

# RFH10N45 RFH10N50

## N-Channel Enhancement Mode Power Field Effect Transistors

August 1991

### Features

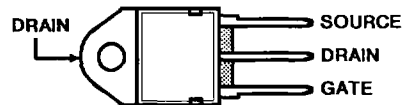
- 10A, 450V and 500V
- $r_{DS(on)} = 0.6\Omega$
- SOA is Power-Dissipation Limited
- Nanosecond Switching Speeds
- Linear Transfer Characteristics
- High Input Impedance
- Majority Carrier Device
- High-Current, Low-Inductance Package

### 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.

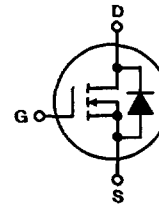
The RFH types are supplied in the JEDEC TO-218AC plastic package.

### Packages

 TO-218AC  
TOP VIEW


### Terminal Diagram

N-CHANNEL ENHANCEMENT MODE



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

	RFH10N45	RFH10N50	UNITS
Drain-Source Voltage .....	450	500	V
Drain-Gate Voltage ( $R_{GS} = 1\text{m}\Omega$ ) .....	450	500	V
Continuous Drain Current .....			
RMS Continuous .....	10	10	A
Pulsed Drain Current .....	20	20	A
Gate-Source Voltage .....	$\pm 20$	$\pm 20$	V
Maximum Power Dissipation .....			
$T_C = +25^\circ\text{C}$ .....	150	150	W
Above $T_C = +25^\circ\text{C}$ , Derate Linearly .....	1.2	1.2	W/ $^\circ\text{C}$
Operating and Storage Junction .....	-55 to +150	-55 to +150	$^\circ\text{C}$
Temperature Range .....			

**4**
**N-CHANNEL  
POWER MOSFETS**

## Specifications RFH10N45, RFH10N50

**ELECTRICAL CHARACTERISTICS, at Case Temperature (T<sub>c</sub>) = 25° C unless otherwise specified.**

CHARACTERISTIC	SYMBOL	TEST CONDITIONS	LIMITS				UNITS
			RFH10N45		RFH10N50		
			Min.	Max.	Min.	Max.	
Drain-Source Breakdown Voltage	BV <sub>DSS</sub>	I <sub>D</sub> = 10 mA V <sub>GS</sub> = 0	450	—	500	—	V
Gate Threshold Voltage	V <sub>GS(th)</sub>	V <sub>GS</sub> = V <sub>DS</sub> I <sub>D</sub> = 1 mA	2	4	2	4	V
Zero Gate Voltage Drain Current	I <sub>DSS</sub>	V <sub>DS</sub> = 360 V	—	1	—	—	μA
		V <sub>DS</sub> = 400 V	—	—	—	1	
		T <sub>c</sub> = 125° C	—	—	—	—	
		V <sub>DS</sub> = 360 V	—	50	—	—	
		V <sub>DS</sub> = 400 V	—	—	—	50	
Gate-Source Leakage Current	I <sub>GSS</sub>	V <sub>GS</sub> = ± 20 V V <sub>DS</sub> = 0	—	100	—	100	nA
Drain-Source On Voltage	V <sub>DS(on)</sub> <sup>Ⓐ</sup>	I <sub>D</sub> = 5 A	—	3.0	—	3.0	V
		V <sub>GS</sub> = 10 V					
		I <sub>D</sub> = 10 A	—	10	—	10	
		V <sub>GS</sub> = 10 V					
Static Drain-Source On Resistance	r <sub>DS(on)</sub> <sup>Ⓐ</sup>	I <sub>D</sub> = 5 A V <sub>GS</sub> = 10 V	—	0.6	—	0.6	Ω
Forward Transconductance	g <sub>fs</sub> <sup>Ⓐ</sup>	V <sub>DS</sub> = 10 V I <sub>D</sub> = 5 A	5	—	5	—	mho
Input Capacitance	C <sub>iss</sub>	V <sub>DS</sub> = 25 V	—	3000	—	3000	pF
Output Capacitance	C <sub>oss</sub>	V <sub>GS</sub> = 0 V	—	600	—	600	
Reverse Transfer Capacitance	C <sub>rss</sub>	f = 1MHz	—	200	—	200	
Turn-On Delay Time	t <sub>d(on)</sub>	V <sub>DS</sub> = 250 V	26(typ)	60	26(typ)	60	ns
Rise Time	t <sub>r</sub>	I <sub>D</sub> = 5 A	50(typ)	100	50(typ)	100	
Turn-Off Delay Time	t <sub>d(off)</sub>	R <sub>gen</sub> = R <sub>gs</sub> = 50Ω	525(typ)	900	525(typ)	900	
Fall Time	t <sub>f</sub>	V <sub>GS</sub> = 10 V	105(typ)	180	105(typ)	180	
Thermal Resistance Junction-to-Case	Rθ <sub>JC</sub>	RFH10N45, RFH10N50 Series	—	0.83	—	0.83	

<sup>Ⓐ</sup>Pulsed: Pulse duration = 300 μs max., duty cycle = 2%.

### SOURCE-DRAIN DIODE RATINGS AND CHARACTERISTICS

CHARACTERISTIC	SYMBOL	TEST CONDITIONS	LIMITS				UNITS
			RFH10N45		RFH10N50		
			Min.	Max.	Min.	Max.	
Diode Forward Voltage	V <sub>SD</sub> *	I <sub>SD</sub> = 5 A	—	1.4	—	1.4	V
Reverse Recovery Time	t <sub>rr</sub>	I <sub>F</sub> = 4 A, d <sub>I<sub>F</sub></sub> /d <sub>I</sub> = 100 A/μs	950 (typ.)		950 (typ.)		ns

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

# RFH10N45, RFH10N50

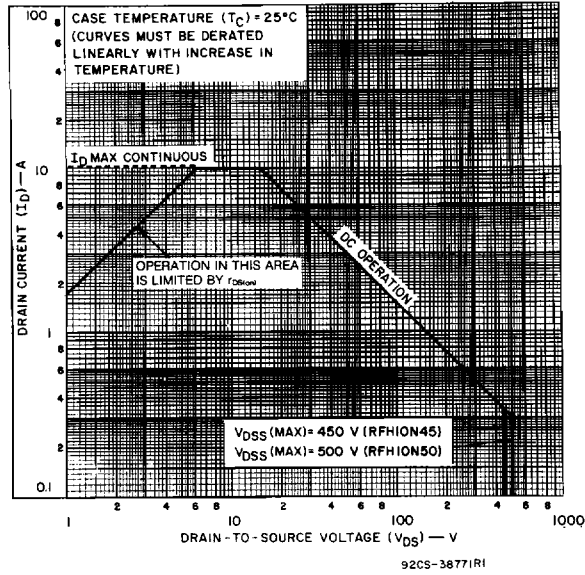


Fig. 1 - Maximum safe operating areas for all types.

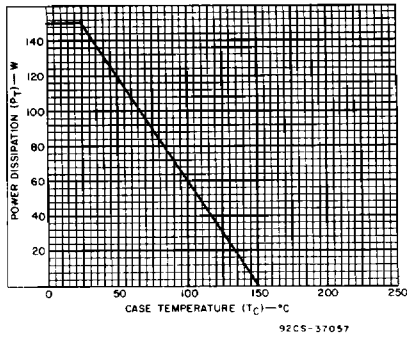


Fig. 2 - Power vs. temperature derating curve for all types.

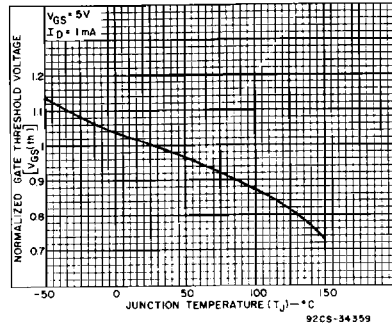


Fig. 3 - Typical normalized gate threshold voltage as a function of junction temperature for all types.

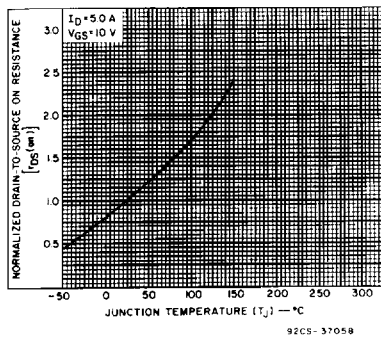


Fig. 4 - Normalized drain-to-source on resistance to junction temperature for all types.

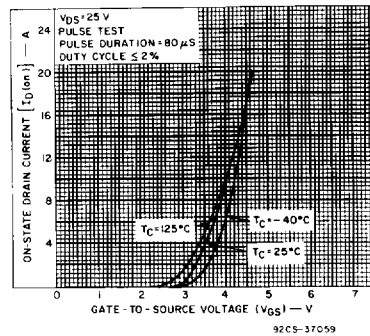


Fig. 5 - Typical transfer characteristics for all types.

# RFH10N45, RFH10N50

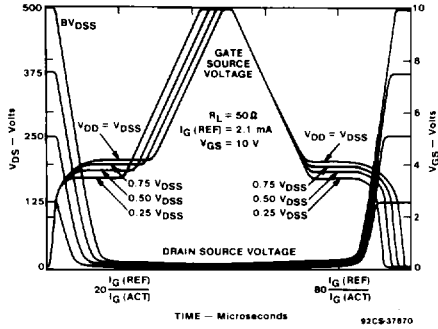


Fig. 6 - Normalized switching waveforms for constant gate-current. Refer to Harris application notes AN-7254 and AN-7260.

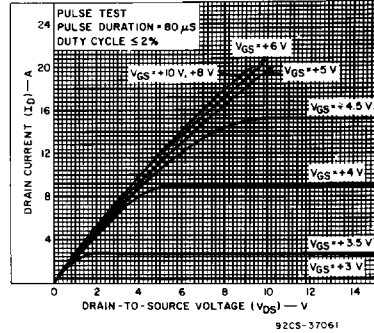


Fig. 7 - Typical saturation characteristics for all types.

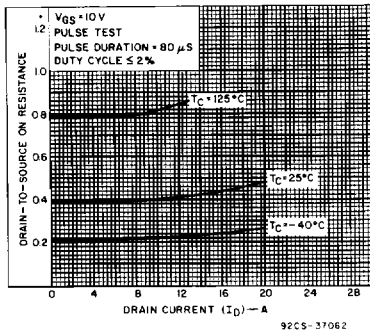


Fig. 8 - Typical drain-to-source on resistance as a function of drain current for all types.

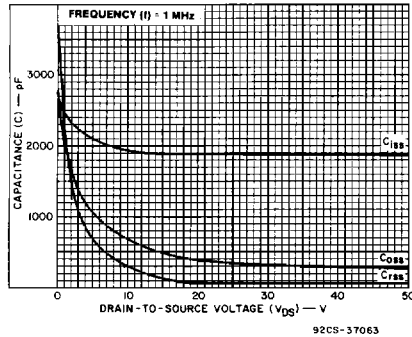


Fig. 9 - Capacitance as a function of drain-to-source voltage for all types.

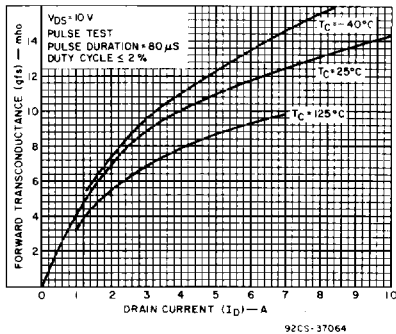


Fig. 10 - Typical forward transconductance as a function of drain current for all types.

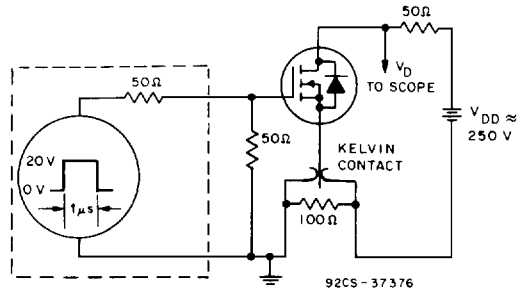


Fig. 11 - Switching Time Test Circuit.