

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

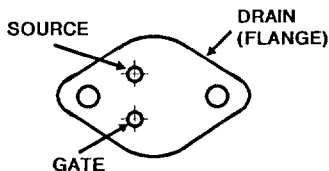
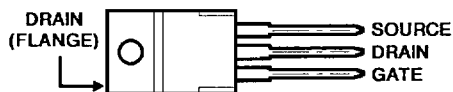
Description

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.

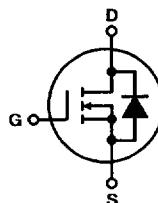
Packages

TO-204AA


 TO-220AB
TOP VIEW


Terminal Diagram

N-CHANNEL ENHANCEMENT MODE



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

	RFM6N45	RFM6N50	RFP6N45	RFP6N50	UNITS	
Drain-Source Voltage	V_{DSS}	450	500	450	500	V
Drain-Gate Voltage ($R_{GS} = 1\text{m}\Omega$)	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						
$T_C = +25^\circ\text{C}$	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						

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N-CHANNEL
POWER MOSFETS

Specifications RFM6N45, RFM6N50, RFP6N45, RFP6N50

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}	$I_D=1\text{ mA}$ $V_{GS}=0$	450	—	500	—	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}	$V_{DS}=360\text{ V}$ $V_{DS}=400\text{ V}$	—	10	—	—	μA
		$T_C=125^\circ\text{ C}$ $V_{DS}=360\text{ V}$ $V_{DS}=400\text{ V}$	—	50	—	50	
Gate-Source Leakage Current	I_{GSS}	$V_{GS}=\pm 20\text{ V}$ $V_{DS}=0$	—	100	—	100	nA
Drain-Source On Voltage	$V_{DS(on)}^a$	$I_D=3\text{ A}$ $V_{GS}=10\text{ V}$	—	3.75	—	3.75	V
		$I_D=6\text{ A}$ $V_{GS}=10\text{ V}$	—	12	—	12	
Static Drain-Source On Resistance	$r_{DS(on)}^a$	$I_D=3\text{ A}$ $V_{GS}=10\text{ V}$	—	1.25	—	1.25	Ω
Forward Transconductance	g_{fs}^a	$V_{DS}=10\text{ V}$ $I_D=3\text{ A}$	2	—	2	—	mho
Input Capacitance	C_{iss}	$V_{DS}=25\text{ V}$ $V_{GS}=0\text{ V}$	—	1500	—	1500	pF
Output Capacitance	C_{oss}	$f=1\text{ MHz}$	—	250	—	250	
Reverse Transfer Capacitance	C_{rss}		—	200	—	200	
Turn-On Delay Time	$t_d(on)$	$V_{DD}=250\text{ V}$ $I_D=3\text{ A}$ $R_{gen}=R_{gs}=50\ \Omega$ $V_{GS}=10\text{ V}$	15(typ)	45	15(typ)	45	ns
Rise Time	t_r		40(typ)	80	40(typ)	80	
Turn-Off Delay Time	$t_d(off)$		190(typ)	300	190(typ)	300	
Fall Time	t_f		60(typ)	100	60(typ)	100	
Thermal Resistance Junction-to-Case	$R\theta_{JC}$	RFM6N45, RFM6N50	—	1.25	—	1.25	$^\circ\text{C/W}$
		RFP6N45, RFP6N50	—	1.67	—	1.67	

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	$I_{SD}=3\text{ A}$	—	1.4	—	1.4	V
Reverse Recovery Time	t_{rr}	$I_F=4\text{ A}$ $dI_F/dt=100\text{ A}/\mu\text{s}$	800(typ.)		800(typ.)		ns

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

RFM6N45, RFM6N50, RFP6N45, RFP6N50

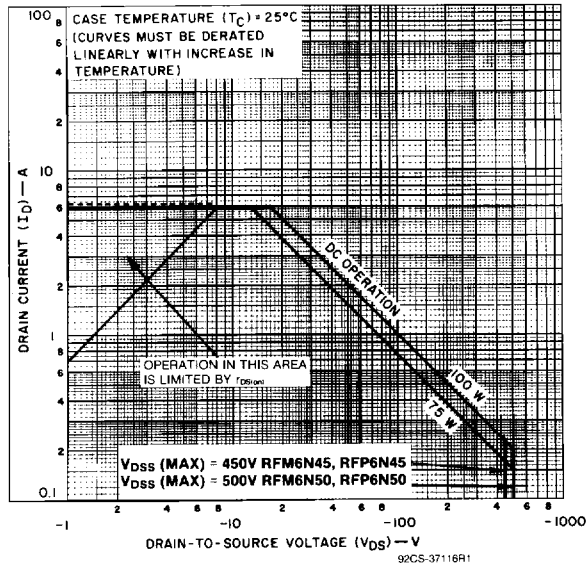


Fig. 1 — Maximum operating areas for all types.

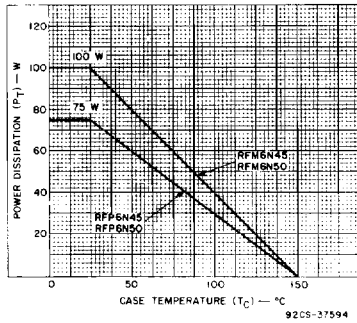


Fig. 2 — Power dissipation vs. temperature derating curve for all types.

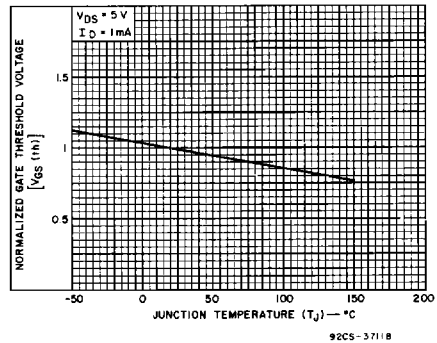


Fig. 3 — Typical normalized gate threshold voltage as a function of junction temperature for all types.

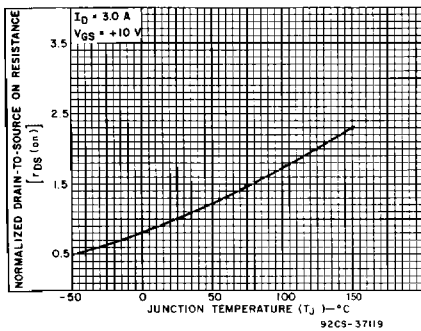


Fig. 4 — Normalized drain-to-source on resistance to junction temperature for all types.

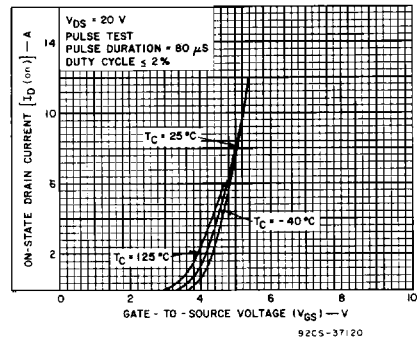


Fig. 5 — Typical transfer characteristics for all types.

RFM6N45, RFM6N50, RFP6N45, RFP6N50

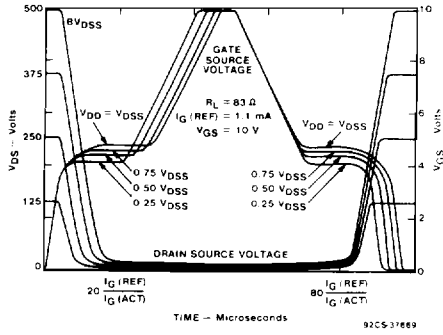


Fig. 6 - Normalized switching waveforms for constant gate-current. Refer to Harris application notes AN-7254 and AN-7260

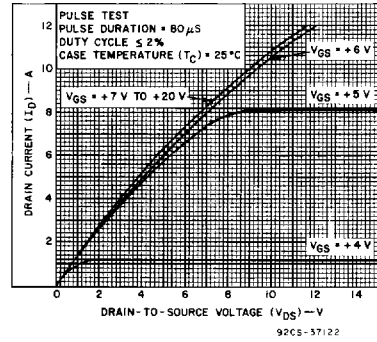


Fig. 7 - Typical saturation characteristics for all types.

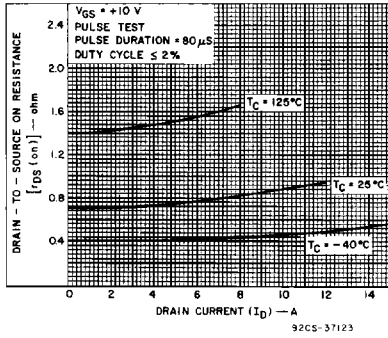


Fig. 8 - Typical drain-to-source on resistance as a function of drain current for all types

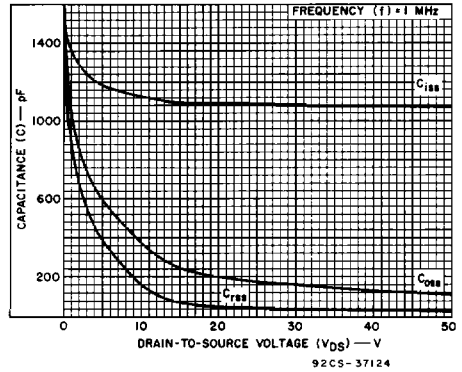


Fig. 9 - Capacitance as a function of drain-to-source voltage for all types.

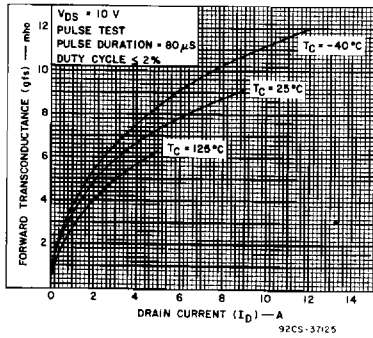


Fig. 10 - Typical forward transconductance as a function of drain current for all types.

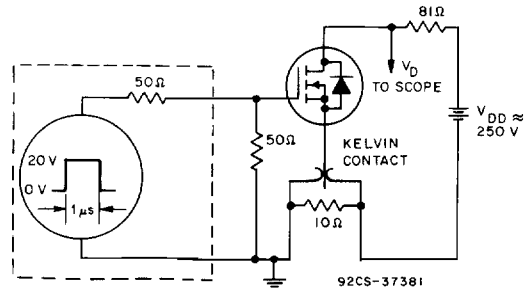


Fig. 11 - Switching Time Test Circuit.