RFH30N12, RFH30N15

File Number **1633**

Power MOS Field-Effect Transistors

N-Channel Enhancement-Mode Power Field-Effect Transistors

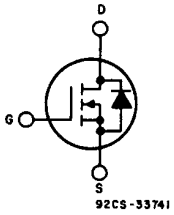
30 A, 120 V - 150 V

$r_{DS(on)}$ = 0.075 Ω

Features:

- *SOA is power-dissipation limited*
- *Nanosecond switching speeds*
- *Linear transfer characteristics*
- *High input impedance*
- *Majority carrier device*
- *High-current, low-inductance package*

TERMINAL DIAGRAM



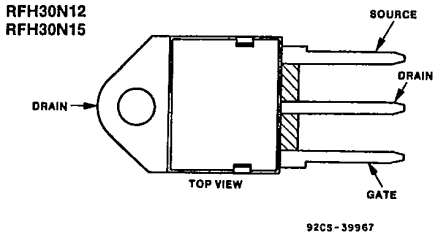
N-CHANNEL ENHANCEMENT MODE

The RFH30N12 and RFH30N15* 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 RFH-types are supplied in the JEDEC TO-218AC plastic package.

*The RFH30N12 and RFH30N15 types were formerly RCA developmental numbers TA9578A and TA9578B respectively.

TERMINAL DESIGNATIONS



JEDEC TO-218AC

MAXIMUM RATINGS, *Absolute-Maximum Values (T_C = 25° C):*

		RFH30N12	RFH30N15	
DRAIN-SOURCE VOLTAGE	V_{DSS}	120	150	V
DRAIN-GATE VOLTAGE, R_{GS} = 1 MΩ	V_{DGR}	120	150	V
GATE-SOURCE VOLTAGE	V_{GS}	±20		V
DRAIN CURRENT, RMS Continuous	I_D	30		A
Pulsed	I_{DM}	100		A
POWER DISSIPATION @ T_C = 25° C	P_T	150		W
Derate above T_C = 25° C		1.2		W/° C
OPERATING AND STORAGE TEMPERATURE	T_J, T_{stg}	-55 to +150		°C

RFH30N12, RFH30N15

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

CHARACTERISTIC	SYMBOL	TEST CONDITIONS	LIMITS				UNITS
			RFH30N12		RFH30N15		
			Min.	Max.	Min.	Max.	
Drain-Source Breakdown Voltage	BV_{DSS}	I_D = 1 mA V_{GS} = 0	120	—	150	—	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} = 100 V V_{DS} = 120 V	— —	1 —	— —	— 1	μA
		T_C = 125°C V_{DS} = 100 V V_{DS} = 120 V	— —	50 —	— —	— 50	μA
Gate-Source Leakage Current	I_{GSS}	V_{GS} = ± 20 V V_{DS} = 0	—	100	—	100	nA
On-State Gate Voltage	$V_{GS(on)}$[a]	V_{DS} = 5 V I_D = 15 A	—	8	—	8	V
		V_{DS} = 10 V I_D = 30 A	—	10	—	10	V
Drain-Source On Voltage	$V_{DS(on)}$[a]	I_D = 15 A V_{GS} = 10 V	—	1.125	—	1.125	V
		I_D = 30 A V_{GS} = 10 V	—	2.65	—	2.65	V
Static Drain-Source On Resistance	$r_{DS(on)}$[a]	I_D = 15 A V_{GS} = 10 V	—	0.075	—	0.075	Ω
Forward Transconductance	g_{fs}[a]	V_{DS} = 10 V I_D = 15 A	10	—	10	—	mho
Input Capacitance	C_{iss}	V_{DS} = 25 V V_{GS} = 0 V f = 1 MHz	—	3000	—	3000	pF
Output Capacitance	C_{oss}		—	1200	—	1200	pF
Reverse Transfer Capacitance	C_{rss}		—	500	—	500	pF
Turn-On Delay Time	t_d(on)	V_{DS} = 75 V I_D = 15 A R_{gen}=R_{gs}=50Ω V_{GS} = 10 V	75(typ)	115	75(typ)	115	ns
Rise Time	t_r		420(typ)	630	420(typ)	630	ns
Turn-Off Delay Time	t_d(off)		300(typ)	450	300(typ)	450	ns
Fall Time	t_f		250(typ)	375	250(typ)	375	ns
Thermal Resistance Junction-to-Case	$R\theta_{JC}$	RFH30N12, RFH30N15 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
			RFH30N12		RFH30N15		
			Min.	Max.	Min.	Max.	
Diode Forward Voltage	V_{SD} *	I_{SD} = 15A	—	1.4	—	1.4	V
Reverse Recovery Time	t_{rr}	I_F = 4A, d_{IF}/d_t = 100 A/μs	200 (typ.)		200 (typ.)		ns

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

RFH30N12, RFH30N15

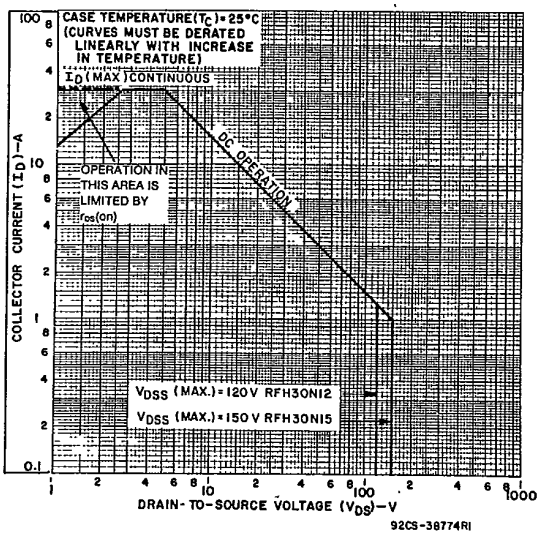


Fig. 1 - Maximum safe operating areas for all types.

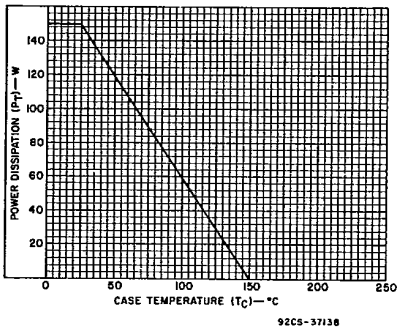


Fig. 2 - Power vs. temperature derating curve for all types.

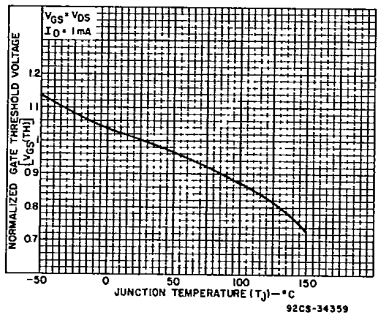


Fig. 3 - Typical normalized gate threshold voltage as a function of junction temperature for all types.

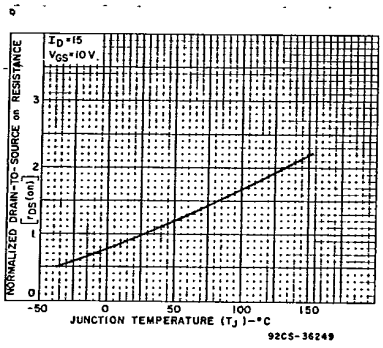


Fig. 4 - Normalized drain-to-source on resistance to junction temperature for all types.

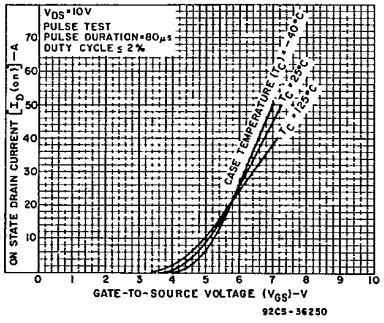


Fig. 5 - Typical transfer characteristics for all types.

RFH30N12, RFH30N15

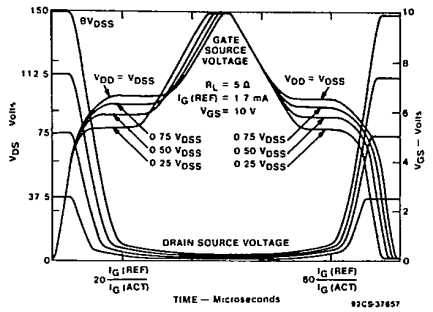


Fig. 6 - Normalized switching waveforms for constant gate-current drive.

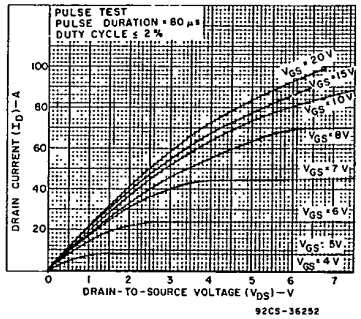


Fig. 7 - Typical saturation characteristics for all types.

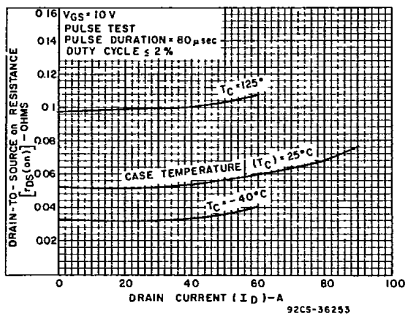


Fig. 8 - Typical drain-to-source on resistance as a function of drain current for all types.

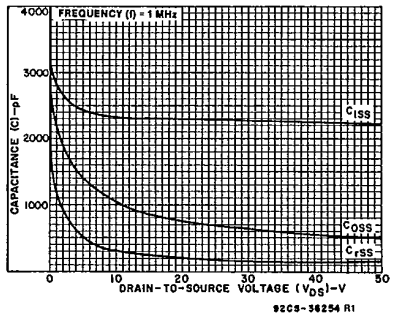


Fig. 9 - Capacitance as a function of drain-to-source voltage for all types.

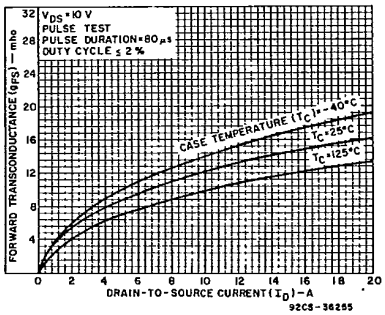


Fig. 10 - Typical forward transconductance as a function of drain current for all types.

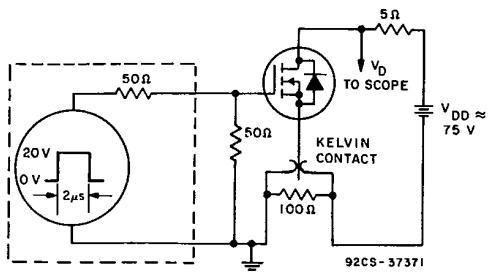


Fig. 11 - Switching Time Test Circuit.

RFK30N12, RFK30N15

File Number **1455**

Power MOS Field-Effect Transistors

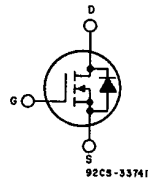
N-Channel Enhancement-Mode Power Field-Effect Transistors

30 A, 120 V - 150 V
$r_{DS}(on)$=0.075 Ω

Features:

- *SOA is power-dissipation limited*
- *Nanosecond switching speeds*
- *Linear transfer characteristics*
- *High input impedance*
- *Majority carrier device*

TERMINAL DIAGRAM



N-CHANNEL ENHANCEMENT MODE

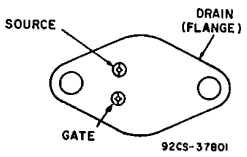
The RFK30N12 and RFK30N15* are n-channel enhancement-mode silicon-gate power field-effect transistors designed for applications such as switching regulators, switching converters, motor drivers, relay drivers, and drivers for high-power bipolar switching transistors requiring high speed and low gate-drive power. These types can be operated directly from integrated circuits.

The RFK-types are supplied in the JEDEC TO-204AE steel package.

*The RFK30N12 and RFK30N15 types were formerly RCA developmental numbers TA9188A and TA9188B, respectively.

TERMINAL DESIGNATIONS

RFK30N12
RFK30N15



JEDEC TO-204AE

MAXIMUM RATINGS, *Absolute-Maximum Values (T_C=25°C):*

		RFK30N12	RFK30N15	
DRAIN-SOURCE VOLTAGE	V_{DSS}	120	150	V
DRAIN-GATE VOLTAGE, R_{GS}=1 MΩ	V_{DGR}	120	150	V
GATE-SOURCE VOLTAGE	V_{GS}	±20		V
DRAIN CURRENT, RMS Continuous	I_D	30		A
Pulsed	I_{DM}	100		A
POWER DISSIPATION @T_C=25°C	P_T	120		W
Derate above T_C=25°C		1.2		W/°C
OPERATING AND STORAGE TEMPERATURE	T_J, T_{stg}	-55 to +125		°C

RFK30N12, RFK30N15

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

CHARACTERISTIC	SYMBOL	TEST CONDITIONS	LIMITS				UNITS
			RFK30N12		RFK30N15		
			MIN.	MAX.	MIN.	MAX.	
Drain-Source Breakdown Voltage	BV_{DSS}	I_D=1 mA V_{GS}=0	120	—	150	—	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}=100 V	—	1	—	—	μA
		V_{DS}=120 V	—	—	—	1	
		T_C=125°C V_{DS}=100 V	—	50	—	—	
		V_{DS}=120 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=15 A V_{GS}=10 V	—	1.125	—	1.125	V
		I_D=30 A V_{GS}=10 V	—	3	—	3	
Static Drain-Source On Resistance	$r_{DS}(on)$[a]	I_D=15 A V_{GS}=10 V	—	0.075	—	0.075	Ω
Forward Transconductance	g_{fs}[a]	V_{DS}=10 V I_D=15 A	10	—	10	—	mho
Input Capacitance	C_{iss}	V_{DS}=25 V	—	3000	—	3000	pF
Output Capacitance	C_{oss}	V_{GS}=0 V	—	1200	—	1200	
Reverse Transfer Capacitance	C_{rss}	f = 1MHz	—	500	—	500	
Turn-On Delay Time	$t_d(on)$	V_{DD}=75V	75(typ)	115	75(typ)	115	ns
Rise Time	t_r	I_D=15 A	420(typ)	630	420(typ)	630	
Turn-Off Delay Time	$t_d(off)$	R_{gen}=R_{gs}=50 Ω	300(typ)	450	300(typ)	450	
Fall Time	t_f	V_{GS}=10 V	250(typ)	375	250(typ)	375	
Thermal Resistance Junction-to-Case	$R_{\theta JC}$	RFK30N12, RFK30N15 Series	—	0.83	—	0.83	°C/W

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

SOURCE-DRAIN DIODE RATINGS AND CHARACTERISTICS

CHARACTERISTIC	SYMBOL	TEST CONDITIONS	LIMITS				UNITS
			RFK30N12		RFK30N15		
			MIN.	MAX.	MIN.	MAX.	
Diode Forward Voltage	V_{SD}	I_{SD}=15 A	—	1.4	—	1.4	V
Reverse Recovery Time	t_{rr}	I_F=4 A d_{IF}/d_t=100 A/μs	200(typ)		200(typ)		ns

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

RFK30N12, RFK30N15

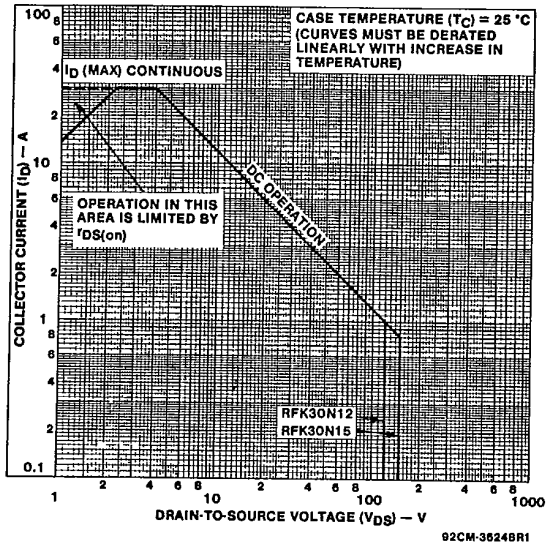


Fig. 1 - Maximum safe operating areas for all types.

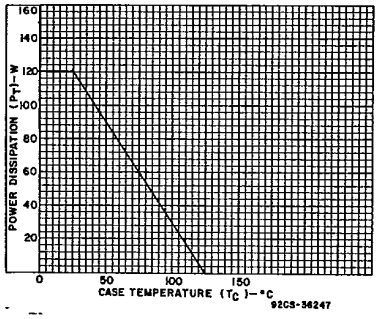


Fig. 2 - Power vs. temperature derating curve for all types.

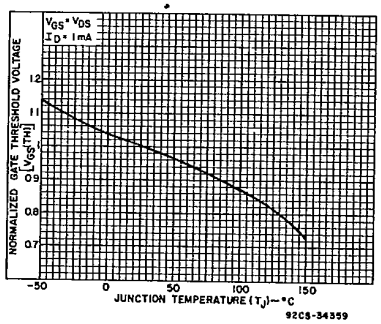


Fig. 3 - Typical normalized gate threshold voltage as a function of junction temperature for all types.

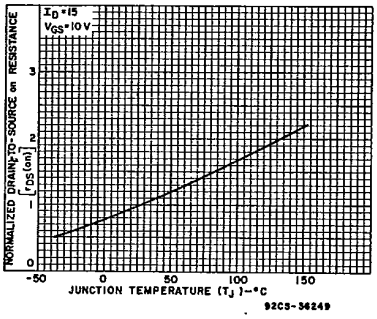
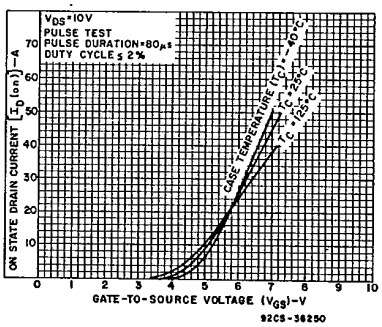


Fig. 4 - Normalized drain-to-source on resistance to junction temperature for all types.



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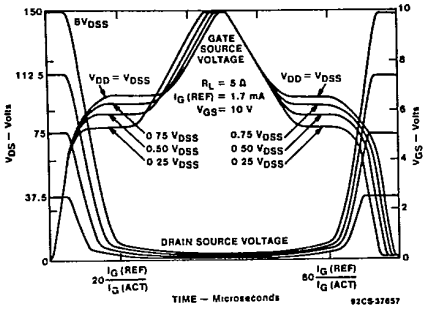

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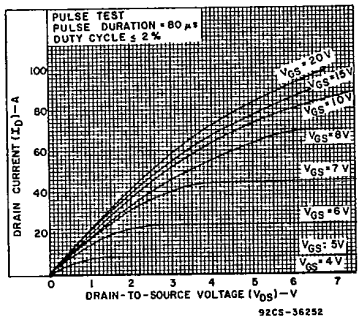

Fig. 7 - Typical saturation characteristics for all types.

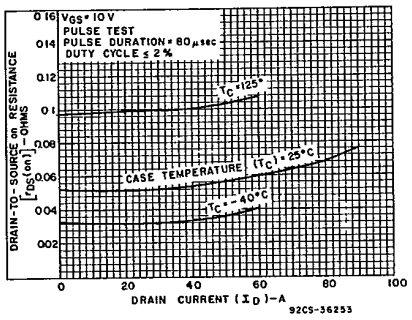

Fig. 8 - Typical drain-to-source on resistance as a function of drain current for all types.

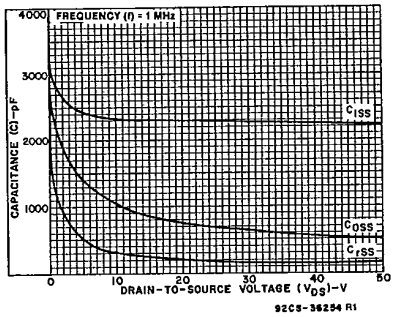

Fig. 9 - Capacitance as a function of drain-to-source voltage for all types.

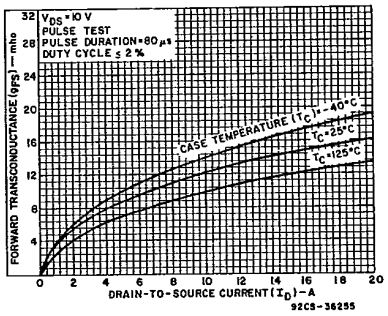

Fig. 10 - Typical forward transconductance as a function of drain current for all types.

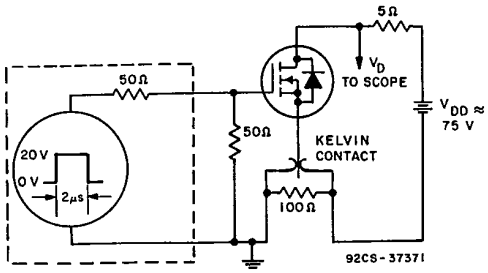

Fig. 11 — Switching Time Test Circuit