

RFH30N12, RFH30N15

File Number 1633

Power MOS Field-Effect Transistors

N-Channel Enhancement-Mode
Power Field-Effect Transistors

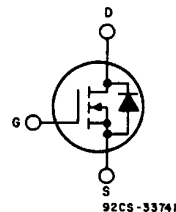
30 A, 120 V - 150 V

 $r_{DS(on)} = 0.075 \Omega$

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



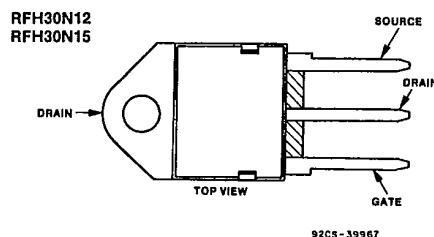
N-CHANNEL ENHANCEMENT MODE

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 ($T_C = 25^\circ\text{C}$):

	RFH30N12	RFH30N15	
DRAIN-SOURCE VOLTAGE	120	150	V
DRAIN-GATE VOLTAGE, $R_{gs} = 1 \text{ M}\Omega$	120	150	V
GATE-SOURCE VOLTAGE	± 20		V
DRAIN CURRENT, RMS Continuous	30		A
Pulsed	100		A
POWER DISSIPATION @ $T_C = 25^\circ\text{C}$	150		W
Derate above $T_C = 25^\circ\text{C}$	1.2		W/ $^\circ\text{C}$
OPERATING AND STORAGE TEMPERATURE	-55 to +150		$^\circ\text{C}$

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 _O = 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
On-State Gate Voltage	V _{GS(on)} ^a	V _{DS} = 5 V I _O = 15 A	—	8	—	8	V
		V _{DS} = 10 V I _O = 30 A	—	10	—	10	
Drain-Source On Voltage	V _{DS(on)} ^a	I _O = 15 A V _{GS} = 10 V	—	1.125	—	1.125	V
		I _O = 30 A V _{GS} = 10 V	—	2.65	—	2.65	
Static Drain-Source On Resistance	r _{DS(on)} ^a	I _O = 15 A V _{GS} = 10 V	—	0.075	—	0.075	Ω
Forward Transconductance	g _{fs} ^a	V _{DS} = 10 V I _O = 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 = 1 MHz	—	500	—	500	
Turn-On Delay Time	t _{d(on)}	V _{DS} = 75 V	75(typ)	115	75(typ)	115	ns
Rise Time	t _r	I _O = 15 A	420(typ)	630	420(typ)	630	
Turn-Off Delay Time	t _{d(off)}	R _{gen} =R _{gs} =50Ω	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	Rθ _{JC}	RFH30N12, RFH30N15 Series	—	0.83	—	0.83	°C/W

^aPulsed: 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}	$I_F = 4A, dI_F/dt = 100 A/\mu s$		200 (typ.)		200 (typ.)		ns

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

RFH30N12, RFH30N15

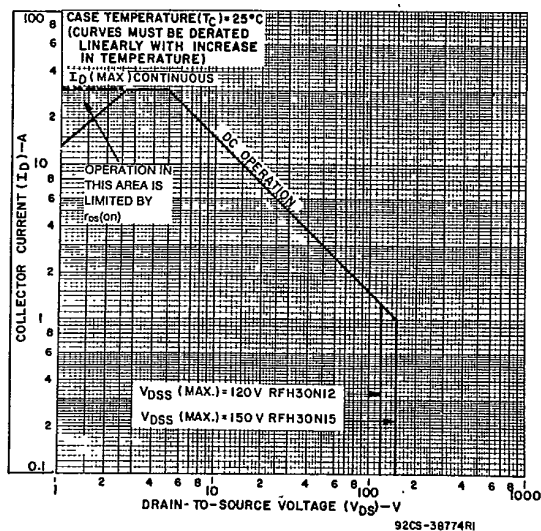


Fig. 1 - Maximum safe operating areas for all types.

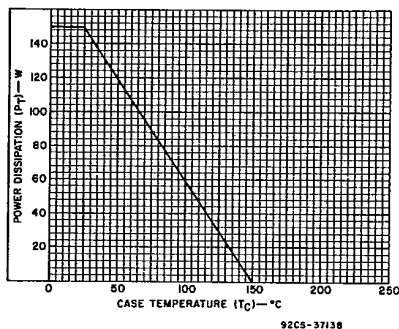


Fig. 2 - Power vs. temperature derating curve for all types.

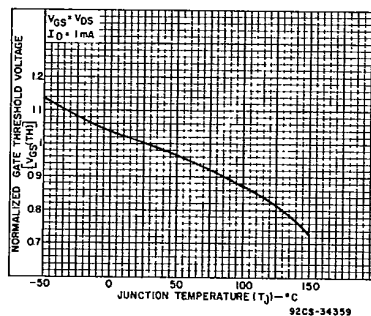


Fig. 3 - Typical normalized gate threshold voltage as a function of junction temperature for all types.

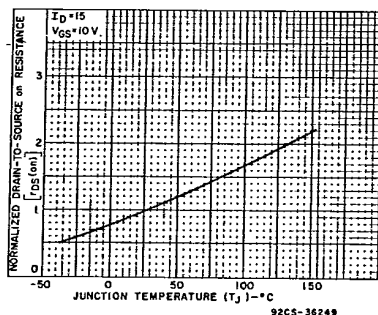


Fig. 4 - Normalized drain-to-source on resistance to junction temperature for all types.

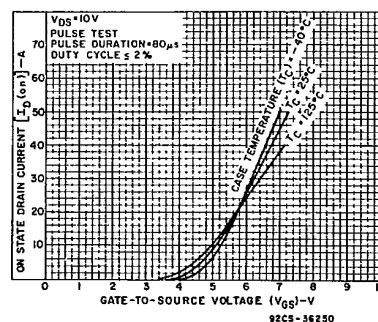


Fig. 5 - Typical transfer characteristics for all types.

RFH30N12, RFH30N15

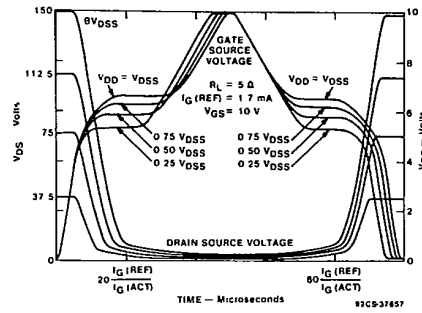


Fig. 6 - Normalized switching waveforms for constant gate-current drive.

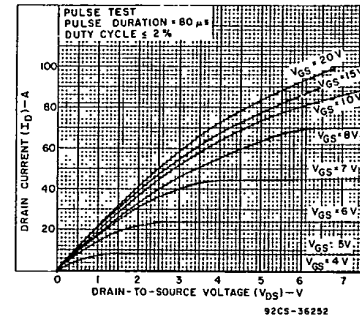


Fig. 7 - Typical saturation characteristics for all types.

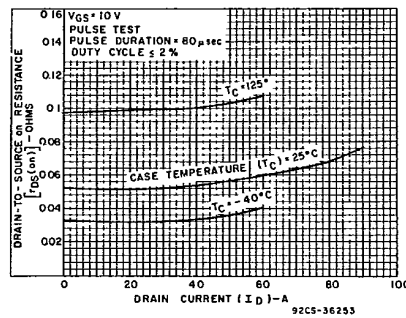


Fig. 8 - Typical drain-to-source on resistance as a function of drain current for all types.

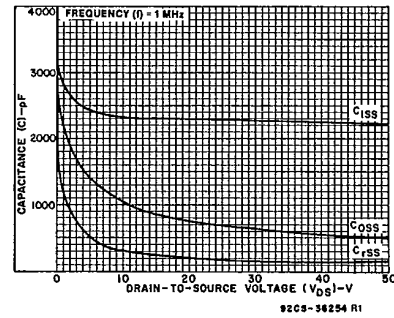


Fig. 9 - Capacitance as a function of drain-to-source voltage for all types.

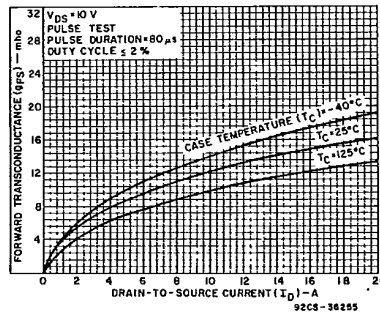


Fig. 10 - Typical forward transconductance as a function of drain current for all types.

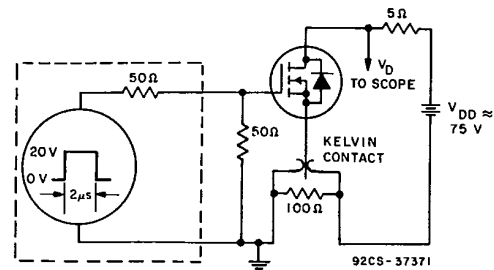


Fig. 11 - Switching Time Test Circuit.

RFK30N12, RFK30N15

File Number 1455

Power MOS Field-Effect Transistors

N-Channel Enhancement-Mode
Power Field-Effect Transistors

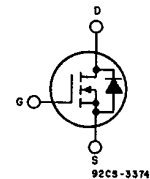
30 A, 120 V - 150 V

 $r_{DS(on)} = 0.075 \Omega$

Features:

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

TERMINAL DIAGRAM



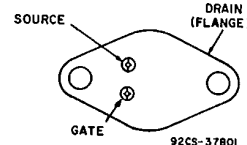
N-CHANNEL ENHANCEMENT MODE

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 ($T_C = 25^\circ\text{C}$):

	RFK30N12	RFK30N15	
DRAIN-SOURCE VOLTAGE	120	150	V
DRAIN-GATE VOLTAGE, $R_{GS} = 1 \text{ M}\Omega$	120	150	V
GATE-SOURCE VOLTAGE		± 20	V
DRAIN CURRENT, RMS Continuous		30	A
Pulsed		100	A
POWER DISSIPATION @ $T_C = 25^\circ\text{C}$		120	W
Derate above $T_C = 25^\circ\text{C}$		1.2	W/ $^\circ\text{C}$
OPERATING AND STORAGE TEMPERATURE	-55 to +125		$^\circ\text{C}$

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	—	50	—	—	
		V _{DS} =100 V 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 _{θJC}	RFK30N12, RFK30N15 Series	—	0.83	—	0.83	°C/W

*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 _I F/d _t =100 A/μs	200(typ)		200(typ)		ns

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

RFK30N12, RFK30N15

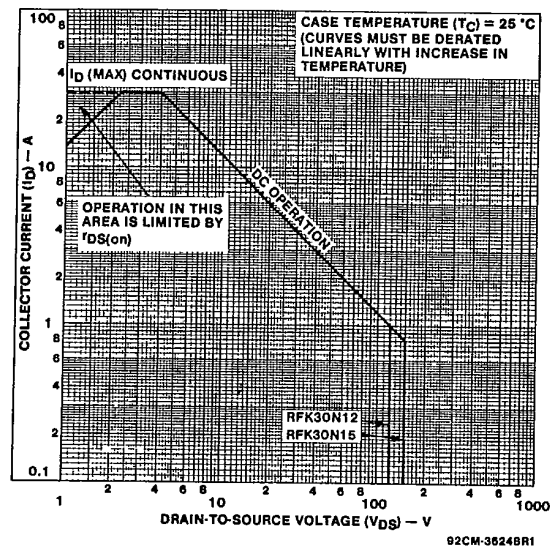


Fig. 1 - Maximum safe operating areas for all types.

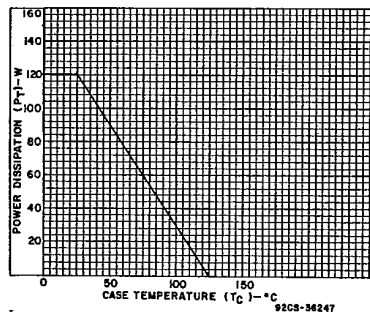


Fig. 2 - Power vs. temperature derating curve for all types.

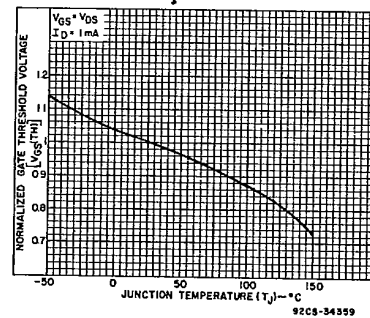


Fig. 3 - Typical normalized gate threshold voltage as a function of junction temperature for all types.

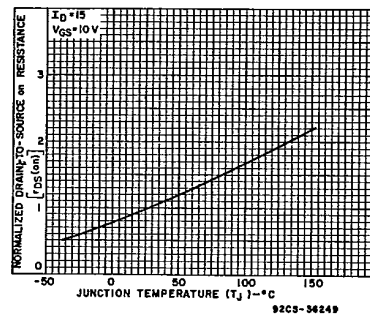


Fig. 4 - Normalized drain-to-source on resistance to junction temperature for all types.

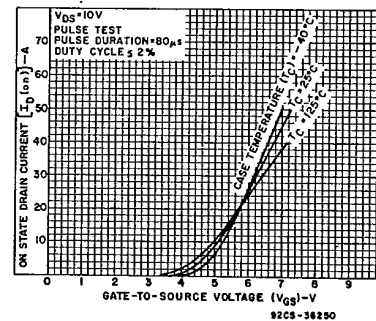


Fig. 5 - Typical transfer characteristics for all types.

RFK30N12, RFK30N15

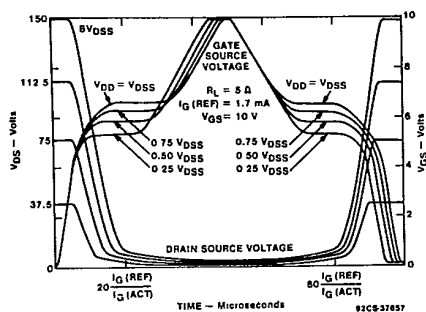


Fig. 6 - Normalized switching waveforms for constant gate-current drive.

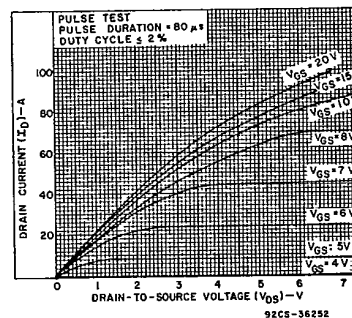


Fig. 7 - Typical saturation characteristics for all types.

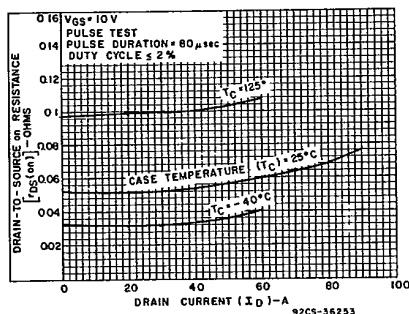


Fig. 8 - Typical drain-to-source on resistance as a function of drain current for all types.

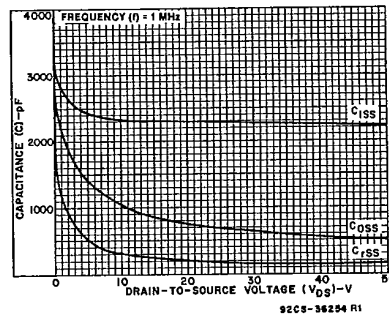


Fig. 9 - Capacitance as a function of drain-to-source voltage for all types.

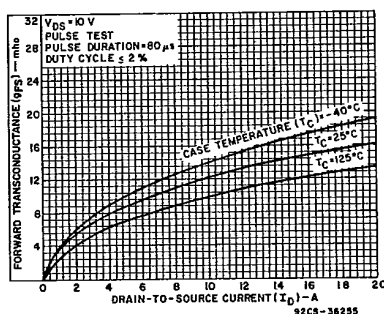


Fig. 10 - Typical forward transconductance as a function of drain current for all types.

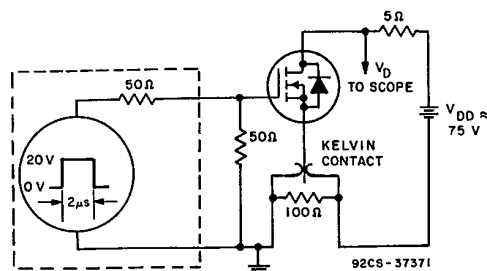


Fig. 11 - Switching Time Test Circuit