

Power MOS Field-Effect Transistors

N-Channel Enhancement-Mode
Power Field-Effect Transistors

4 A, 350 V and 400 V
 $r_{DS(on)}$: 2Ω

Features:

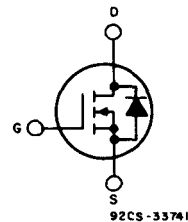
- SOA is power-dissipation limited
- Nanosecond switching speeds
- Linear transfer characteristics
- High input impedance
- Majority carrier device

The RFM4N35 and RFM4N40 and the RFP4N35 and RFP4N40* 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.

*The RFM and RFP series were formerly RCA developmental numbers TA9393 and TA9394, respectively.

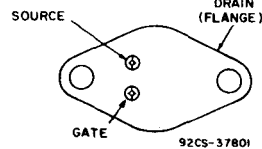
TERMINAL DIAGRAM



N-CHANNEL ENHANCEMENT MODE

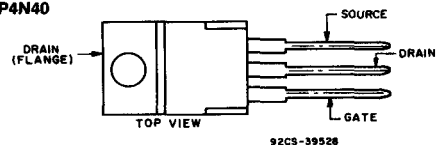
TERMINAL DESIGNATIONS

RFM4N35
RFM4N40



RFP4N35
RFP4N40

JEDEC TO-204AA



JEDEC TO-220AB

MAXIMUM RATINGS, Absolute-Maximum Values ($T_C=25^\circ\text{C}$):

	RFM4N35	RFM4N40		RFP4N35	RFP4N40	
DRAIN-SOURCE VOLTAGE	V_{DS}	350	400	350	400	V
DRAIN-GATE VOLTAGE ($R_{GS}=1\text{ M}\Omega$) ...	V_{DGR}	350	400	350	400	V
GATE-SOURCE VOLTAGE	V_{GS}					V
DRAIN CURRENT, RMS Continuous	I_D					A
Pulsed	I_{DM}					A
POWER DISSIPATION @ $T_C=25^\circ\text{C}$	P_T	7.5	7.5	60	60	W
Derate above $T_C=25^\circ\text{C}$		0.6	0.6	0.48	0.48	W/ $^\circ\text{C}$
OPERATING AND STORAGE TEMPERATURE	T_J, T_{stg}		-55 to +150			$^\circ\text{C}$

RFM4N35, RFM4N40, RFP4N35, RFP4N40ELECTRICAL CHARACTERISTICS, At Case Temperature (T_c) 25° C unless otherwise specified.

CHARACTERISTICS	SYMBOL	TEST CONDITIONS	LIMITS				UNITS
			RFM4N35 RFP4N35		RFM4N40 RFP4N40		
			MIN.	MAX.	MIN.	MAX.	
Drain-Source Breakdown Voltage	BV _{DSS}	I _D =1 mA V _{GS} =0	350	—	400	—	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} =280 V V _{DS} =320 V	—	10	—	—	μA
		T _C =125° C V _{DS} =280 V V _{DS} =320 V	—	100	—	—	
			—	—	—	100	
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 =2 A V _{GS} =10 V	—	4	—	4	V
		I _D =4 A V _{GS} =10 V	—	12	—	12	
Static Drain-Source On Resistance	r _{DS(on)} ^a	I _D =2 A V _{GS} =10 V	—	2	—	2	Ω
Forward Transconductance	g _{fs} ^a	V _{DS} =10 V I _D =2 A	1	—	1	—	mho
Input Capacitance	C _{iss}	V _{DS} =25 V V _{GS} =0 V f=1 MHz	—	750	—	750	pF
Output Capacitance	C _{oss}		—	150	—	150	
Reverse Transfer Capacitance	C _{rss}		—	100	—	100	
Turn-On Delay Time	t _{d(on)}	V _{DD} =200 V I _D =2 A R _{gen} =R _{gs} =50 Ω V _{GS} =10 V	12(typ)	45	12(typ)	45	ns
Rise Time	t _r		42(typ)	60	42(typ)	60	
Turn-Off Delay Time	t _{d(off)}		130(typ)	200	130(typ)	200	
Fall Time	t _f		62(typ)	100	62(typ)	100	
Thermal Resistance Junction-to-Case	Rθ _C	RFM4N35, RFM4N40	—	1.67	—	1.67	°C/W
		RFP4N35, RFP4N40	—	2.083	—	2.083	

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SOURCE-DRAIN DIODE RATINGS AND CHARACTERISTICS

CHARACTERISTIC	SYMBOL	TEST CONDITIONS	LIMITS				UNITS
			RFM4N35 RFP4N35		RFM4N40 RFP4N40		
			MIN.	MAX.	MIN.	MAX.	
Diode Forward Voltage	V_{SD}^a	$I_{SD}=2\text{ A}$	—	1.4	—	1.4	V
Reverse Recovery Time	t_r	$I_F=4\text{ A}$ $dI_F/dt=100\text{ A}/\mu\text{s}$	800(typ)		800(typ)		ns

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

RFM4N35, RFM4N40, RFP4N35, RFP4N40

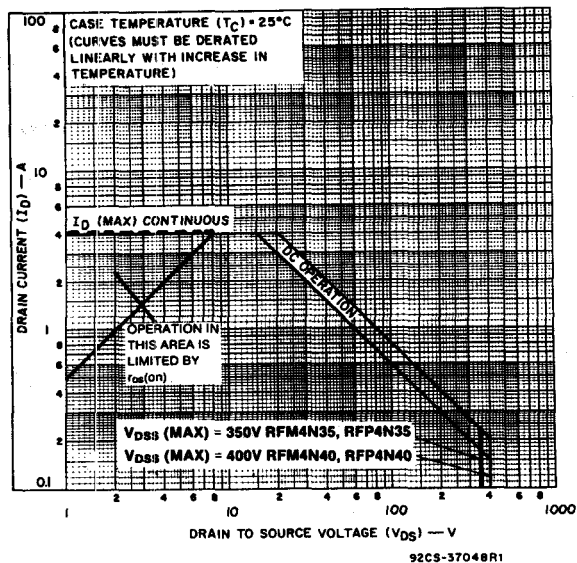


Fig. 1 — Maximum operating areas for all types.

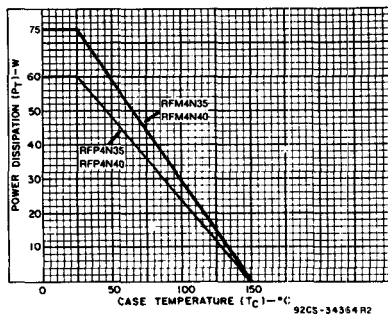


Fig. 2 — Power dissipation vs. temperature derating curve for all types.

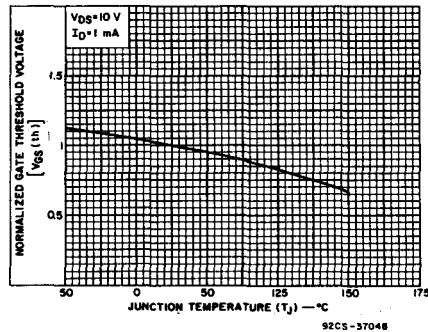


Fig. 3 — Typical normalized gate threshold voltage as a function of junction temperature for all types.

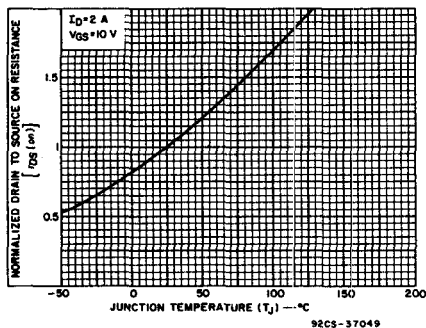


Fig. 4 — Normalized drain-to-source on resistance to junction temperature for all types.

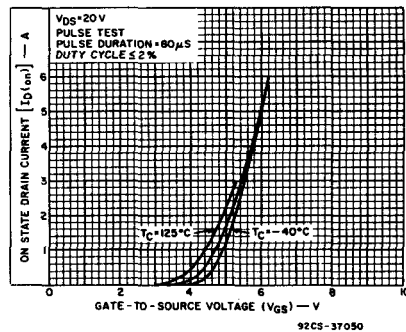


Fig. 5 — Typical transfer characteristics for all types.

RFM4N35, RFM4N40, RFP4N35, RFP4N40

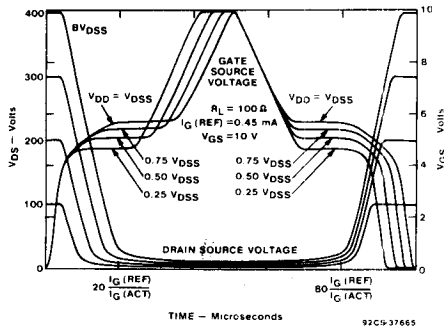


Fig. 6 - Normalized switching waveforms for constant gate-current. Refer to RCA application notes AN-7254 and AN-7260.

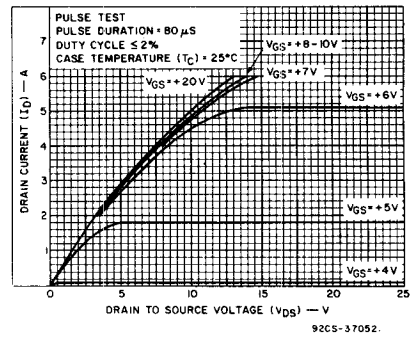


Fig. 7 - Typical saturation characteristics for all types.

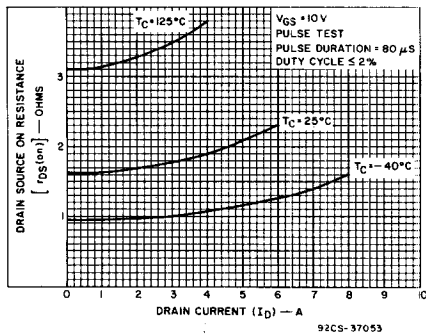


Fig. 8 - Typical drain-to-source on resistance as a function of drain current for all types.

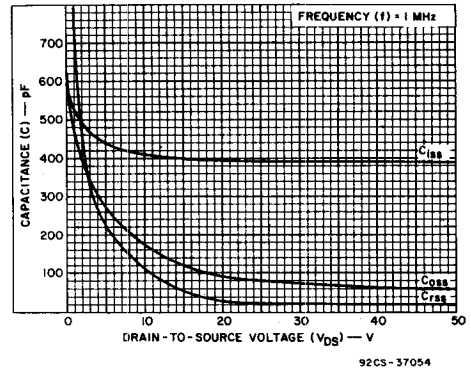


Fig. 9 - Capacitance as a function of drain-to-source voltage for all types.

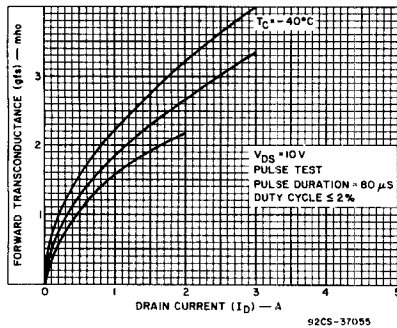


Fig. 10 - Typical forward transconductance as a function of drain current for all types.

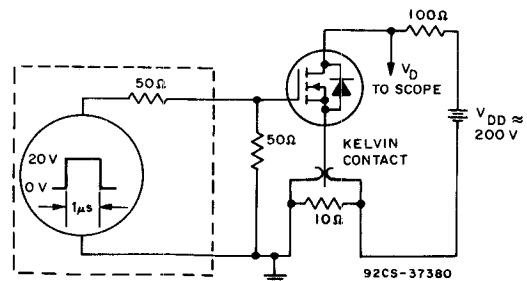


Fig. 11 - Switching Time Test Circuit