HARRIS

RFM6N45/6N50
RFP6N45/6N50

N-Channel Enhancement Mode Power Field Effect Transistors

August 1991

Features

- 6A, 450V and 500V
- $r_{DS(on)} = 1.25\Omega$
- SOA is Power-Dissipation Limited
- Nanosecond Switching Speeds
- Linear Transfer Characteristics
- High Input Impedance
- Majority Carrier Device

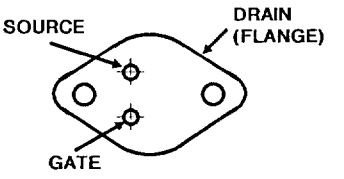
Description

The RFM6N45 and RFM6N50 and the RFP6N45 and RFP6N50 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.

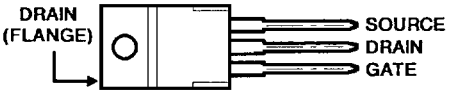
The RFM-series types are supplied in the JEDEC TO-204AA steel package and the RFP-series types in the JEDEC TO-220AB plastic package.

Packages

TO-204AA

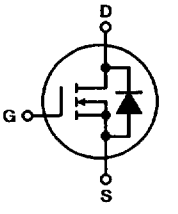


TO-220AB
TOP VIEW



Terminal Diagram

N-CHANNEL ENHANCEMENT MODE



Absolute Maximum Ratings (T_C = 25°C), Unless Otherwise Specified

	RFM6N45	RFM6N50	RFP6N45	RFP6N50	UNITS
Drain-Source Voltage ..... V_{DSS}	450	500	450	500	V
Drain-Gate Voltage (R_{GS} = 1mΩ) ..... V_{DGR}	450	500	450	500	V
Continuous Drain Current					
RMS Continuous ..... I_D	6	6	6	6	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°C ..... P_D	100	100	75	75	W
Above T_C = +25°C, Derate Linearly	0.8	0.8	0.6	0.6	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 **1494.1**

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

CHARACTERISTICS	SYMBOL	TEST CONDITIONS	LIMITS				UNITS
			RFM6N45 RFP6N45		RFM6N50 RFP6N50		
			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 V_{DS}=400 V	— —	10 —	— —	— 10	μA
		T_C=125° C V_{DS}=360 V V_{DS}=400 V	— —	50 —	— —	— 50	μA
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 A V_{GS}=10 V	—	3.75	—	3.75	V
		I_D=6 A V_{GS}=10 V	—	12	—	12	V
Static Drain-Source On Resistance	$r_{DS}(on)$[a]	I_D=3 A V_{GS}=10 V	—	1.25	—	1.25	Ω
Forward Transconductance	g_{fs}[a]	V_{DS}=10 V I_D=3 A	2	—	2	—	mho
Input Capacitance	C_{iss}	V_{DS}=25 V V_{GS}=0 V f=1 MHz	—	1500	—	1500	pF
Output Capacitance	C_{oss}		—	250	—	250	pF
Reverse Transfer Capacitance	C_{rss}		—	200	—	200	pF
Turn-On Delay Time	$t_d(on)$	V_{DD} = 250 V I_D=3 A R_{gen}=R_{gs}=50 Ω V_{GS}=10 V	15(typ)	45	15(typ)	45	ns
Rise Time	t_r		40(typ)	80	40(typ)	80	ns
Turn-Off Delay Time	$t_d(off)$		190(typ)	300	190(typ)	300	ns
Fall Time	t_f		60(typ)	100	60(typ)	100	ns
Thermal Resistance Junction-to-Case	$R\theta_{JC}$	RFM6N45, RFM6N50	—	1.25	—	1.25	°C/W
		RFP6N45, RFP6N50	—	1.67	—	1.67	°C/W

SOURCE-DRAIN DIODE RATINGS AND CHARACTERISTICS

CHARACTERISTIC	SYMBOL	TEST CONDITIONS	LIMITS				UNITS
			RFM6N45 RFP6N45		RFM6N50 RFP6N50		
			Min.	Max.	Min.	Max.	
Diode Forward Voltage	V_{SD} [a]	I_{SD} = 3A	—	1.4	—	1.4	V
Reverse Recovery Time	t_{rr}	I_F = 4A d_{IF}/d_t = 100A/μs	800(typ.)		800(typ.)		ns

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

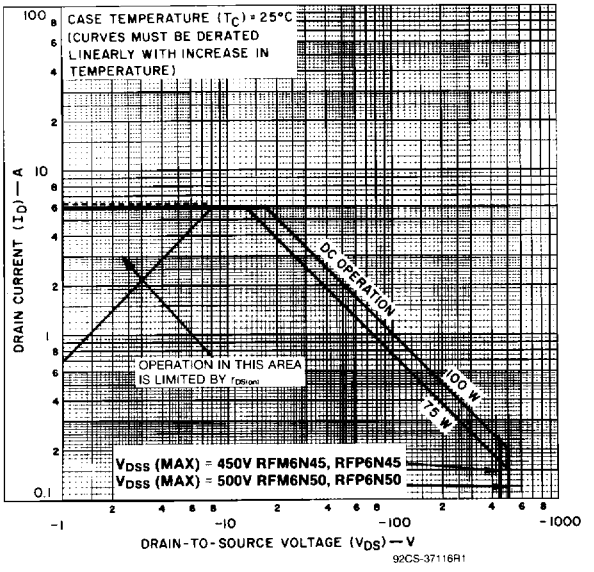


Fig. 1 — Maximum operating areas for all types.

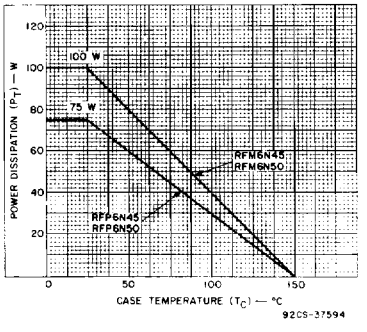


Fig. 2 — Power dissipation vs. temperature derating curve for all types.

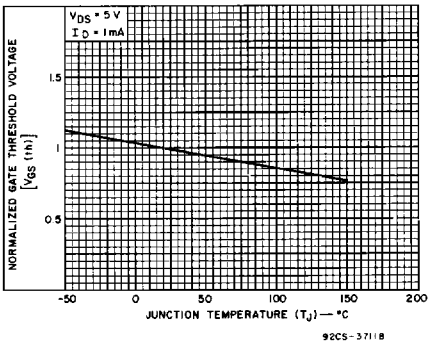


Fig. 3 — Typical normalized gate threshold voltage as a function of junction temperature for all types.

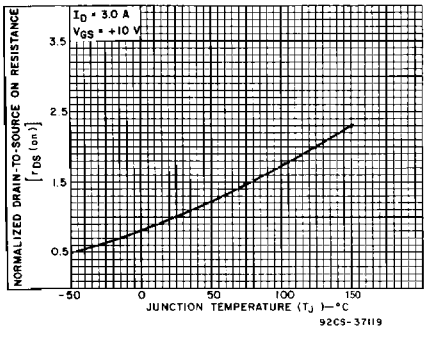


Fig. 4 — Normalized drain-to-source on resistance to junction temperature for all types.

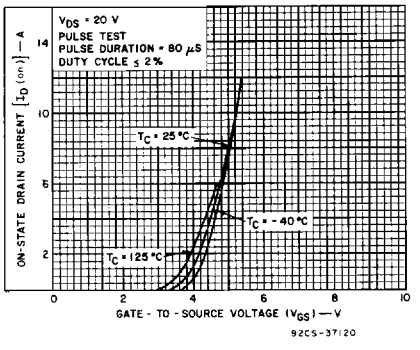


Fig. 5 — Typical transfer characteristics for all types.

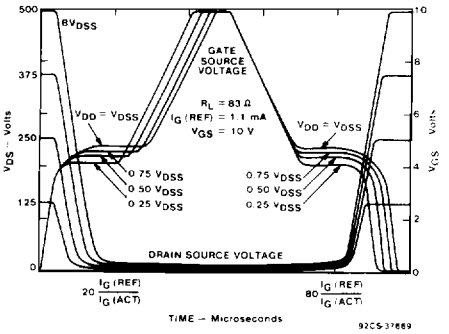


Fig. 6 – Normalized switching waveforms for constant gate-current. Refer to Harris application notes AN-7254 and AN-7260

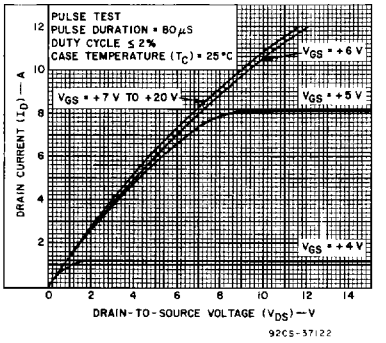


Fig. 7 — Typical saturation characteristics for all types.

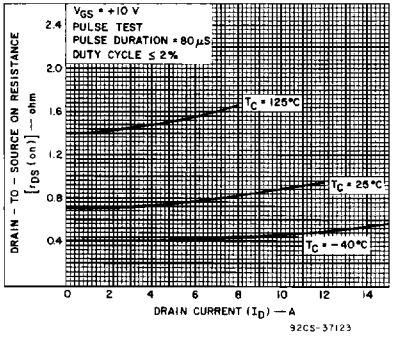


Fig. 8 — Typical drain-to-source on resistance as a function of drain current for all types.

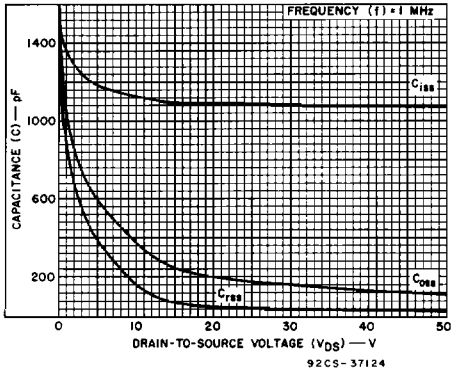


Fig. 9 — Capacitance as a function of drain-to-source voltage for all types.

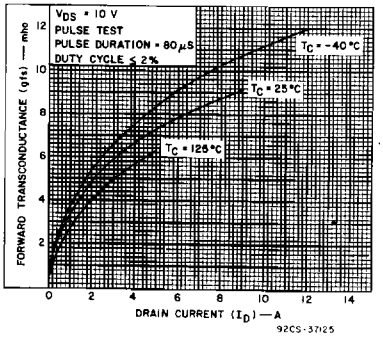


Fig. 10 — Typical forward transconductance as a function of drain current for all types.

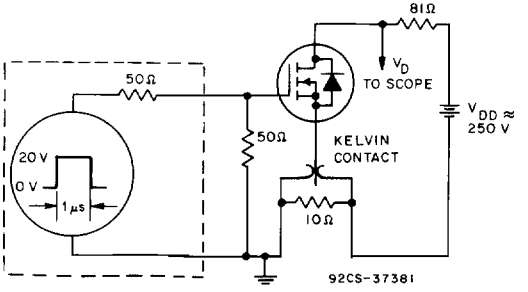


Fig. 11 — Switching Time Test Circuit.