RFH25N18, RFH25N20

File Number **1631**

Power MOS Field-Effect Transistors

N-Channel Enhancement-Mode Power Field-Effect Transistors

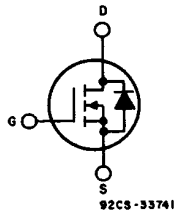
25 A, 180 V - 200 V

$r_{DS(on)}$ = 0.15 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



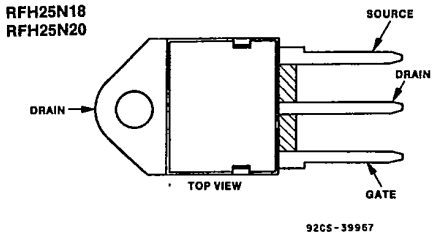
N-CHANNEL ENHANCEMENT MODE

The RFH25N18 and RFH25N20* 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 RFH25N18 and RFH25N20 types were formerly RCA developmental numbers TA9483A and TA9483B respectively.

TERMINAL DESIGNATION



JEDEC TO-218AC

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

		RFH25N18	RFH25N20	
DRAIN-SOURCE VOLTAGE	V_{DSS}	180	200	V
DRAIN-GATE VOLTAGE, R_{GS} = 1 MΩ	V_{DGR}	180	200	V
GATE-SOURCE VOLTAGE	V_{GS}	±20		V
DRAIN CURRENT, RMS Continuous	I_D	25		A
Pulsed	I_{DM}	60		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

RFH25N18, RFH25N20

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

CHARACTERISTIC	SYMBOL	TEST CONDITIONS	LIMITS				UNITS
			RFH25N18		RFH25N20		
			Min.	Max.	Min.	Max.	
Drain-Source Breakdown Voltage	BV_{DSS}	I_D = 1 mA V_{GS} = 0	180	—	200	—	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} = 145 V V_{DS} = 160 V	— —	1 —	— —	— 1	μA
		T_C = 125°C V_{DS} = 145 V V_{DS} = 160 V	— —	50 —	— —	— 50	μA
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 = 12.5 A V_{GS} = 10 V	—	1.875	—	1.875	V
		I_D = 25 A V_{GS} = 10 V	—	5	—	5	V
Static Drain-Source On Resistance	$r_{DS}(on)$[a]	I_D = 12.5 A V_{GS} = 10 V	—	.15	—	.15	Ω
Forward Transconductance	g_{fs}[a]	V_{DS} = 10 V I_D = 12.5 A	7	—	7	—	mho
Input Capacitance	C_{iss}	V_{DS} = 25 V V_{GS} = 0 V f = 1MHz	—	3500	—	3500	pF
Output Capacitance	C_{oss}		—	900	—	900	pF
Reverse Transfer Capacitance	C_{rss}		—	400	—	400	pF
Turn-On Delay Time	$t_d(on)$	V_{DS} = 100 V I_D = 12.5 A R_{gen}=R_{gs}=50Ω V_{GS} = 10 V	40(typ)	80	40(typ)	80	ns
Rise Time	t_r		150(typ)	225	150(typ)	225	ns
Turn-Off Delay Time	$t_d(off)$		300(typ)	400	300(typ)	400	ns
Fall Time	t_f		120(typ)	200	120(typ)	200	ns
Thermal Resistance Junction-to-Case	$R\theta_{JC}$	RFH25N18, RFH25N20 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
			RFH25N18		RFH25N20		
			Min.	Max.	Min.	Max.	
Diode Forward Voltage	V_{SD} *	I_{SD} = 12.5A	—	1.4	—	1.4	V
Reverse Recovery Time	t_{rr}	I_F = 4A, d_{IF}/d_t = 100 A/μs	300 (typ.)		300 (typ.)		ns

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

RFH25N18, RFH25N20

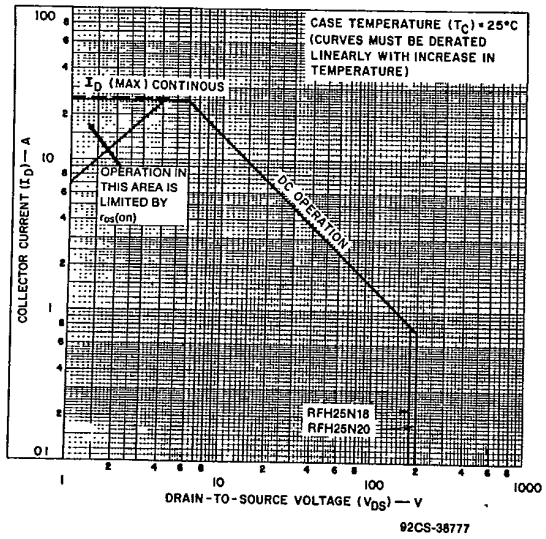


Fig. 1 - Maximum safe operating areas for all types.

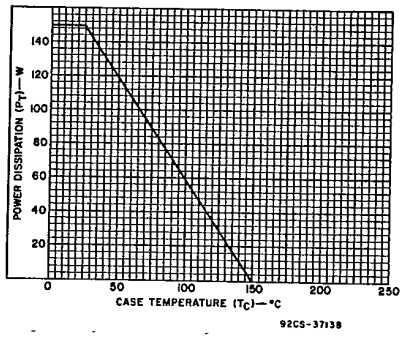


Fig. 2 - Power vs. temperature derating curve for all types.

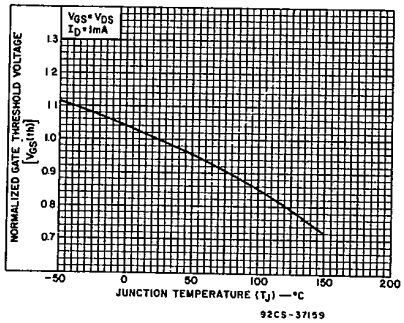


Fig. 3 - Typical normalized gate threshold voltage as a function of junction temperature for all types.

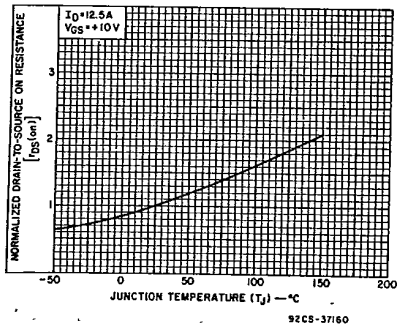


Fig. 4 - Normalized drain-to-source on resistance to junction temperature for all types.

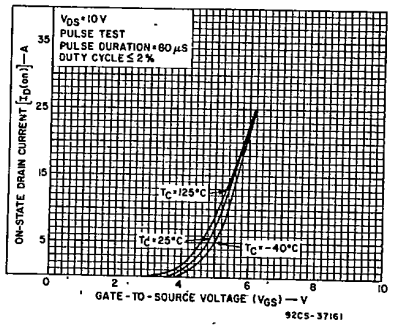


Fig. 5 - Typical transfer characteristics for all types.

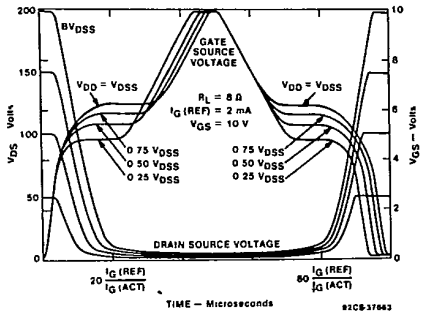


Fig. 6 - Normalized switching waveforms for constant gate-current drive.

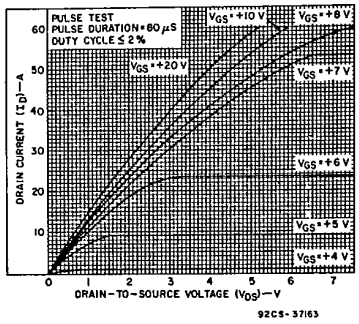


Fig. 7 - Typical saturation characteristics for all types.

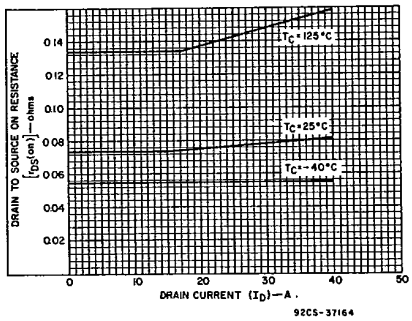


Fig. 8 - Typical drain-to-source on resistance as a function of drain current for all types.

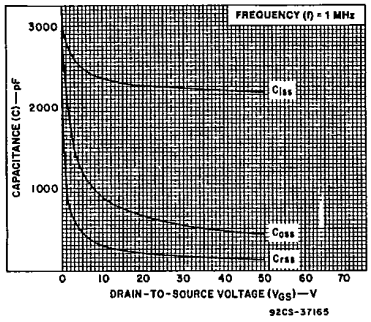


Fig. 9 - Capacitance as a function of drain-to-source voltage for all types.

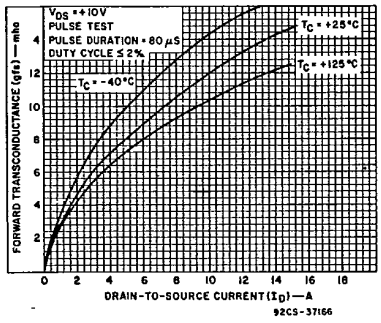


Fig. 10 - Typical forward transconductance as a function of drain current for all types.

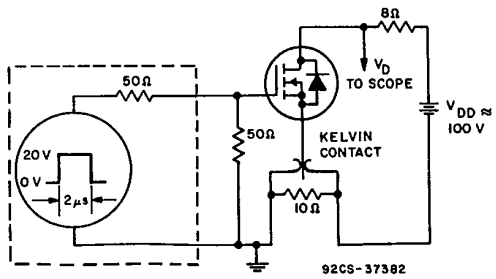


Fig. 11 - Switching Time Test Circuit.

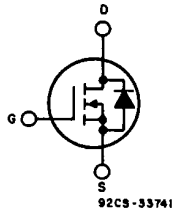
RFK25N18, RFK25N20

File Number **1500**

N-Channel Enhancement-Mode Power Field-Effect Transistors

25 A, 180 V - 200 V
$r_{DS}(on)$ = 0.15 Ω

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



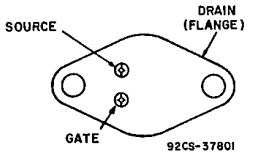
N-CHANNEL ENHANCEMENT MODE

The RFK25N18 and RFK25N20* 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 RFK25N18 and RFK25N20 types were formerly RCA developmental numbers TA9295A and TA9295B, respectively.

TERMINAL DESIGNATIONS



JEDEC TO-204AE

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

		RFK25N18		RFK25N20	
DRAIN-SOURCE VOLTAGE	V_{DSS}	180		200	V
DRAIN-GATE VOLTAGE, R_{gs}=1 MΩ	V_{DGR}	180		200	V
GATE-SOURCE VOLTAGE	V_{GS}		±20		V
DRAIN CURRENT, RMS Continuous	I_D		25		A
Pulsed	I_{DM}		60		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

RFK25N18, RFK25N20

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

CHARACTERISTICS	SYMBOL	TEST CONDITIONS	LIMITS				UNITS
			RFK25N18		RFK25N20		
			MIN.	MAX.	MIN.	MAX.	
Drain-Source Breakdown Voltage	BV_{DSS}	I_D=1 mA V_{GS}=0	180	—	200	—	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}=145 V V_{DS}=160 V	— —	1 —	— —	— 1	μA
		T_C=125°C V_{DS}=145 V V_{DS}=160 V	— —	50 —	— —	— 50	μA
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=12.5 A V_{GS}=10 V	—	1.875	—	1.875	V
		I_D=25 A V_{GS}=10 V	—	5	—	5	V
Static Drain-Source On Resistance	$r_{DS}(on)$[a]	I_D=12.5 A V_{GS}=10 V	—	.15	—	.15	Ω
Forward Transconductance	g_{fs}[a]	V_{DS}=10 V I_D=12.5 A	7	—	7	—	mho
Input Capacitance	C_{iss}	V_{DS}=25 V V_{GS}=0 V f = 1MHz	—	3500	—	3500	pF
Output Capacitance	C_{oss}		—	900	—	900	pF
Reverse Transfer Capacitance	C_{rss}		—	400	—	400	pF
Turn-On Delay Time	$t_d(on)$	V_{DD}=100 V I_D=12.5 A R_{gen}=R_{gs}=50 Ω V_{GS}=10 V	40(typ)	80	40(typ)	80	ns
Rise Time	t_r		150(typ)	225	150(typ)	225	ns
Turn-Off Delay Time	$t_d(off)$		300(typ)	400	300(typ)	400	ns
Fall Time	t_f		120(typ)	200	120(typ)	200	ns
Thermal Resistance Junction-to-Case	$R\theta_{JC}$	RFK25N18, RFK25N20 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
			RFK25N18		RFK25N20		
			MIN.	MAX.	MIN.	MAX.	
Diode Forward Voltage	V_{SD}	I_{SD}=12.5 A	—	1.4	—	1.4	V
Reverse Recovery Time	t_{rr}	I_F=4 A d_{IF}/d_t=100 A/μs	300(typ)		300(typ)		ns

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

RFK25N18, RFK25N20

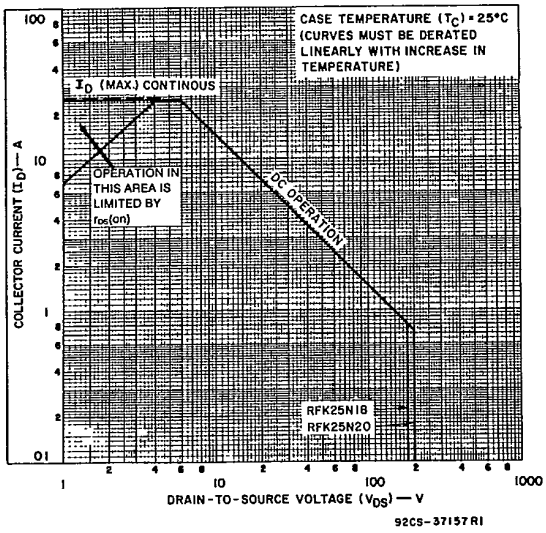


Fig. 1 — Maximum safe operating areas for all types.

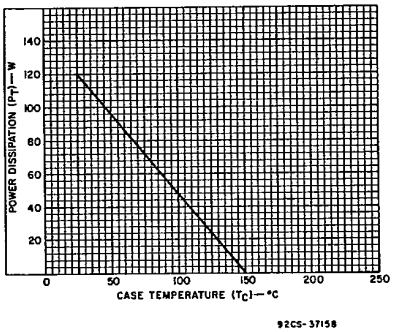


Fig. 2 — Power vs. temperature derating curve for all types.

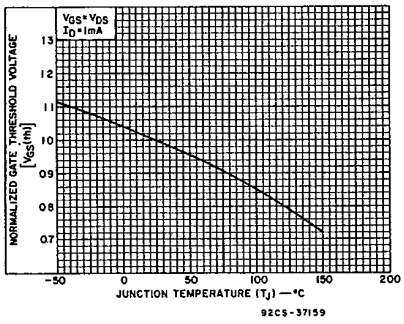


Fig. 3 — Typical normalized gate threshold voltage as a function of junction temperature for all types.

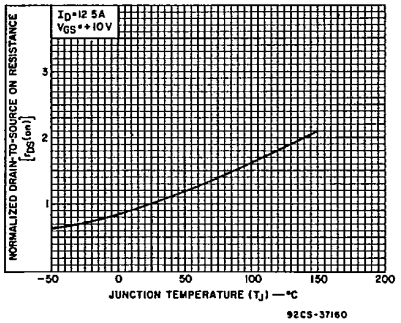


Fig. 4 — Normalized drain-to-source on resistance to junction temperature for all types.

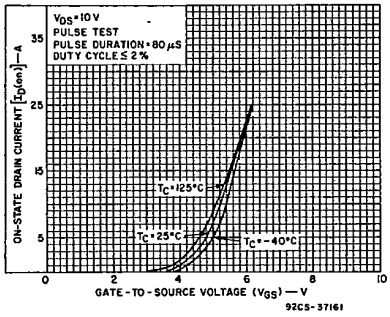
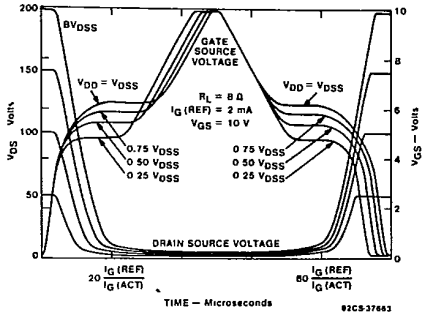


Fig. 5 — Typical transfer characteristics for all types.

RFK25N18, RFK25N20



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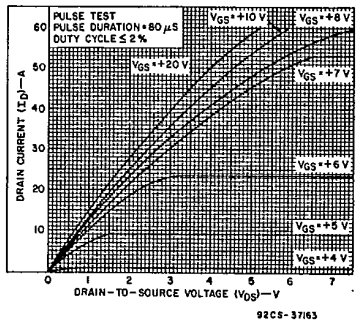

Fig. 7 — Typical saturation characteristics for all types.

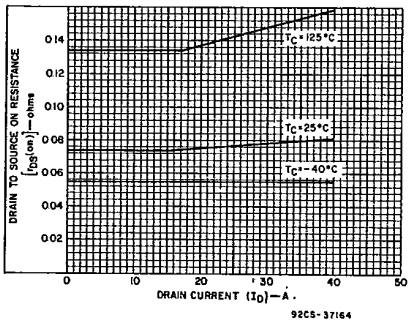

Fig. 8 — Typical drain-to-source on resistance as a function of drain current for all types.

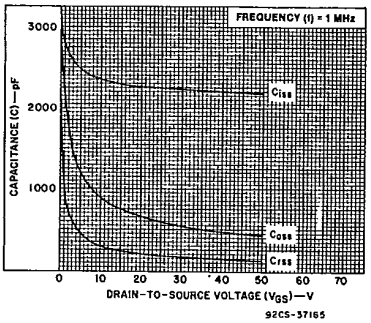

Fig. 9 — Capacitance as a function of drain-to-source voltage for all types.

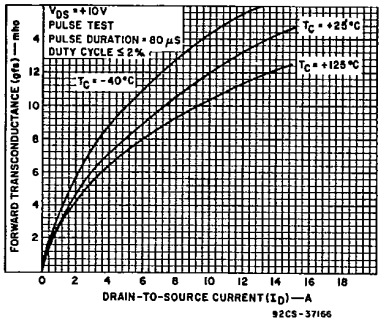

Fig. 10 — Typical forward transconductance as a function of drain current for all types.

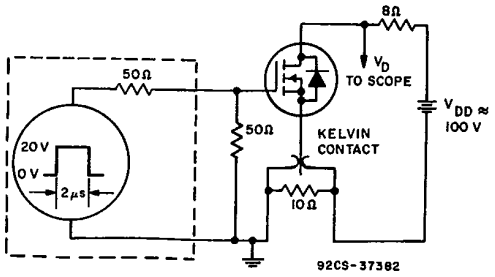

Fig. 11 — Switching Time Test Circuit