

RFH25N18, RFH25N20

File Number 1631

Power MOS Field-Effect Transistors

N-Channel Enhancement-Mode
Power Field-Effect Transistors

25 A, 180 V - 200 V

 $r_{DS(on)} = 0.15 \Omega$

Features:

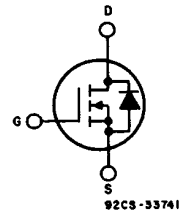
- SOA is power-dissipation limited
- Nanosecond switching speeds
- Linear transfer characteristics
- High input impedance
- Majority carrier device
- High-current, low-inductance package

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.

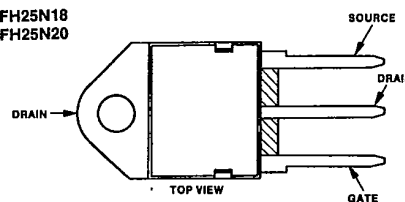
*The RFH25N18 and RFH25N20 types were formerly RCA developmental numbers TA9483A and TA9483B respectively.

TERMINAL DIAGRAM



N-CHANNEL ENHANCEMENT MODE

TERMINAL DESIGNATION

RFH25N18
RFH25N20

JEDEC TO-218AC

MAXIMUM RATINGS, Absolute-Maximum Values ($T_C = 25^\circ\text{C}$):

	RFH25N18	RFH25N20	
DRAIN-SOURCE VOLTAGE	180	200	V
DRAIN-GATE VOLTAGE, $R_{gs} = 1 \text{ M}\Omega$	180	200	V
GATE-SOURCE VOLTAGE	± 20		V
DRAIN CURRENT, RMS Continuous	25		A
Pulsed	60		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		$^\circ\text{C}$

3875081 G E SOLID STATE

01E 18186 D, T-39-13

Standard Power MOSFETs

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	—	1	—	—	μA
		V _{DS} = 160 V	—	—	—	1	
		T _C = 125°C V _{DS} = 145 V	—	50	—	—	
		V _{DS} = 160 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 = 12.5 A V _{GS} = 10 V	—	1.875	—	1.875	V
		I _D = 25 A V _{GS} = 10 V	—	5	—	5	
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	—	3500	—	3500	pF
Output Capacitance	C _{oss}	V _{GS} = 0 V	—	900	—	900	
Reverse Transfer Capacitance	C _{rss}	f = 1MHz	—	400	—	400	
Turn-On Delay Time	t _{d(on)}	V _{DS} = 100 V	40(typ)	80	40(typ)	80	ns
Rise Time	t _r	I _D = 12.5 A	150(typ)	225	150(typ)	225	
Turn-Off Delay Time	t _{d(off)}	R _{gen} =R _{gs} =50Ω	300(typ)	400	300(typ)	400	
Fall Time	t _f	V _{GS} = 10 V	120(typ)	200	120(typ)	200	
Thermal Resistance Junction-to-Case	Rθ _{JC}	RFH25N18, RFH25N20 Series	—	0.83	—	0.83	°C/W

[#]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}	$I_F = 4A, dI_F/dt = 100 A/\mu s$		300 (typ.)		300 (typ.)		ns

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

RFH25N18, RFH25N20

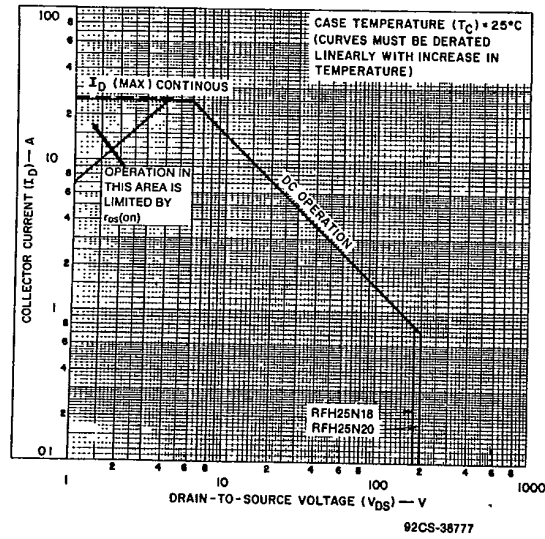


Fig. 1 - Maximum safe operating areas for all types.

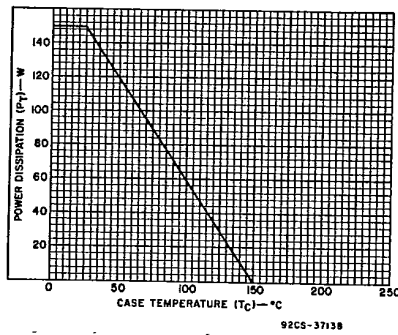


Fig. 2 - Power vs. temperature derating curve for all types.

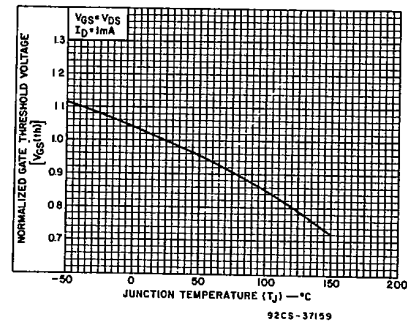


Fig. 3 - Typical normalized gate threshold voltage as a function of junction temperature for all types.

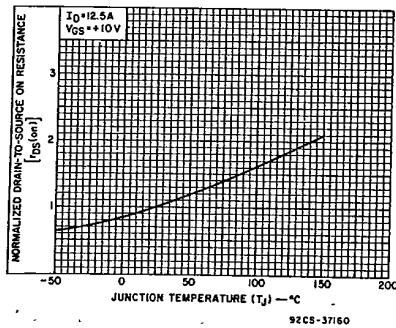


Fig. 4 - Normalized drain-to-source on resistance to junction temperature for all types.

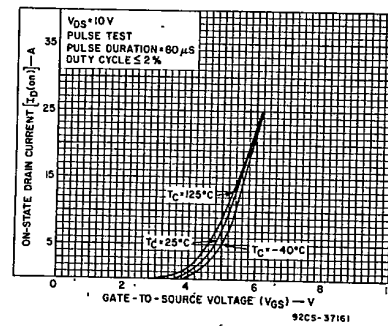


Fig. 5 - Typical transfer characteristics for all types.

RFH25N18, RFH25N20

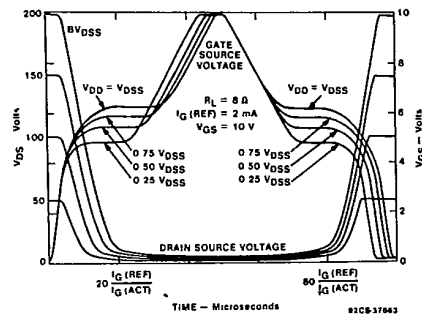


Fig. 6 - Normalized switching waveforms for constant gate-current drive.

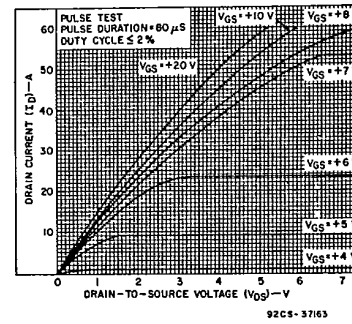


Fig. 7 - Typical saturation characteristics for all types.

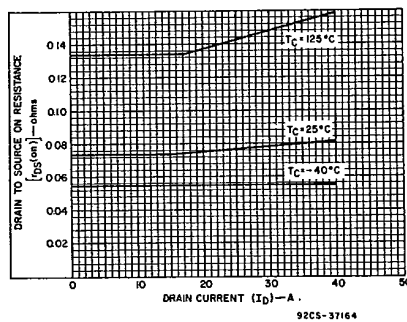


Fig. 8 - Typical drain-to-source on resistance as a function of drain current for all types.

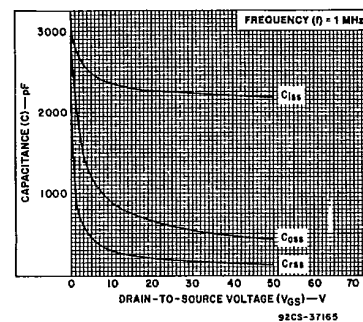


Fig. 9 - Capacitance as a function of drain-to-source voltage for all types.

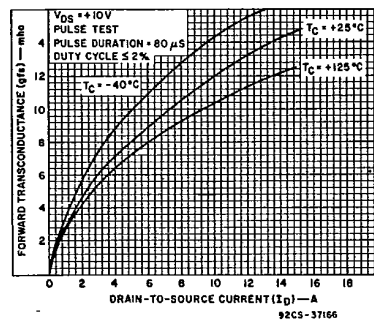


Fig. 10 - Typical forward transconductance as a function of drain current for all types.

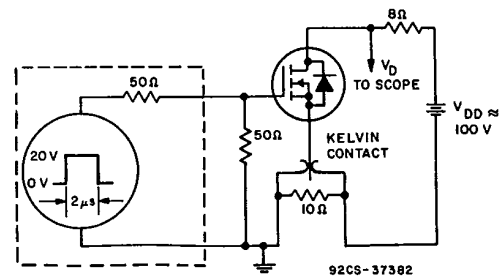


Fig. 11 - Switching Time Test Circuit.

RFK25N18, RFK25N20

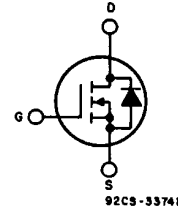
File Number 1500

N-Channel Enhancement-Mode Power Field-Effect Transistors

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

Features:

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



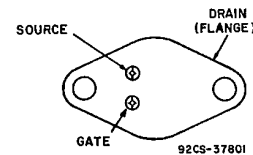
N-CHANNEL ENHANCEMENT MODE

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

	RFK25N18	RFK25N20	
DRAIN-SOURCE VOLTAGE	180	200	V
DRAIN-GATE VOLTAGE, $R_{DS}=1 \text{ M}\Omega$	180	200	V
GATE-SOURCE VOLTAGE	± 20		V
DRAIN CURRENT, RMS Continuous	25		A
Pulsed	60		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		$^\circ \text{C}$

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 _{DS} =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		
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	
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	—	3500	—	3500	pF
Output Capacitance	C _{OSS}	V _{GS} =0 V	—	900	—	900	
Reverse Transfer Capacitance	C _{rss}	f = 1MHz	—	400	—	400	
Turn-On Delay Time	t _{d(on)}	V _{DD} =100 V	40(typ)	80	40(typ)	80	ns
Rise Time	t _r	I _D =12.5 A	150(typ)	225	150(typ)	225	
Turn-Off Delay Time	t _{d(off)}	R _{gen} =R _{gs} =50 Ω	300(typ)	400	300(typ)	400	
Fall Time	t _f	V _{GS} =10 V	120(typ)	200	120(typ)	200	
Thermal Resistance Junction-to-Case	R _{θJC}	RFK25N18, RFK25N20 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
			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 dI _F /dt=100 A/μs	300(typ)		300(typ)		ns

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

Standard Power MOSFETs

RFK25N18, RFK25N20

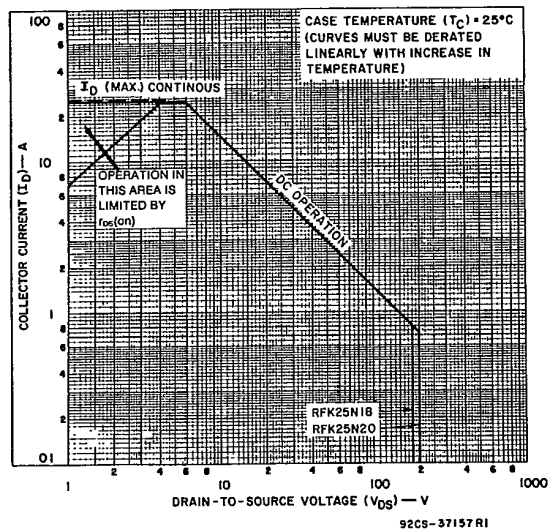


Fig. 1 — Maximum safe operating areas for all types.

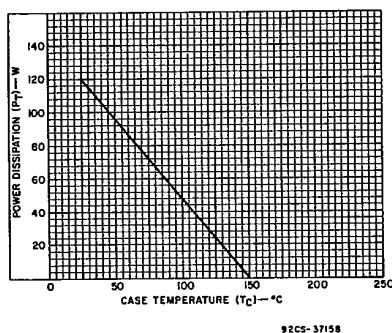


Fig. 2 — Power vs. temperature derating curve for all types.

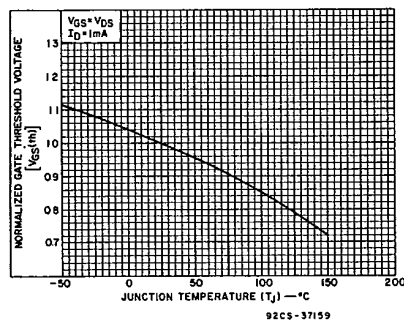


Fig. 3 — Typical normalized gate threshold voltage as a function of junction temperature for all types.

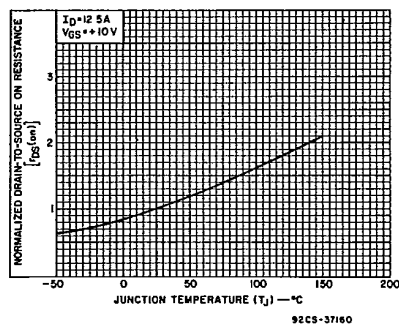


Fig. 4 — Normalized drain-to-source on resistance to junction temperature for all types.

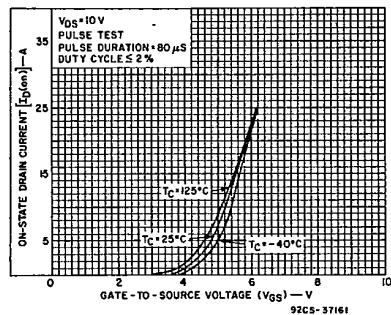


Fig. 5 — Typical transfer characteristics for all types.

RFK25N18, RFK25N20

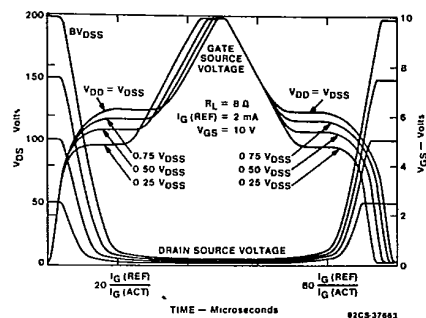


Fig. 6 - Normalized switching waveforms for constant gate-current drive.

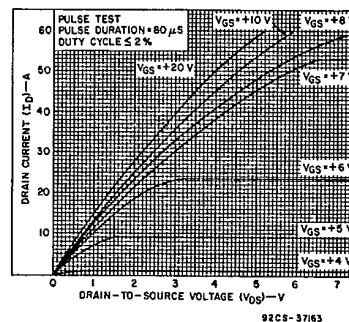


Fig. 7 - Typical saturation characteristics for all types.

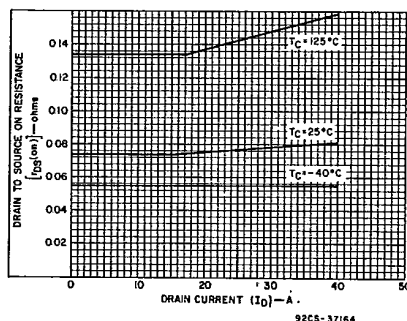


Fig. 8 - Typical drain-to-source on resistance as a function of drain current for all types.

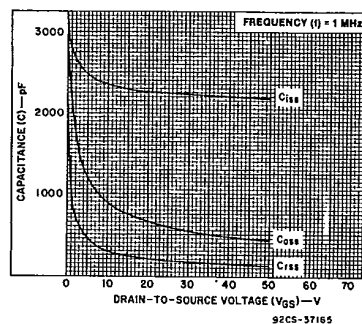


Fig. 9 - Capacitance as a function of drain-to-source voltage for all types.

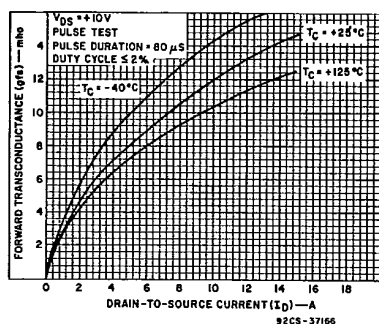


Fig. 10 - Typical forward transconductance as a function of drain current for all types.

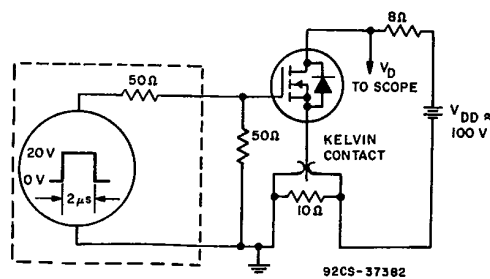


Fig. 11 - Switching Time Test Circuit