HARRIS

RFM3N45/3N50
RFP3N45/3N50

N-Channel Enhancement Mode Power Field Effect Transistors

August 1991

Features

- 3A, 450V and 500V
- $r_{DS(on)} = 3\Omega$
- SOA is Power-Dissipation Limited
- Nanosecond Switching Speeds
- Linear Transfer Characteristics
- High Input Impedance
- Majority Carrier Device

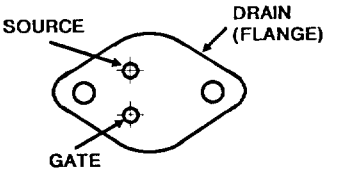
Description

The RFM3N45 and RFM3N50 and the RFP3N45 and RFP3N50 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.

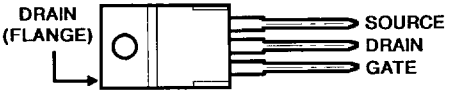
The RFM-series types are supplied in the JEDEC TO-204AA steel package and the RFP-series types in the JEDEC TO-220AB plastic package.

Packages

TO-204AA

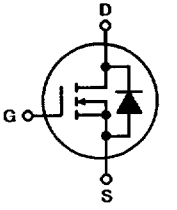


TO-220AB
TOP VIEW



Terminal Diagram

N-CHANNEL ENHANCEMENT MODE



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

	RFM3N45	RFM3N50	RFP3N45	RFP3N50	UNITS
Drain-Source Voltage ..... V_{DSS}	450	500	450	500	V
Drain-Gate Voltage ($R_{GS} = 1m\Omega$) ..... V_{DGR}	450	500	450	500	V
Continuous Drain Current					
RMS Continuous ..... I_D	3	3	3	3	A
Pulsed Drain Current ..... I_{DM}	5	5	5	5	A
Gate-Source Voltage ..... V_{GS}	±20	±20	±20	±20	V
Maximum Power Dissipation					
$T_C = +25^oC$ ..... P_D	75	75	60	60	W
Above $T_C = +25^oC$, Derate Linearly ..... P_D	0.6	0.6	0.48	0.48	W/°C
Operating and Storage Junction Temperature Range ..... T_J, T_{STG}	-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.

File Number **1384.1**

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

CHARACTERISTIC	SYMBOL	TEST CONDITIONS	LIMITS				UNITS
			RFM3N45 RFP3N45		RFM3N50 RFP3N50		
			Min.	Max.	Min.	Max.	
Drain-Source Breakdown Voltage	BV_{DSS}	I_D = 1 mA V_{GS}=0	450	—	500	—	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}=360 V	—	10	—	—	μA
		V_{DS}=400 V	—	—	—	10	
		T_C=125° C V_{DS}=360 V	—	50	—	—	
		V_{DS}=400 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=1.5 A V_{GS}=10 V	—	4.5	—	4.5	V
		I_D=3 A V_{GS}=10 V	—	10.5	—	10.5	
Static Drain-Source On Resistance	$r_{DS}(on)$[a]	I_D=1.5 A V_{GS}=10 V	—	3	—	3	Ω
Forward Transconductance	g_{fs}[a]	V_{DS}=10 V I_D=1.5 A	1	—	1	—	mho
Input Capacitance	C_{iss}	V_{DS}=25 V	—	750	—	750	pF
Output Capacitance	C_{oss}	V_{GS}=0 V	—	150	—	150	
Reverse-Transfer Capacitance	C_{rss}	f = 1MHz	—	100	—	100	
Turn-On Delay Time	$t_d(on)$	V_{DD}=250 V	30(Typ)	45	30(Typ)	45	ns
Rise Time	t_r	I_D=1.5 A	40(Typ)	60	40(Typ)	60	
Turn-Off Delay Time	$t_d(off)$	R_{gen}=R_{gs}=50 Ω	90(Typ)	135	90(Typ)	135	
Fall Time	t_f	V_{GS}=10 V	50(Typ)	75	50(Typ)	75	
Thermal Resistance Junction-to-Case	$R_{\theta JC}$	RFM3N45, RFM3N50	—	1.67	—	1.67	°C/W
		RFP3N45, RFP3N50	—	2.083	—	2.083	

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

SOURCE-DRAIN DIODE RATINGS AND CHARACTERISTICS

CHARACTERISTIC	SYMBOL	TEST CONDITIONS	LIMITS				UNITS
			RFM3N45 RFP3N45		RFM3N50 RFP3N50		
			MIN.	MAX.	MIN.	MAX.	
Diode Forward Voltage	V_{SD}	I_{SD}=1.5 A	—	1.4	—	1.4	V
Reverse Recovery Time	t_{rr}	I_F=4 A d_{iF}/d_t=100 A/μs	800(typ)		800(typ)		ns

*Pulse Test: Width ≤ 300 μs, duty cycle ≤ 2%.

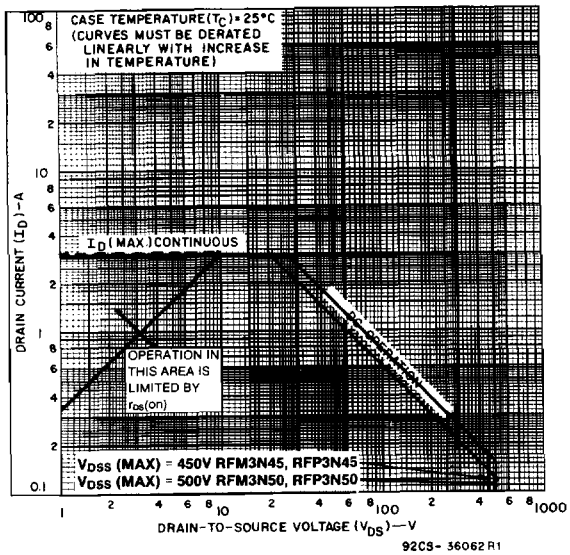


Fig. 1 - Maximum operating areas for all types.

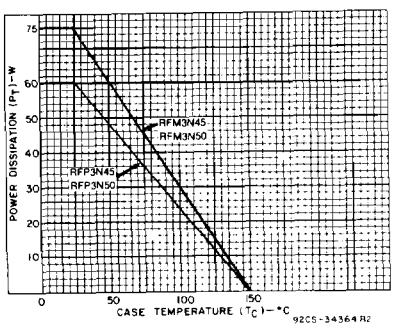


Fig. 2 - Power dissipation vs. temperature derating curve for all types.

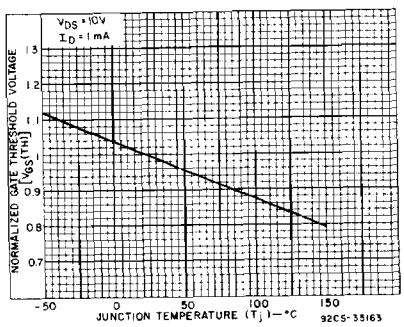


Fig. 3 - Typical normalized gate threshold voltage as a function of junction temperature for all types.

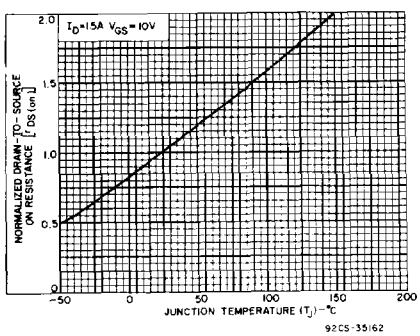


Fig. 4 - Normalized drain-to-source on resistance to junction temperature for all types.

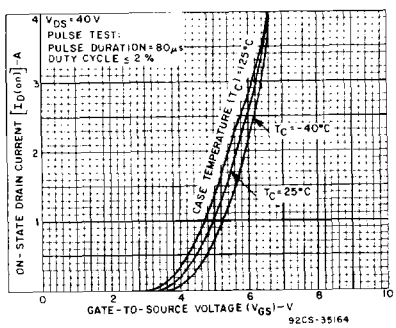


Fig. 5 - Typical transfer characteristics for all types.

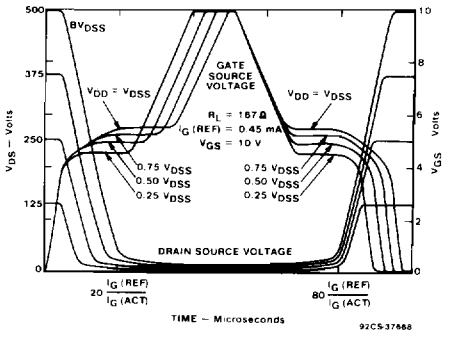


Fig. 6 – Normalized switching waveforms for constant gate-current. Refer to Harris application notes AN-7254 and AN-7260

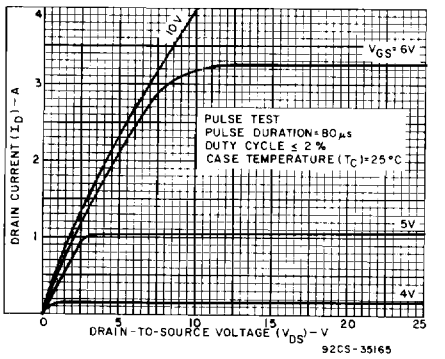


Fig. 7 - Typical saturation characteristics for all types.

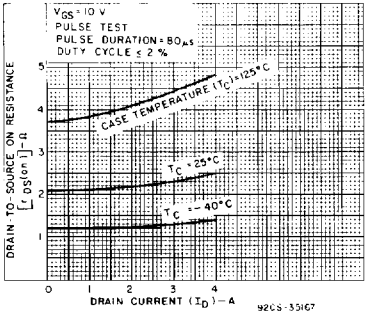


Fig. 8 - Typical drain-to-source on resistance as a function of drain current for all types.

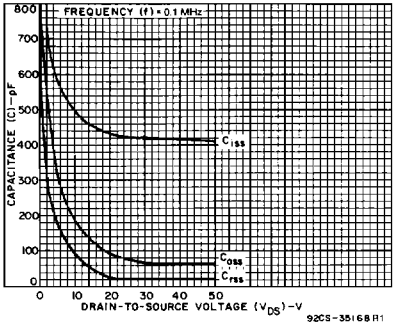


Fig. 9 - Capacitance as a function of drain-to-source voltage for all types.

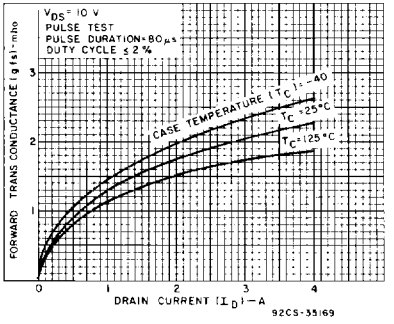


Fig. 10 - Typical forward transconductance as a function of drain current for all types.

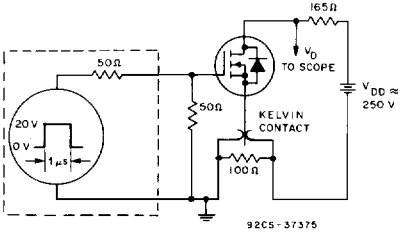


Fig. 11 — Switching Time Test Circuit