

Standard Power MOSFETs

RFH30N12, RFH30N15

File Number 1633

Power MOS Field-Effect Transistors

N-Channel Enhancement-Mode Power Field-Effect Transistors

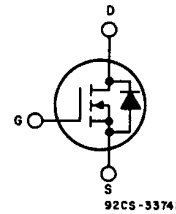
30 A, 120 V - 150 V

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

Features:

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

TERMINAL DIAGRAM



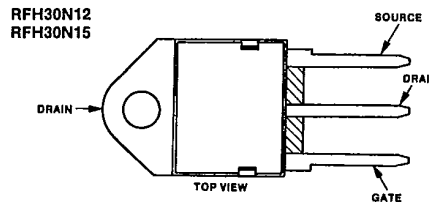
N-CHANNEL ENHANCEMENT MODE

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 ($T_c = 25^\circ C$):

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

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 V _{DS} = 120 V	—	1	—	—	μA
		T _c = 125° C V _{DS} = 100 V V _{DS} = 120 V	—	50	—	—	
			—	—	—	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 _D = 15 A	—	8	—	8	V
		V _{DS} = 10 V I _D = 30 A	—	10	—	10	
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	
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 _f ^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 _{res}	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 _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}	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	SYMBOL	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 /dI = 100 A/μs	200 (typ.)		200 (typ.)		ns

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

RFH30N12, RFH30N15

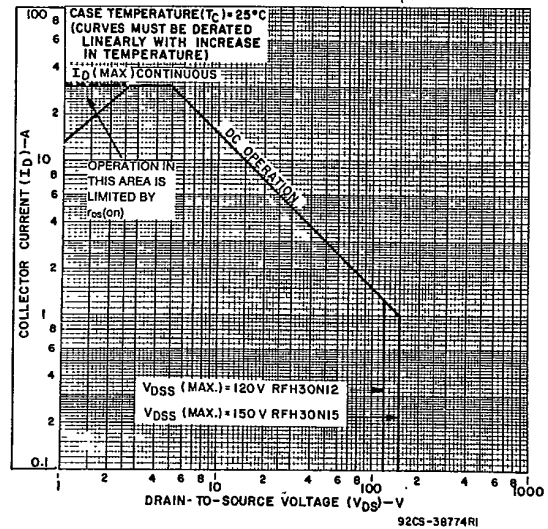


Fig. 1 - Maximum safe operating areas for all types.

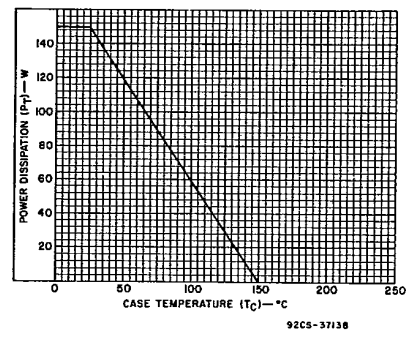


Fig. 2 - Power vs. temperature derating curve for all types.

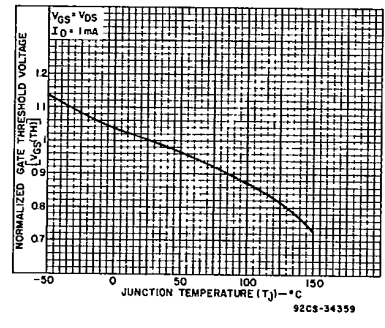


Fig. 3 - Typical normalized gate threshold voltage as a function of junction temperature for all types.

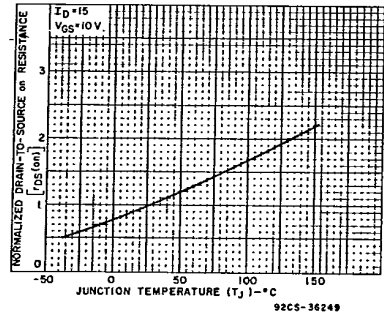


Fig. 4 - Normalized drain-to-source on resistance to junction temperature for all types.

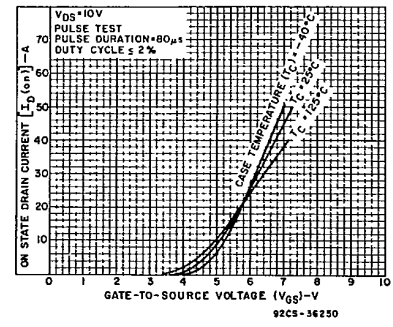


Fig. 5 - Typical transfer characteristics for all types.

RFH30N12, RFH30N15

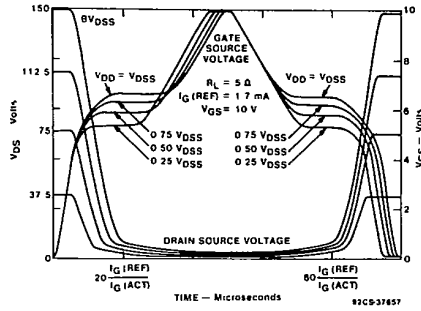


Fig. 6 - Normalized switching waveforms for constant gate-current drive.

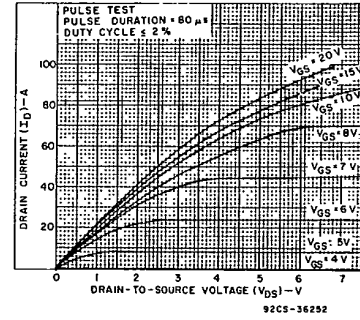


Fig. 7 - Typical saturation characteristics for all types.

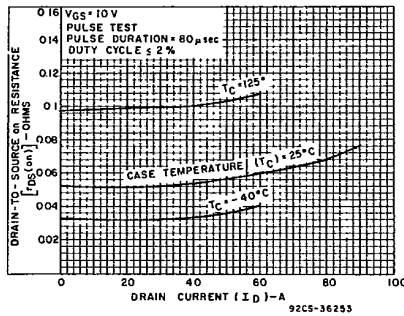


Fig. 8 - Typical drain-to-source on resistance as a function of drain current for all types.

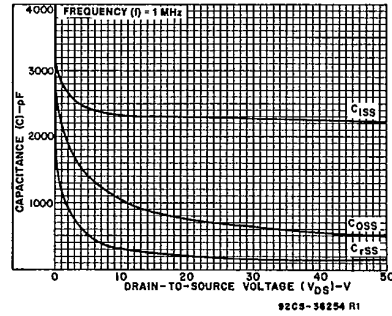


Fig. 9 - Capacitance as a function of drain-to-source voltage for all types.

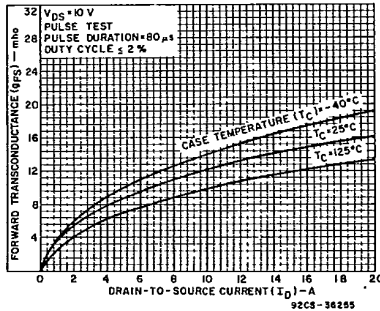


Fig. 10 - Typical forward transconductance as a function of drain current for all types.

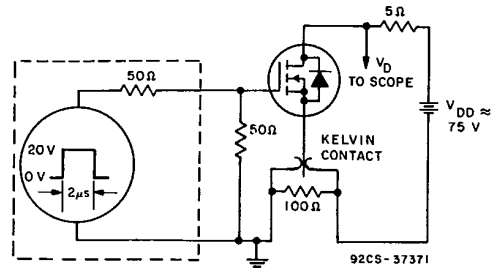


Fig. 11 - Switching Time Test Circuit.

RFK30N12, RFK30N15

File Number 1455

Power MOS Field-Effect Transistors

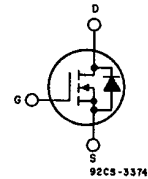
**N-Channel Enhancement-Mode
Power Field-Effect Transistors**

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

Features:

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

TERMINAL DIAGRAM



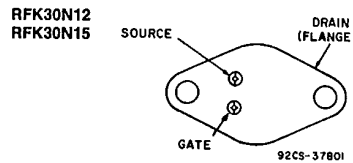
N-CHANNEL ENHANCEMENT MODE

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



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 V _{DS} =100 V V _{DS} =120 V	—	50	—	—	
Gate-Source Leakage Current	I _{DSS}	V _{GS} = ± 20 V, V _{DS} =0	—	100	—	100	nA
Drain-Source On Voltage	V _{DS(on)} *	I _D =15 A V _{GS} =10 V	—	1.125	—	1.125	V
		I _D =30 A V _{GS} =10 V	—	3	—	3	
		I _D =15 A V _{GS} =10 V	—	0.075	—	0.075	
Static Drain-Source On Resistance	r _{DS(on)} *	I _D =15 A V _{GS} =10 V	—	0.075	—	0.075	Ω
Forward Transconductance	g _{fs} *	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	

*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 _r	I _F =4 A d _{I_F}/d_t=100 A/μs}	200(typ)		200(typ)		ns

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

RFK30N12, RFK30N15

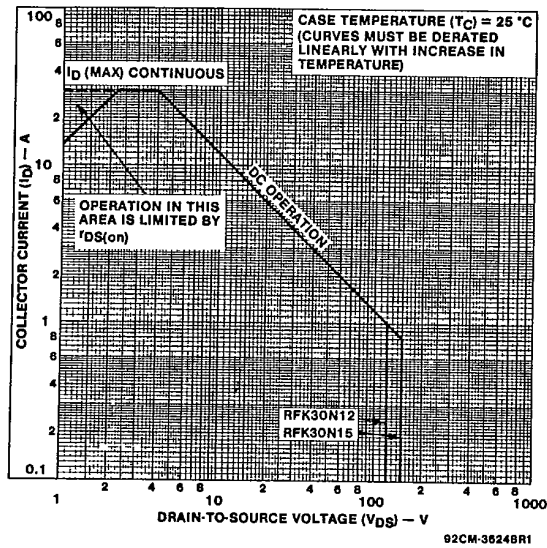


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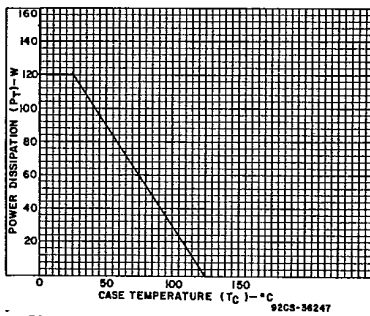


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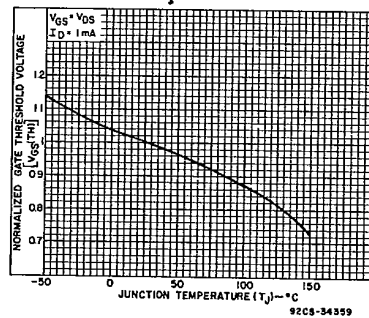


Fig. 3 - Typical normalized gate threshold voltage as a function of junction temperature for all types.

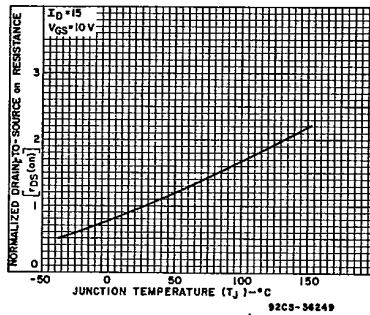


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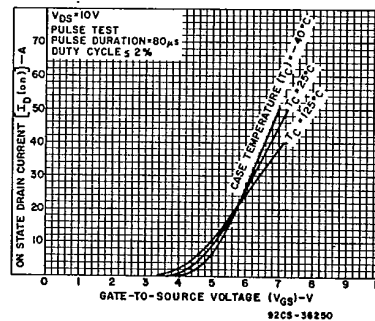


Fig. 5 - Typical transfer characteristics for all types.

RFK30N12, RFK30N15

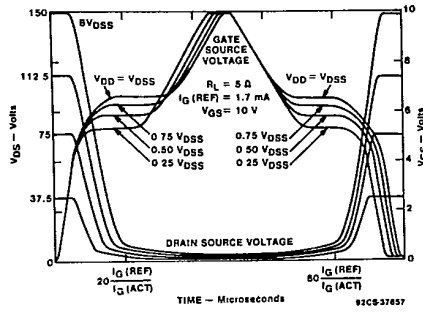


Fig. 6 - Normalized switching waveforms for constant gate-current drive.

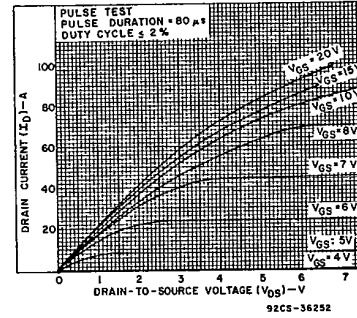


Fig. 7 - Typical saturation characteristics for all types.

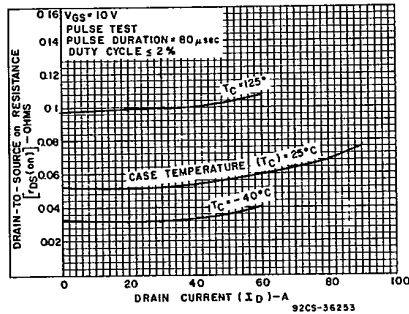


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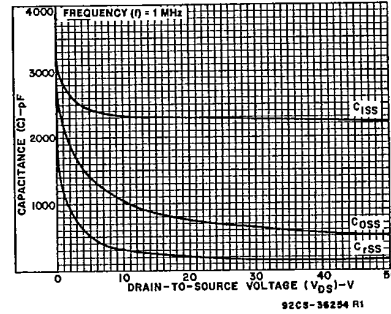


Fig. 9 - Capacitance as a function of drain-to-source voltage for all types.

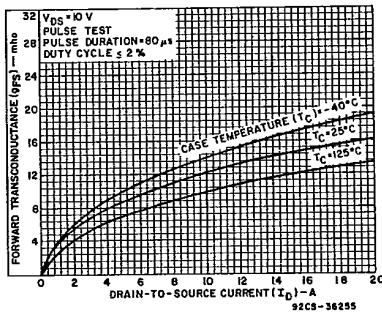


Fig. 10 - Typical forward transconductance as a function of drain current for all types.

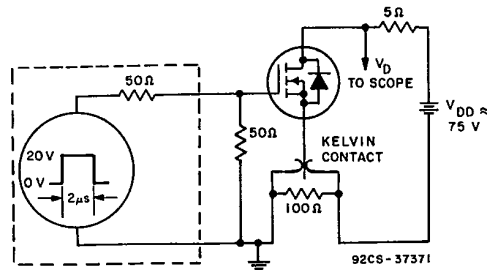


Fig. 11 - Switching Time Test Circuit