HARRIS

RFM7N35/7N40
RFP7N35/7N40

N-Channel Enhancement Mode Power Field Effect Transistors

August 1991

Features

- 7A, 350V and 400V
- $r_{DS(on)} = 0.75\Omega$
- SOA is Power-Dissipation Limited
- Nanosecond Switching Speeds
- Linear Transfer Characteristics
- High Input Impedance
- Majority Carrier Device

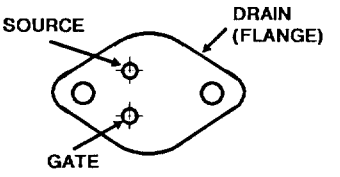
Description

The RFM7N35 and RFM7N40 and the RFP7N35 and RFP7N40 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.

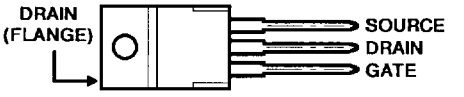
The RFM-series types are supplied in the JEDEC TO-204AA steel package and the RFP-series types in the JEDEC TO-220AB plastic package.

Packages

TO-204AA

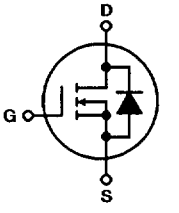


TO-220AB
TOP VIEW



Terminal Diagram

N-CHANNEL ENHANCEMENT MODE



Absolute Maximum Ratings ($T_C = 25^oC$), Unless Otherwise Specified

	RFM7N35	RFM7N40	RFP7N35	RFP7N40	UNITS
Drain-Source Voltage ..... V_{DSS}	350	400	350	400	V
Drain-Gate Voltage ($R_{GS} = 1m\Omega$) ..... V_{DGR}	350	400	350	400	V
Continuous Drain Current					
RMS Continuous ..... I_D	7	7	7	7	A
Pulsed Drain Current ..... I_{DM}	15	15	15	15	A
Gate-Source Voltage ..... V_{GS}	±20	±20	±20	±20	V
Maximum Power Dissipation					
$T_C = +25^oC$ ..... P_D	100	100	75	75	W
Above $T_C = +25^oC$, Derate Linearly	0.8	0.8	0.6	0.6	W/°C
Operating and Storage Junction Temperature Range ..... TJ, TSTG	-55 to +150	-55 to +150	-55 to +150	-55 to +150	°C

CAUTION: These devices are sensitive to electrostatic discharge. Proper I.C. handling procedures should be followed.

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

CHARACTERISTIC	SYMBOL	TEST CONDITIONS	LIMITS				UNITS
			RFM7N35 RFP7N35		RFM7N40 RFP7N40		
			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	—	1	—	—	μA
		V_{DS}=320 V	—	—	—	1	
		T_C=125°C V_{DS}=280 V	—	50	—	—	
		V_{DS}=320 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=3.5 A V_{GS}=10 V	—	2.63	—	2.63	V
		I_D=7 A V_{GS}=10 V	—	10	—	10	
Static Drain-Source On Resistance	$r_{DS}(on)$[a]	I_D=3.5 A V_{GS}=10 V	—	0.75	—	0.75	Ω
Forward Transconductance	g_{fs}[a]	V_{DS}=10 V I_D=3.5 A	2	—	2	—	mho
Input Capacitance	C_{iss}	V_{DS}=25 V	—	1600	—	1600	pF
Output Capacitance	C_{oss}	V_{GS}=0 V	—	300	—	300	
Reverse-Transfer Capacitance	C_{rss}	f= 1 MHz	—	200	—	200	
Turn-On Delay Time	$t_d(on)$	V_{DS}=200 V	16(typ)	45	16(typ)	45	ns
Rise Time	t_r	I_D=3.5 A	54(typ)	75	54(typ)	75	
Turn-Off Delay Time	$t_d(off)$	R_{gen}=R_{gs}=50 Ω	170(typ)	250	170(typ)	250	
Fall Time	t_f	V_{GS}=10 V	62(typ)	100	62(typ)	100	
Thermal Resistance Junction-to-Case	$R_{\theta JC}$	RFM7N35, RFM7N40	—	1.25	—	1.25	°C/W
		RFP7N35, RFP7N40	—	1.67	—	1.67	

SOURCE-DRAIN DIODE RATINGS AND CHARACTERISTICS

CHARACTERISTIC	SYMBOL	TEST CONDITIONS	LIMITS				UNITS
			RFM7N35 RFP7N35		RFM7N40 RFP7N40		
			Min.	Max.	Min.	Max.	
Diode Forward Voltage	V_{SD}[a]	I_{SD}=3.5 A	—	1.4	—	1.4	V
Reverse Recovery Time	t_{rr}	I_F=4 A di_F/dt=100 A/μs	870 (typ)				ns

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

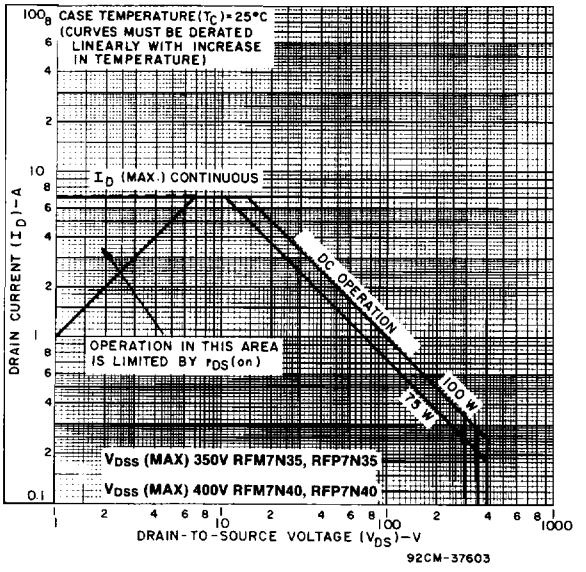

Fig. 1 - Maximum safe operating areas for all types.

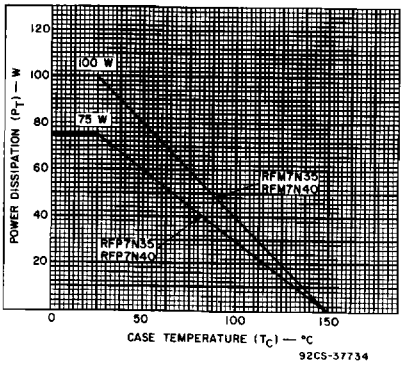

Fig. 2 - Power dissipation vs. case temperature derating curve for all types.

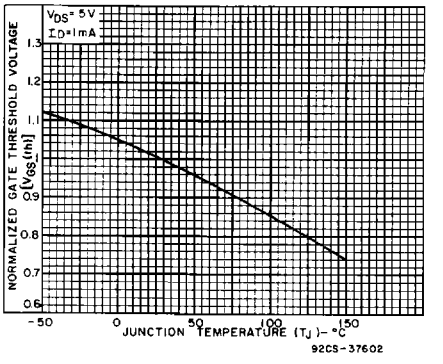

Fig. 3 - Typical normalized gate threshold voltage as a function of junction temperature for all types.

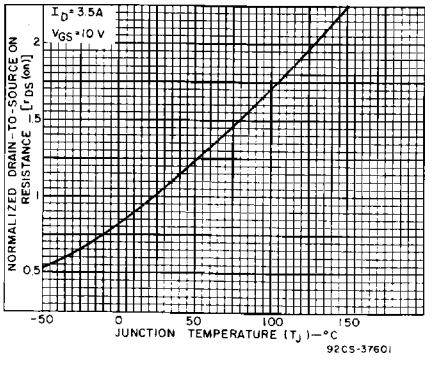

Fig. 4 - Normalized drain-to-source on resistance as a function of junction temperature for all types.

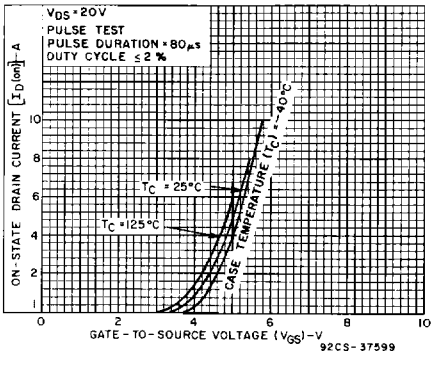

Fig. 5 - Typical transfer characteristics for all types.

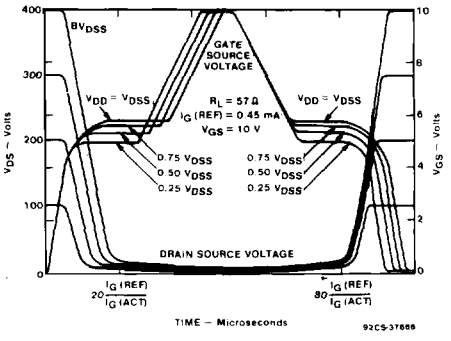

Fig. 6 – Normalized switching waveforms for constant gate-current. Refer to Harris application notes AN-7254 and AN-7260

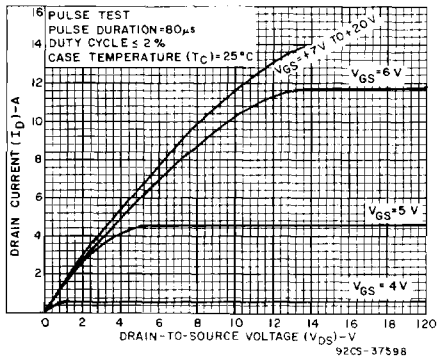

Fig. 7 - Typical saturation characteristics for all types.

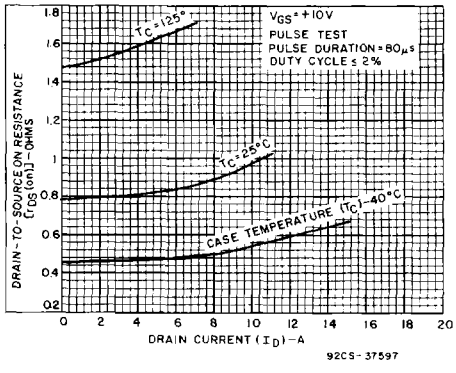

Fig. 8 - Typical drain-to-source on resistance as a function of drain current for all types.

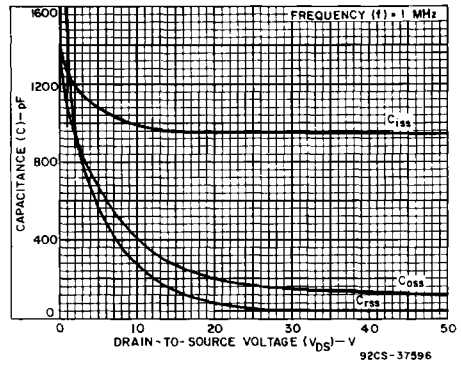

Fig. 9 - Capacitance as a function of drain-to-source voltage for all types.

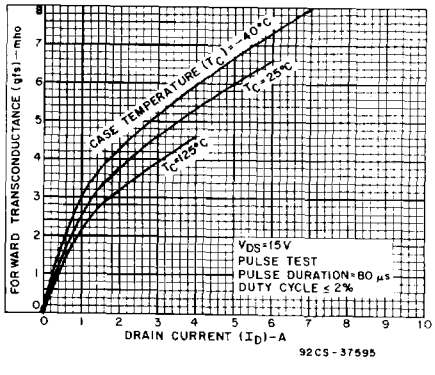

Fig. 10 - Typical forward transconductance as a function of drain current for all types.

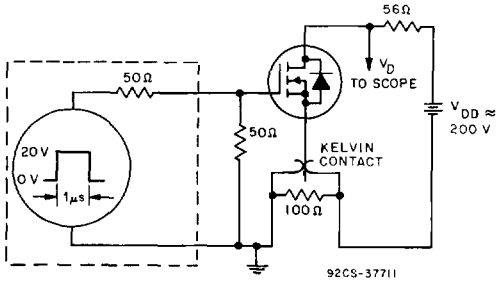

Fig. 11 - Switching time test circuit.