

RFM10N45 RFM10N50

N-Channel Enhancement Mode Power Field Effect Transistors

August 1991

Features

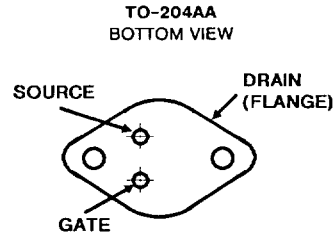
- 10A, 450V and 500V
- $r_{DS(on)} = 0.6\Omega$
- SOA is Power-Dissipation Limited
- Nanosecond Switching Speeds
- Linear Transfer Characteristics
- High Input Impedance
- Majority Carrier Device
- High-Current, Low-Inductance Package

Description

The RFM10N45 and RFM10N50 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 transistors requiring high speed and low gate-drive power. These transistors can be operated directly from integrated circuits.

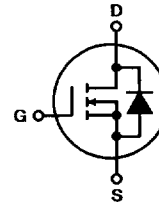
The RFM types are supplied in the JEDEC TO-204AA steel package.

Packages



Terminal Diagram

N-CHANNEL ENHANCEMENT MODE



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

	RFM10N45	RFM10N50	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	± 20	± 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 RFM10N45, RFM10N50

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

CHARACTERISTIC	SYMBOL	TEST CONDITIONS	LIMITS				UNITS
			RFM10N45		RFM10N50		
			Min.	Max.	Min.	Max.	
Drain-Source Breakdown Voltage	BV_{DSS}	$I_D = 10 \text{ mA}$ $V_{GS} = 0$	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}	$V_{DS} = 360 \text{ V}$	—	1	—	—	μA
		$V_{DS} = 400 \text{ V}$	—	—	—	1	
		$T_C = 125^\circ\text{C}$ $V_{DS} = 360 \text{ V}$ $V_{DS} = 400 \text{ V}$	—	50	—	—	
Gate-Source Leakage Current	I_{DSS}	$V_{GS} = \pm 20 \text{ V}$ $V_{DS} = 0$	—	100	—	100	nA
Drain-Source On Voltage	$V_{DS(on)}^{\text{a}}$	$I_D = 5 \text{ A}$ $V_{GS} = 10 \text{ V}$	—	3.0	—	3.0	V
		$I_D = 10 \text{ A}$ $V_{GS} = 10 \text{ V}$	—	10	—	10	
Static Drain-Source On Resistance	$r_{DS(on)}^{\text{a}}$	$I_D = 5 \text{ A}$ $V_{GS} = 10 \text{ V}$	—	0.6	—	0.6	Ω
Forward Transconductance	g_{fs}^{a}	$V_{DS} = 10 \text{ V}$ $I_D = 5 \text{ A}$	5	—	5	—	mho
Input Capacitance	C_{iss}	$V_{DS} = 25 \text{ V}$	—	3000	—	3000	pF
Output Capacitance	C_{oss}	$V_{GS} = 0 \text{ V}$	—	600	—	600	
Reverse Transfer Capacitance	C_{riss}	$f = 1 \text{ MHz}$	—	200	—	200	
Turn-On Delay Time	$t_d(on)$	$V_{DS} = 250$	26(typ)	60	26(typ)	60	ns
Rise Time	t_r	$I_D = 5 \text{ A}$	50(typ)	100	50(typ)	100	
Turn-Off Delay Time	$t_d(off)$	$R_{gen} = R_{gs} = 50 \Omega$	525(typ)	900	525(typ)	900	
Fall Time	t_f	$V_{GS} = 10 \text{ V}$	105(typ)	180	105(typ)	180	
Thermal Resistance Junction-to-Case	$R_{\theta JC}$	RFM10N45, RFM10N50 Series	—	0.83	—	0.83	$^\circ\text{C/W}$

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

SOURCE-DRAIN DIODE RATINGS AND CHARACTERISTICS

CHARACTERISTIC	SYMBOL	TEST CONDITIONS	LIMITS				UNITS
			RFM10N45		RFM10N50		
			Min.	Max.	Min.	Max.	
Diode Forward Voltage	V_{SD}	$I_{SD} = 5 \text{ A}$	—	1.4	—	1.4	V
Reverse Recovery Time	t_{rr}	$I_F = 4 \text{ A}$, $dI_F/dt = 100 \text{ A}/\mu\text{s}$	950 typ.		950 typ.		ns

* Pulse Test: Width $\leq 300 \mu\text{s}$, Duty cycle $\leq 2\%$.

RFM10N45, RFM10N50

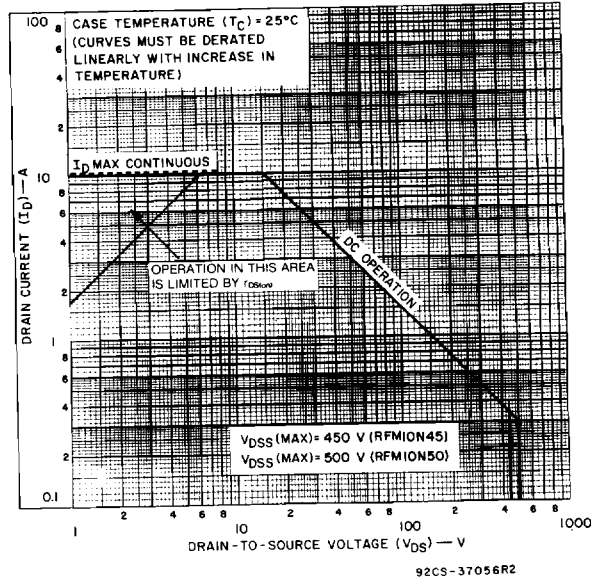


Fig. 1 - Maximum safe operating areas for all types.

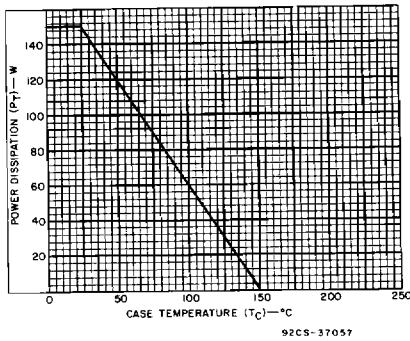


Fig. 2 - Power vs. temperature derating curve for all types.

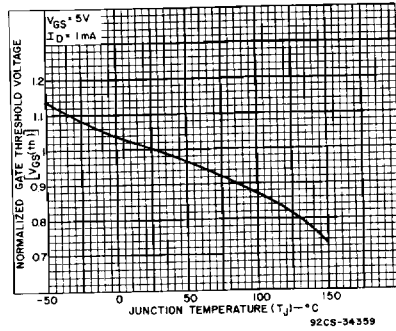


Fig. 3 - Typical normalized gate threshold voltage as a function of junction temperature for all types.

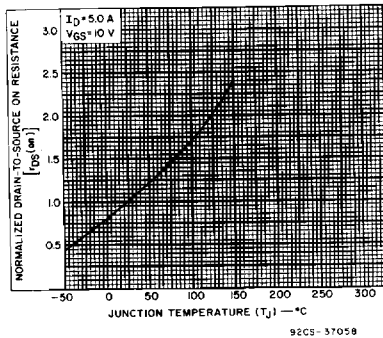


Fig. 4 - Normalized drain-to-source on resistance to junction temperature for all types.

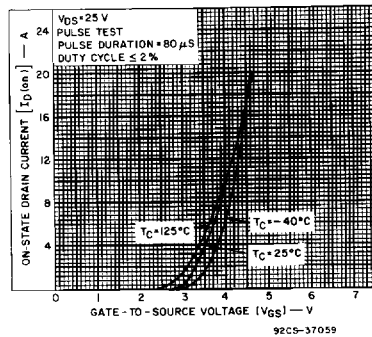


Fig. 5 - Typical transfer characteristics for all types.

RFM10N45, RFM10N50

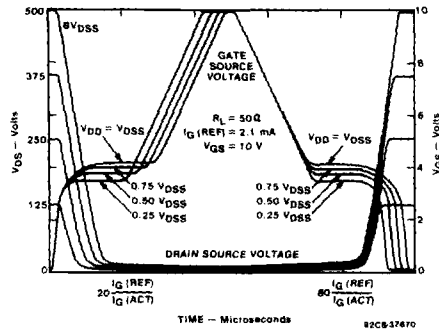


Fig. 6 - Normalized switching waveforms for constant gate-current. Refer to Harris application notes AN-7254 and AN-7260.

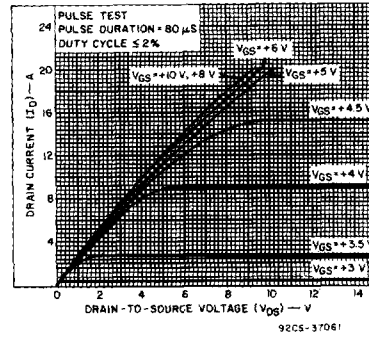


Fig. 7 - Typical saturation characteristics for all types.

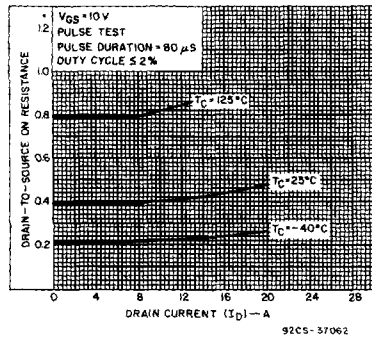


Fig. 8 - Typical drain-to-source on resistance as a function of drain current for all types.

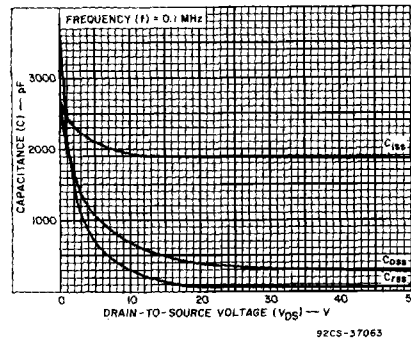


Fig. 9 - Capacitance as a function of drain-to-source voltage for all types.

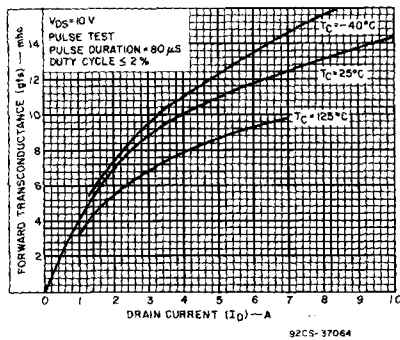


Fig. 10 - Typical forward transconductance as a function of drain current for all types.

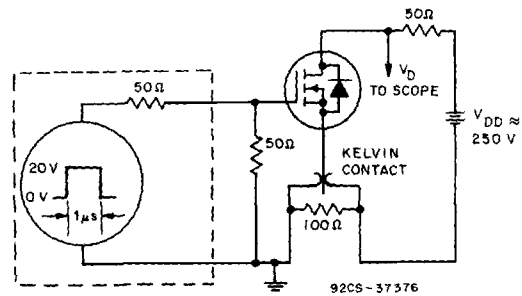


Fig. 11 - Switching Time Test Circuit.