HARRIS

RFH10N45
RFH10N50

N-Channel Enhancement Mode Power Field Effect Transistors

August 1991

Features

- 10A, 450V and 500V
- $r_{DS(on)} = 0.6\Omega$
- SOA is Power-Dissipation Limited
- Nanosecond Switching Speeds
- Linear Transfer Characteristics
- High Input Impedance
- Majority Carrier Device
- High-Current, Low-Inductance Package

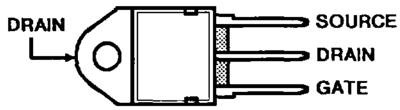
Description

The RFH10N45 and RFH10N50 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 transistors can be operated directly from integrated circuits.

The RFH types are supplied in the JEDEC TO-218AC plastic package.

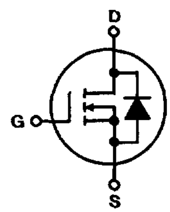
Packages

TO-218AC
TOP VIEW



Terminal Diagram

N-CHANNEL ENHANCEMENT MODE



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N-CHANNEL POWER MOSFETs

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

		RFH10N45	RFH10N50	UNITS
Drain-Source Voltage	V_{DSS}	450	500	V
Drain-Gate Voltage ($R_{GS} = 1m\Omega$)	V_{DGR}	450	500	V
Continuous Drain Current				
RMS Continuous	I_D	10	10	A
Pulsed Drain Current	I_{DM}	20	20	A
Gate-Source Voltage	V_{GS}	±20	±20	V
Maximum Power Dissipation				
$T_C = +25^oC$	P_D	150	150	W
Above $T_C = +25^oC$, Derate Linearly		1.2	1.2	$W/^oC$
Operating and Storage Junction Temperature Range	T_J, T_{STG}	-55 to +150	-55 to +150	^oC

CAUTION: These devices are sensitive to electrostatic discharge. Proper I.C. handling procedures should be followed.

File Number **1629.1**

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

CHARACTERISTIC	SYMBOL	TEST CONDITIONS	LIMITS				UNITS
			RFH10N45		RFH10N50		
			Min.	Max.	Min.	Max.	
Drain-Source Breakdown Voltage	BV_{DSS}	I_D = 10 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	—	1	—	—	μA
		V_{DS} = 400 V	—	—	—	1	
		T_C = 125° C, V_{DS} = 360 V	—	50	—	—	
		T_C = 125° C, 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 = 5 A, V_{GS} = 10 V	—	3.0	—	3.0	V
		I_D = 10 A, V_{GS} = 10 V	—	10	—	10	
Static Drain-Source On Resistance	$r_{DS}(on)$[a]	I_D = 5A, V_{GS} = 10 V	—	0.6	—	0.6	Ω
Forward Transconductance	g_{fs}[a]	V_{DS} = 10 V, I_D = 5 A	5	—	5	—	mho
Input Capacitance	C_{iss}	V_{DS} = 25 V	—	3000	—	3000	pF
Output Capacitance	C_{oss}	V_{GS} = 0 V	—	600	—	600	
Reverse Transfer Capacitance	C_{rss}	f = 1MHz	—	200	—	200	
Turn-On Delay Time	$t_d(on)$	V_{DS} = 250 V	26(typ)	60	26(typ)	60	ns
Rise Time	t_r	I_D = 5 A	50(typ)	100	50(typ)	100	
Turn-Off Delay Time	$t_d(off)$	R_{gen}=R_{gs}=50Ω	525(typ)	900	525(typ)	900	
Fall Time	t_f	V_{GS} = 10 V	105(typ)	180	105(typ)	180	
Thermal Resistance Junction-to-Case	$R\theta_{JC}$	RFH10N45, RFH10N50 Series	—	0.83	—	0.83	°C/W

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

SOURCE-DRAIN DIODE RATINGS AND CHARACTERISTICS

CHARACTERISTIC		TEST CONDITIONS	LIMITS				UNITS
			RFH10N45		RFH10N50		
			Min.	Max.	Min.	Max.	
Diode Forward Voltage	V_{SD} *	I_{SD} = 5A	—	1.4	—	1.4	V
Reverse Recovery Time	t_{rr}	I_F = 4A, d_{IF}/d_t = 100 A/μs	950 (typ.)		950 (typ.)		ns

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

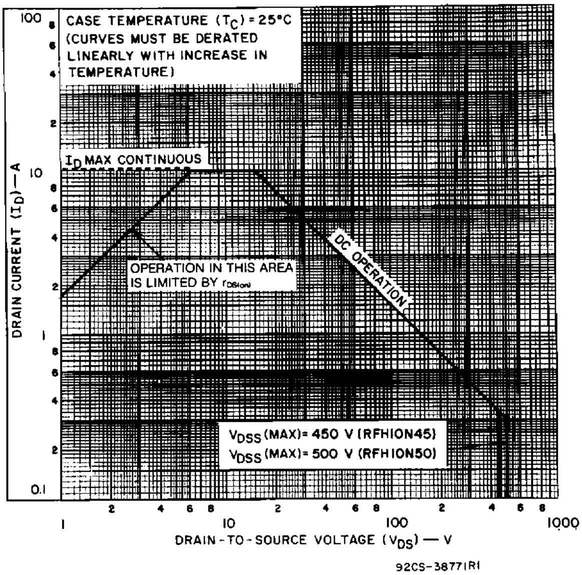

Fig. 1 - Maximum safe operating areas for all types.

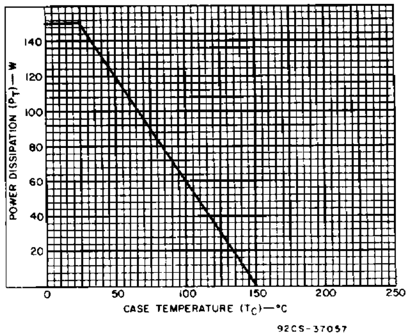

Fig. 2 - Power vs. temperature derating curve for all types.

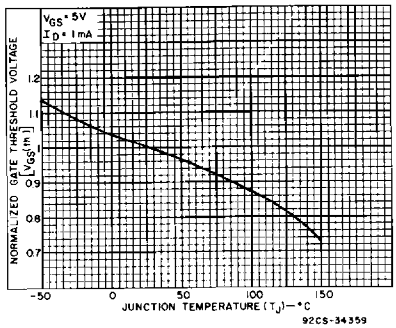

Fig. 3 - Typical normalized gate threshold voltage as a function of junction temperature for all types.

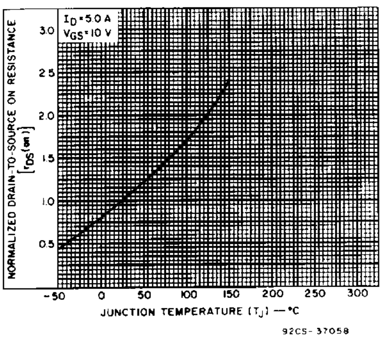

Fig. 4 - Normalized drain-to-source on resistance to junction temperature for all types.

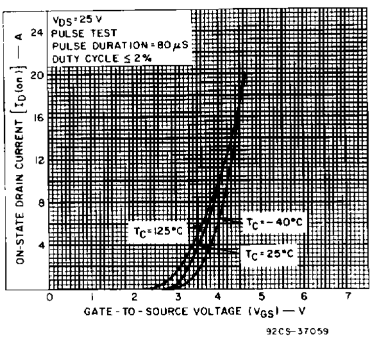

Fig. 5 - Typical transfer characteristics for all types.

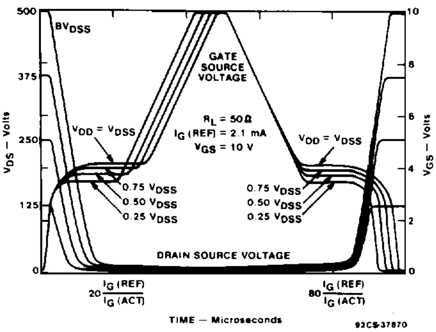

Fig. 6 – Normalized switching waveforms for constant gate-current. Refer to Harris application notes AN-7254 and AN-7260.

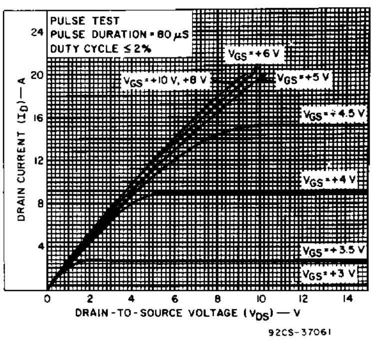

Fig. 7 - Typical saturation characteristics for all types.

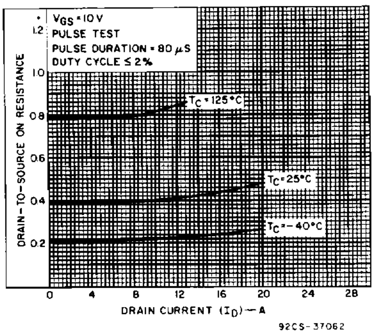

Fig. 8 - Typical drain-to-source on resistance as a function of drain current for all types.

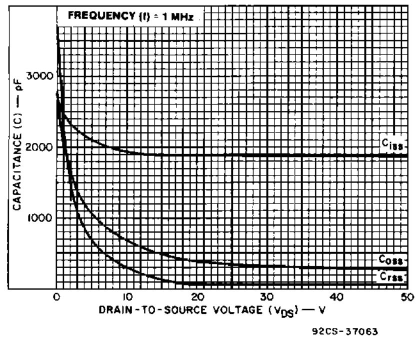

Fig. 9 - Capacitance as a function of drain-to-source voltage for all types.

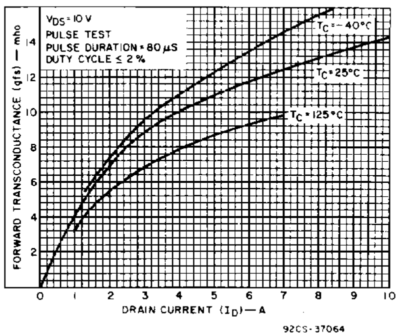

Fig. 10 - Typical forward transconductance as a function of drain current for all types.

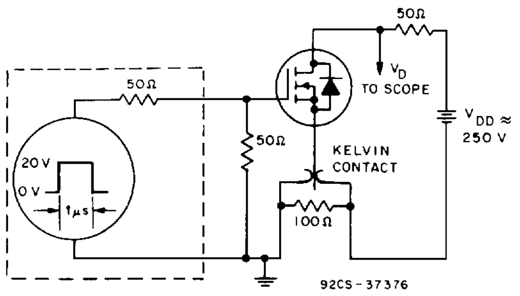

Fig. 11 - Switching Time Test Circuit.