



HARRIS

HARRIS SEMICONDUCTOR SECTOR

56E D ■ 4302271 0041678 T98 ■ HAS

August 1991

RFM8N18/8N20 RFP8N18/8N20

N-Channel Enhancement Mode Power Field Effect Transistors

Features

- 8A, 180V and 200V
- $r_{DS(on)} = 0.5\Omega$
- SOA is Power-Dissipation Limited
- Nanosecond Switching Speeds
- Linear Transfer Characteristics
- High Input Impedance
- Majority Carrier Device

Description

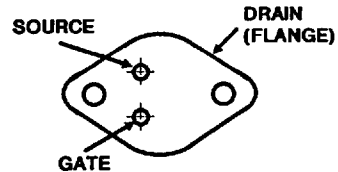
The RFM8N18 and RFM8N20 and the RFP8N18 and RFP8N20 are n-channel enhancement-mode silicon-gate power field-effect transistors designed for applications such as switching regulators, switching converters, motor drivers, relay drivers, and drivers for high-power bipolar switching transistors requiring 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.

Packages

T-39-11

TO-204AA

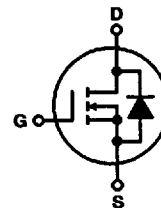


TO-220AB
TOP VIEW



Terminal Diagram

N-CHANNEL ENHANCEMENT MODE



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

	RFM8N18	RFM8N20	RFP8N18	RFP8N20	UNITS	
Drain-Source Voltage	V_{DS}	180	200	180	200	V
Drain-Gate Voltage ($R_{GS} = 1\text{m}\Omega$)	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}	± 20	± 20	± 20	± 20	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		0.8	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 RFM8N18, RFM8N20, RFP8N18, RFP8N20

HARRIS SEMICONDUCTOR

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

T-39-11

CHARACTERISTICS	SYMBOL	TEST CONDITIONS	LIMITS				UNITS
			RFM8N18 RFP8N18		RFM8N20 RFP8N20		
			MIN.	MAX.	MIN.	MAX.	
Drain-Source Breakdown Voltage	BV_{DSS}	$I_D = 1 \text{ mA}$ $V_{GS} = 0$	180	—	200	—	V
Gate Threshold Voltage	$V_{GS(th)}$	$V_{GS} = V_{DS}$ $I_D = 1 \text{ mA}$	2	4	2	4	V
Zero Gate Voltage Drain Current	I_{DSS}	$V_{DS} = 145 \text{ V}$ $V_{DS} = 160 \text{ V}$	—	1	—	—	μA
		$T_c = 125^\circ\text{C}$ $V_{DS} = 145 \text{ V}$ $V_{DS} = 160 \text{ V}$	—	50	—	—	
Gate-Source Leakage Current	I_{GSS}	$V_{GS} = \pm 20 \text{ V}$ $V_{DS} = 0$	—	100	—	100	nA
Drain-Source On Voltage	$V_{DS(on)}^a$	$I_D = 4 \text{ A}$ $V_{GS} = 10 \text{ V}$	—	2.0	—	2.0	V
		$I_D = 8 \text{ A}$ $V_{GS} = 10 \text{ V}$	—	5.5	—	5.5	
Static Drain-Source On Resistance	$r_{DS(on)}^a$	$I_D = 4 \text{ A}$ $V_{GS} = 10 \text{ V}$	—	0.5	—	0.5	Ω
Forward Transconductance	g_{fs}^a	$V_{DS} = 10 \text{ V}$ $I_D = 4 \text{ A}$	1.5	—	1.5	—	mho
Input Capacitance	C_{iss}	$V_{DS} = 25 \text{ V}$	—	750	—	750	pF
Output Capacitance	C_{oss}	$V_{GS} = 0 \text{ V}$	—	250	—	250	
Reverse Transfer Capacitance	C_{res}	$f = 1\text{MHz}$	—	100	—	100	
Turn-On Delay Time	$t_d(on)$	$V_{DD} = 100 \text{ V}$ $I_D = 4 \text{ A}$ $R_{gen} = R_{gs} = 50 \Omega$ $V_{GS} = 10 \text{ V}$	30(typ.)	45	30(typ.)	45	ns
Rise Time	t_r		100(typ.)	150	100(typ.)	150	
Turn-Off Delay Time	$t_d(off)$		90(typ.)	135	90(typ.)	135	
Fall Time	t_f		70(typ.)	105	70(typ.)	105	
Thermal Resistance Junction-to-Case	$R\theta_{JC}$	RFM8N18, RFM8N20	—	1.67	—	1.67	$^\circ\text{C/W}$
		RFP8N18, RFP8N20	—	2.083	—	2.083	

N-CHANNEL
POWER MOSFETS

SOURCE-DRAIN DIODE RATINGS AND CHARACTERISTICS

CHARACTERISTIC	SYMBOL	TEST CONDITIONS	LIMITS				UNITS
			RFM8N18 RFP8N18		RFM8N20 RFP8N20		
			Min.	Max.	Min.	Max.	
Diode Forward Voltage	V_{SD}^a	$I_{SD} = 4 \text{ A}$	—	1.4	—	1.4	V
Reverse Recovery Time	t_r	$I_F = 4 \text{ A}$ $dI_F/dt = 100 \text{ A}/\mu\text{s}$	225(typ.)		225(typ.)		ns

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

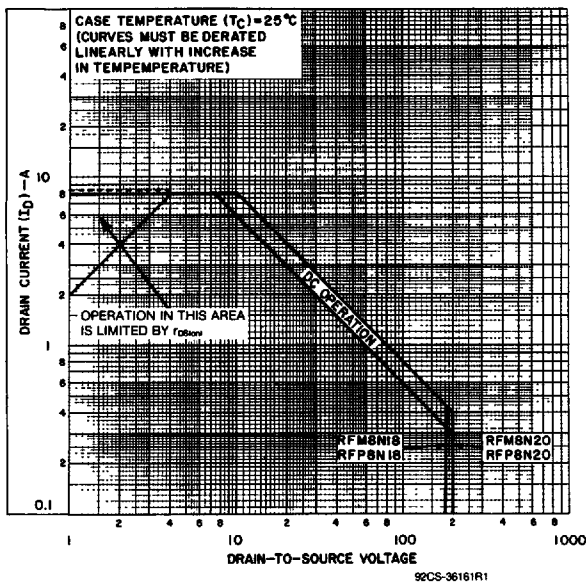


Fig. 1 — Maximum safe operating areas for all types.

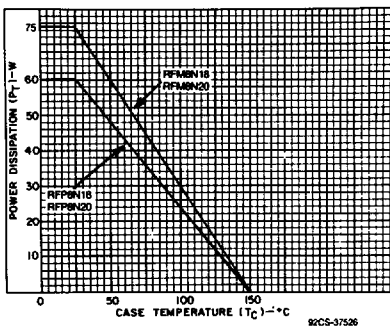


Fig. 2 — Power vs. temperature derating curve for all types.

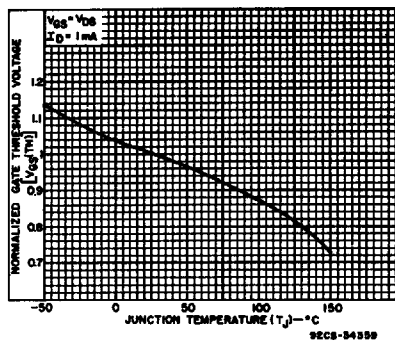


Fig. 3 — Typical normalized gate threshold voltage as a function of junction temperature for all types.

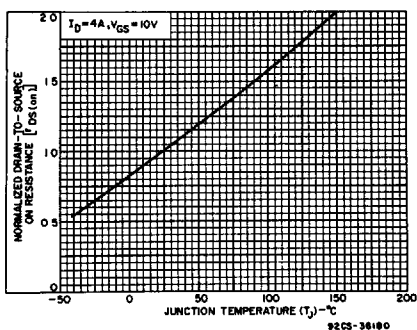


Fig. 4 — Normalized drain-to-source on resistance to junction temperature for all types.

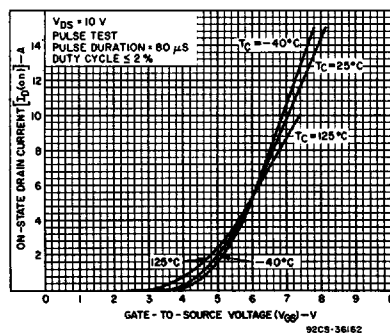


Fig. 5 — Typical transfer characteristics for all types.

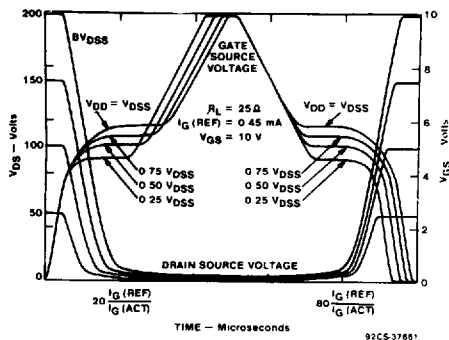


Fig. 6 - Normalized switching waveforms for constant gate-current. Refer to Harris application notes AN-7254 and AN-7260

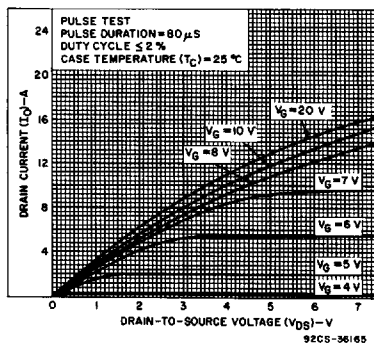


Fig. 7 - Typical saturation characteristics for all types.

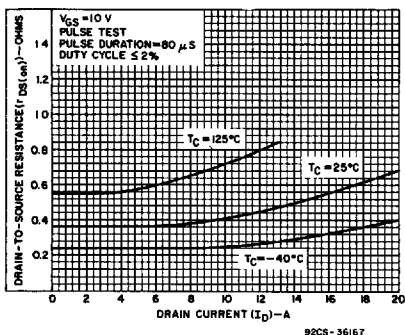


Fig. 8 - Typical drain-to-source on resistance as a function of drain current for all types.

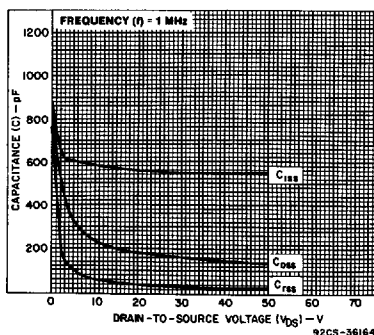


Fig. 9 - Capacitance as a function of drain-to-source voltage for all types.

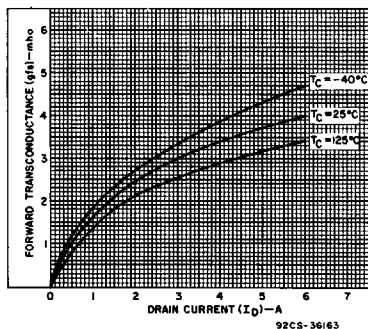


Fig. 10 - Typical forward transconductance as a function of drain current for all types.

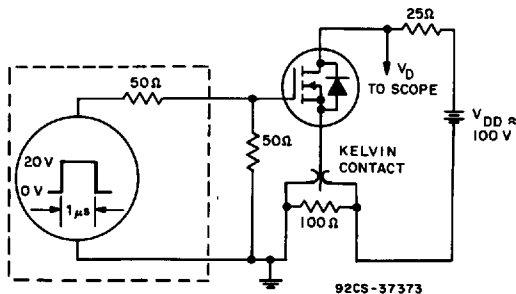


Fig. 11 - Switching Time Test Circuit.

N-CHANNEL POWER MOSFETS