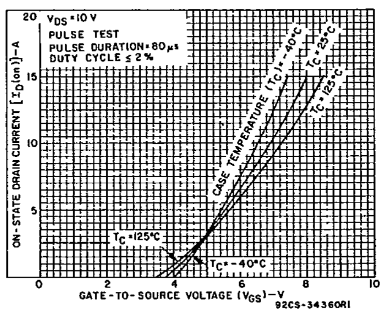


Fig. 5 — Typical transfer characteristics for all types.

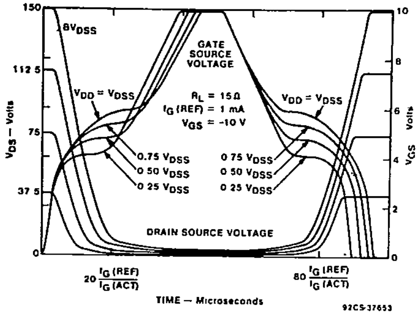


Fig. 6 - Normalized switching waveforms for constant gate-current drive.

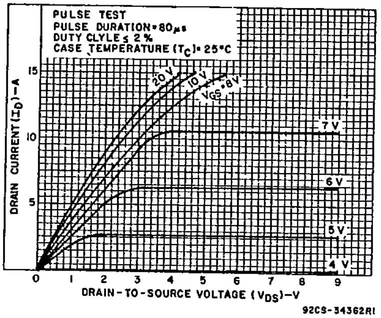


Fig. 7 — Typical saturation characteristics for all types.

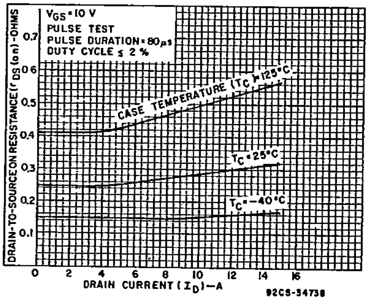


Fig. 8 - Typical drain-to-source on resistance as a function drain current for all types.

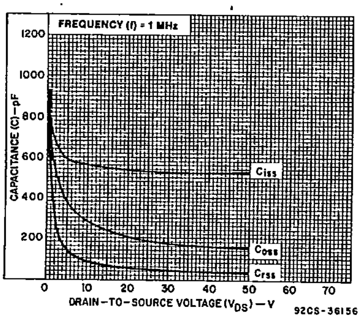


Fig. 9 — Capacitance as a function of drain-to-source voltage for all types.

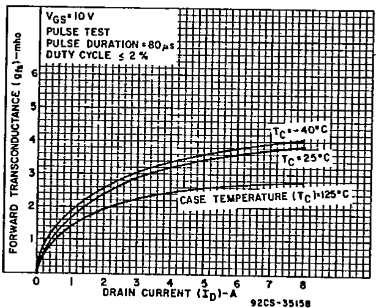


Fig. 10 - Typical forward transconductance as a function of drain current for all types.

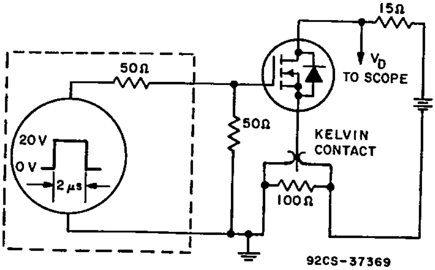


Fig. 11 — Switching Time Test Circuit