

# RFM8N18L/20L RFP8N18L/20L

N-Channel Logic Level  
Power Field-Effect Transistors (L<sup>2</sup>FET)

August 1991

## Features

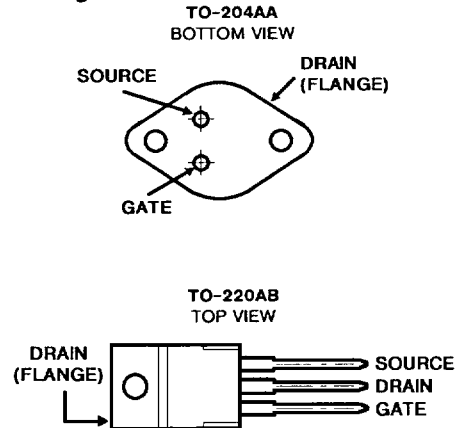
- 8A, 180V and 200V
- $r_{DS(ON)} = 0.5\Omega$
- Design Optimized for 5V Gate Drives
- Can be Driven Directly from QMOS, NMOS, TTL Circuits
- Compatible with Automotive Drive Requirements
- SOA is Power-Dissipation Limited
- Nanosecond Switching Speeds
- Linear Transfer Characteristics
- High Input Impedance
- Majority Carrier Device

## Description

The RFM8N18L and RFM8N20L and the RFP8N18L and RFP8N20L are N-channel enhancement-mode silicon-gate power field-effect transistors specifically designed for use with logic level (5V) driving sources in applications such as programmable controllers, automotive switching and solenoid drivers. This performance is accomplished through a special gate oxide design which provides full rated conduction at gate biases in the 3V - 5V range, thereby facilitating true on-off power control directly from logic circuit supply voltages.

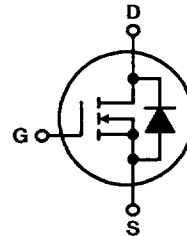
The RFM series types are supplied in the JEDEC TO-204AA steel package and the RFP series types in the JEDEC TO-220AB plastic package.

## Package



## Terminal Diagram

N-CHANNEL ENHANCEMENT MODE



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

	RFM8N18L	RFM8N20L	RFP8N18L	RFP8N20L	UNITS
Drain-Source Voltage ..... $V_{DS}$	180	200	180	200	V
Drain-Gate Voltage ( $R_{GS} = 1M\Omega$ ) ..... $V_{DGR}$	180	200	180	200	V
Continuous Drain Current					
RMS Continuous ..... $I_D$	8	8	8	8	A
Pulsed Drain Current ..... $I_{DM}$	20	20	20	20	A
Gate-Source Voltage ..... $V_{GS}$	$\pm 10$	$\pm 10$	$\pm 10$	$\pm 10$	V
Maximum Power Dissipation					
$T_C = +25^\circ\text{C}$ ..... $P_D$	75	75	60	60	W
Above $T_C = +25^\circ\text{C}$ , Derate Linearly .....	0.6	0.6	0.48	0.48	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 RFM8N18L, RFM8N20L, RFP8N18L, RFP8N20L

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

CHARACTERISTIC	SYMBOL	TEST CONDITIONS	LIMITS				UNITS
			RFM8N18L RFP8N18L		RFM8N20L RFP8N20L		
			MIN.	MAX.	MIN.	MAX.	
Drain-Source Breakdown Voltage	$V_{DS}$	$I_D=1\text{ mA}$ $V_{GS}=0$	180	—	200	—	V
Gate Threshold Voltage	$V_{GS(th)}$	$V_{GS}=V_{DS}$ $I_D=1\text{ mA}$	1	2	1	2	V
Zero Gate Voltage Drain Current	$I_{DSS}$	$V_{DS}=145\text{ V}$ $V_{GS}=160\text{ V}$	—	1	—	—	$\mu\text{A}$
		$T_C=125^\circ\text{ C}$ $V_{DS}=145\text{ V}$ $V_{GS}=160\text{ V}$	—	50	—	—	
Gate-Source Leakage Current	$I_{GSS}$	$V_{GS}=\pm 10\text{ V}$ $V_{DS}=0$	—	100	—	100	nA
Drain-Source On Voltage	$V_{DS(on)}^a$	$I_D=4\text{ A}$ $V_{GS}=5\text{ V}$	—	2.0	—	2.0	V
		$I_D=8\text{ A}$ $V_{GS}=5\text{ V}$	—	4.6	—	4.6	
Static Drain-Source On Resistance	$r_{DS(on)}^a$	$I_D=4\text{ A}$ $V_{GS}=5\text{ V}$	—	0.5	—	0.6	$\Omega$
Forward Transconductance	$g_{fs}^a$	$V_{DS}=10\text{ V}$ $I_D=4\text{ A}$	3.0	—	3.0	—	mho
Input Capacitance	$C_{iss}$	$V_{DS}=25\text{ V}$	—	900	—	900	pF
Output Capacitance	$C_{oss}$	$V_{GS}=0\text{ V}$	—	250	—	250	
Reverse-Transfer Capacitance	$C_{rss}$	$f=1\text{ MHz}$	—	120	—	120	
Turn-On Delay Time	$t_d(on)$	$V_{DD}=50\text{ V}$ $I_D=4\text{ A}$ $R_{\theta gn}=\infty$ $R_{\theta gs}=6.25\ \Omega$ $V_{GS}=5\text{ V}$	15(typ)	45	15(typ)	45	ns
Rise Time	$t_r$		45(typ)	150	45(typ)	150	
Turn-Off Delay Time	$t_d(off)$		100(typ)	135	100(typ)	135	
Fall Time	$t_f$		60(typ)	105	60(typ)	105	
Thermal Resistance Junction-to-Case	$R_{\theta JC}$	RFM8N18L, RFM8N20L	—	1.67	—	1.67	$^\circ\text{C/W}$
		RFP8N18L, RFP8N20L	—	2.083	—	2.083	

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

### SOURCE-DRAIN DIODE RATINGS AND CHARACTERISTICS

CHARACTERISTIC	SYMBOL	TEST CONDITIONS	LIMITS				UNITS
			RFM8N18L RFP8N18L		RFM8N20L RFP8N20L		
			MIN.	MAX.	MIN.	MAX.	
Diode Forward Voltage	$V_{SD}$	$I_{SD}=4\text{ A}$	—	1.4	—	1.4	V
Reverse Recovery Time	$t_{rr}$	$I_F=4\text{ A}$ $d_I/d_t=100\text{ A}/\mu\text{s}$	250(typ)		250(typ)		ns

<sup>\*</sup>Pulse Test: Width  $\leq 300\ \mu\text{s}$ , duty cycle  $\leq 2\%$ .

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LOGIC LEVEL  
POWER MOSFETS

RFM8N18L, RFM8N20L, RFP8N18L, RFP8N20L

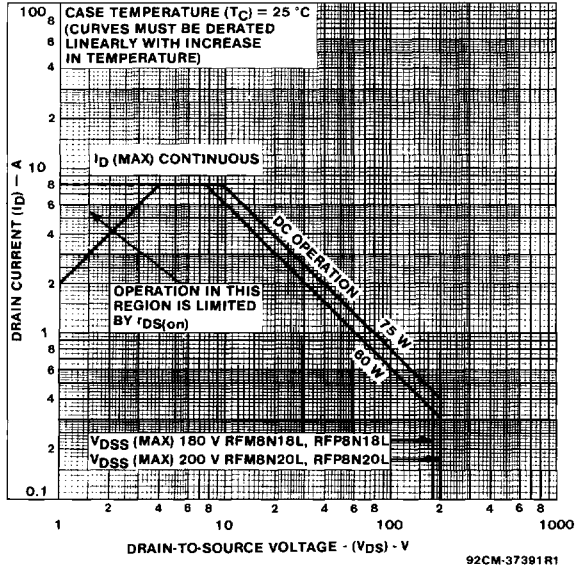


Fig. 1 — Maximum safe operating areas for all types.

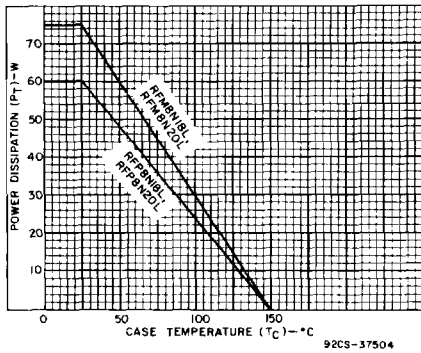


Fig. 2 — Power vs. temperature derating curve for all types.

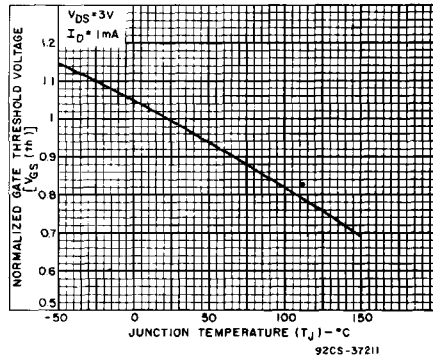


Fig. 3 — Typical normalized gate threshold voltage as a function of junction temperature for all types.

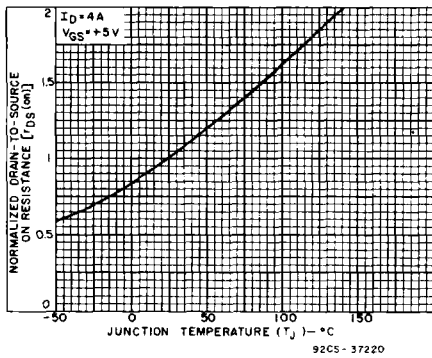


Fig. 4 — Normalized drain-to-source on resistance to junction temperature for all types.

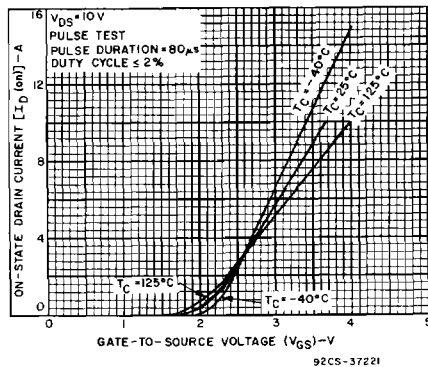


Fig. 5 — Typical transfer characteristics for all types.

# RFM8N18L, RFM8N20L, RFP8N18L, RFP8N20L

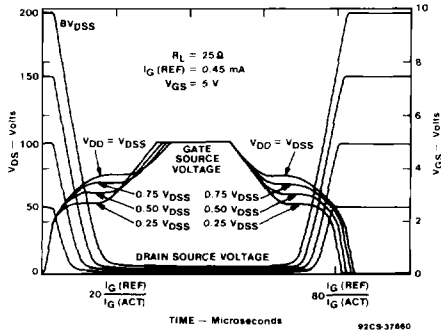


Fig. 6 - Normalized switching waveforms for constant gate-current. Refer to Harris application notes AN754 and AN-7260.

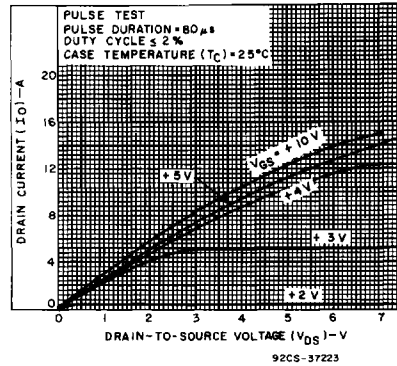


Fig. 7 - Typical saturation characteristics for all types.

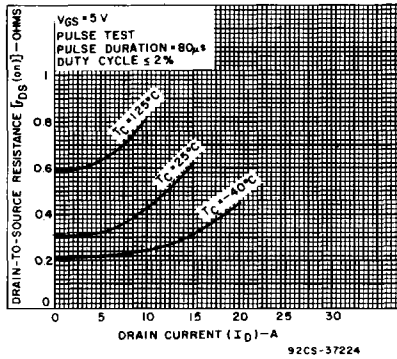


Fig. 8 - Typical drain-to-source on resistance as a function of drain current for all types.

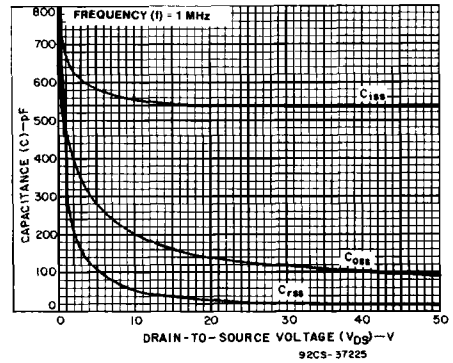


Fig. 9 - Capacitance as a function of drain-to-source voltage for all types.

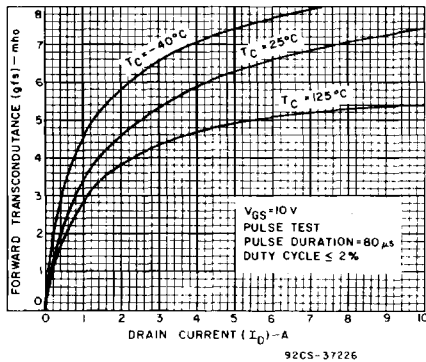


Fig. 10 - Typical forward transconductance as a function of drain current for all types.

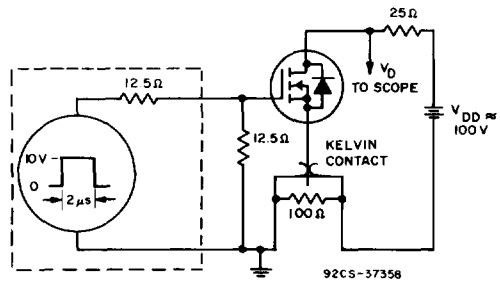


Fig. 11 - Switching Time Test Circuit.

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