

# 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

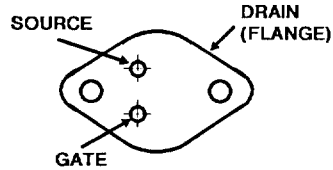
### Description

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.

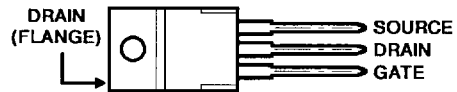
The RFM-series types are supplied in the JEDEC TO-204AA steel package and the RFP-series types in the JEDEC TO-220AB plastic package.

### Packages

TO-204AA

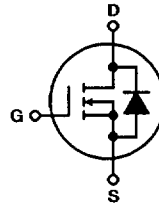


TO-220AB  
TOP VIEW



### Terminal Diagram

N-CHANNEL ENHANCEMENT MODE



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

	RFM7N35	RFM7N40	RFP7N35	RFP7N40	UNITS	
Drain-Source Voltage .....	$V_{DSS}$	350	400	350	400	V
Drain-Gate Voltage ( $R_{GS} = 1\text{m}\Omega$ ) .....	$V_{DGR}$	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 .....	$V_{GS}$	$\pm 20$	$\pm 20$	$\pm 20$	$\pm 20$	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						

4  
N-CHANNEL  
POWER MOSFETs

## Specifications RFM7N35, RFM7N40, RFP7N35, RFP7N40

**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	$BV_{DSS}$	$I_D=1\text{ mA}$ $V_{GS}=0$	350	—	400	—	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	$I_{DSS}$	$V_{DS}=280\text{ V}$ $V_{GS}=320\text{ V}$	—	1	—	—	$\mu\text{A}$
		$T_c=125^\circ\text{ C}$ $V_{DS}=280\text{ V}$ $V_{GS}=320\text{ V}$	—	50	—	50	
Gate-Source Leakage Current	$I_{GSS}$	$V_{GS}=\pm 20\text{ V}$ $V_{DS}=0$	—	100	—	100	nA
Drain-Source On Voltage	$V_{DS(on)}^a$	$I_D=3.5\text{ A}$ $V_{GS}=10\text{ V}$	—	2.63	—	2.63	V
		$I_D=7\text{ A}$ $V_{GS}=10\text{ V}$	—	10	—	10	
Static Drain-Source On Resistance	$r_{DS(on)}^a$	$I_D=3.5\text{ A}$ $V_{GS}=10\text{ V}$	—	0.75	—	0.75	$\Omega$
Forward Transconductance	$g_{fs}^a$	$V_{DS}=10\text{ V}$ $I_D=3.5\text{ A}$	2	—	2	—	mho
Input Capacitance	$C_{iss}$	$V_{DS}=25\text{ V}$	—	1600	—	1600	pF
Output Capacitance	$C_{oss}$	$V_{GS}=0\text{ V}$	—	300	—	300	
Reverse-Transfer Capacitance	$C_{rss}$	$f=1\text{ MHz}$	—	200	—	200	
Turn-On Delay Time	$t_d(on)$	$V_{DS}=200\text{ V}$	16(typ)	45	16(typ)	45	ns
Rise Time	$t_r$	$I_D=3.5\text{ A}$	54(typ)	75	54(typ)	75	
Turn-Off Delay Time	$t_d(off)$	$R_{\theta en}=R_{\theta s}=50\ \Omega$	170(typ)	250	170(typ)	250	
Fall Time	$t_f$	$V_{GS}=10\text{ V}$	62(typ)	100	62(typ)	100	
Thermal Resistance Junction-to-Case	$R_{\theta jc}$	RFM7N35, RFM7N40	—	1.25	—	1.25	$^\circ\text{C/W}$
		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	$V_{SD}^a$	$I_{SD}=3.5\text{ A}$	—	1.4	—	1.4	V
Reverse Recovery Time	$t_{rr}$	$I_F=4\text{ A}$ $di_F/dt=100\text{ A}/\mu\text{s}$	870 (typ)				ns

<sup>a</sup>Pulsed: Pulse duration=300  $\mu\text{s}$  max., duty cycle=2%.

**RFM7N35, RFM7N40, RFP7N35, RFP7N40**

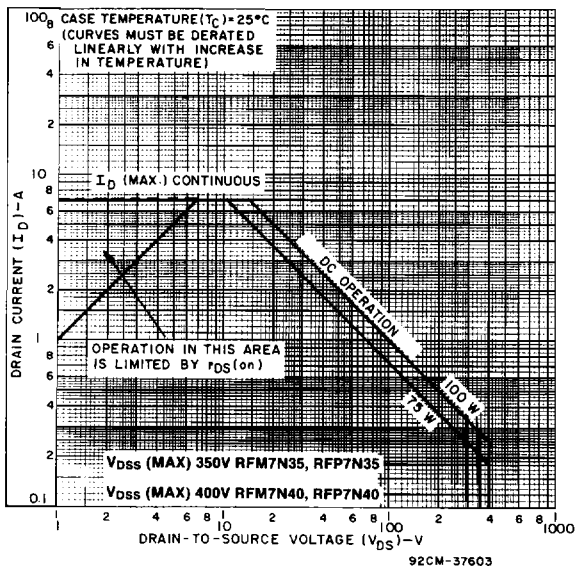


Fig. 1 - Maximum safe operating areas for all types.

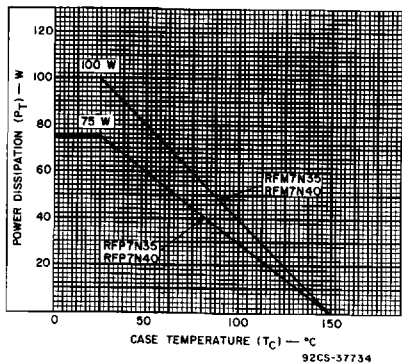


Fig. 2 - Power dissipation vs. case temperature derating curve for all types.

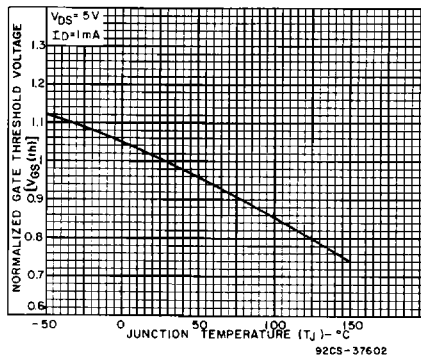


Fig. 3 - Typical normalized gate threshold voltage as a function of junction temperature for all types.

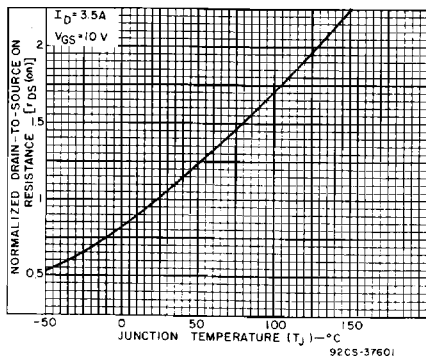


Fig. 4 - Normalized drain-to-source on resistance as a function of junction temperature for all types.

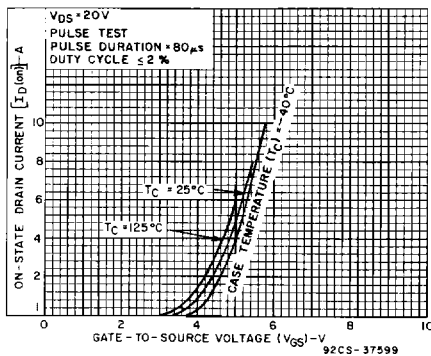


Fig. 5 - Typical transfer characteristics for all types.

RFM7N35, RFM7N40, RFP7N35, RFP7N40

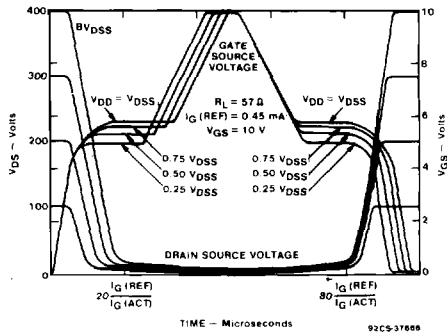


Fig. 6 - Normalized switching waveforms for constant gate-current. Refer to Harris application notes AN-7254 and AN-7260

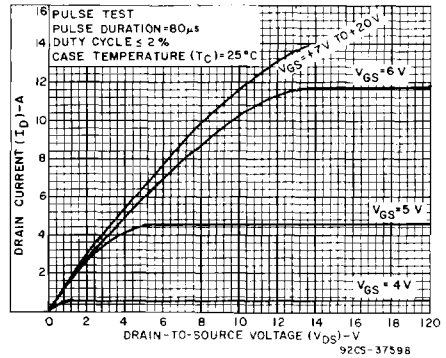


Fig. 7 - Typical saturation characteristics for all types.

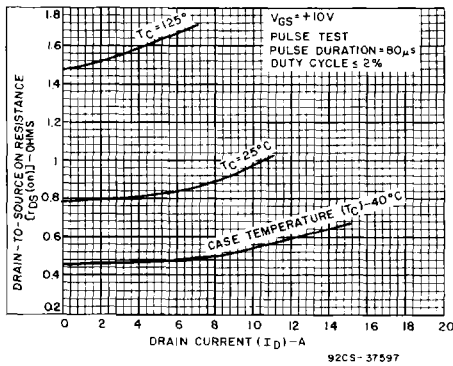


Fig. 8 - Typical drain-to-source on resistance as a function of drain current for all types.

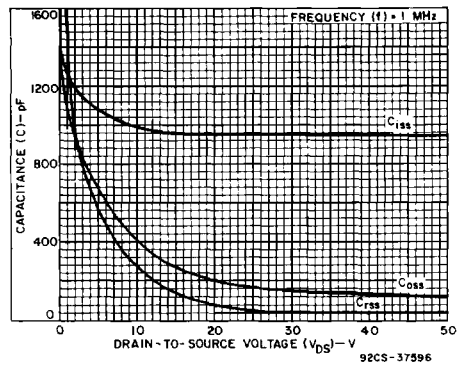


Fig. 9 - Capacitance as a function of drain-to-source voltage for all types.

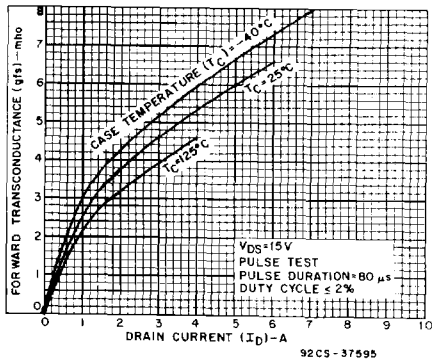


Fig. 10 - Typical forward transconductance as a function of drain current for all types.

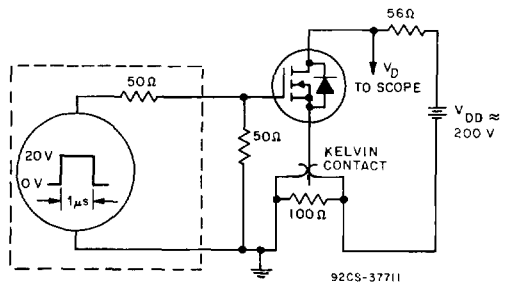


Fig. 11 - Switching time test circuit.