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Standard Power MOSFETs

T 39:23
File Number 1495

RFM12P08, RFM12P10, RFP12P08, RFP12P10

Power MOS Field-Effect Transistors

P-Channel Enhancement-Mode Power Field-Effect Transistors

12 A, -80 V and -100 V
 $r_{DS(on)} = 0.3 \Omega$

Features:

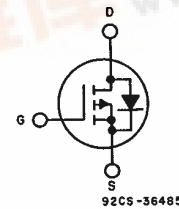
- SOA is power-dissipation limited
- Nanosecond switching speeds
- Linear transfer characteristics
- High input impedance
- Majority carrier device

The RFM12P08 and RFM12P10 and the RFP12P08 and RFP12P10* are p-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 RFM-types are supplied in the JEDEC TO-204AA steel package and the RFP-types in the JEDEC TO-220AB plastic package.

*The RFM and RFP series were formerly RCA developmental numbers TA9410 and TA9411, respectively.

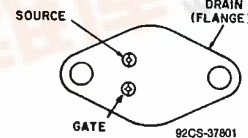
TERMINAL DIAGRAM



P-CHANNEL ENHANCEMENT MODE

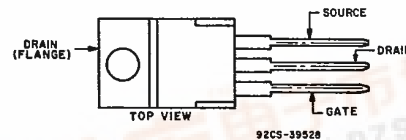
TERMINAL DESIGNATIONS

RFM12P08
RFM12P10



RFP12P08
RFP12P10

JEDEC TO-204AA



JEDEC TO-220AB

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

	RFM12P08	RFM12P10		RFP12P08	RFP12P10	
DRAIN-SOURCE VOLTAGE	V_{DS}	-80	-100	-80	-100	V
DRAIN-GATE VOLTAGE ($R_{gs}=1\text{ M}\Omega$)	V_{DGR}	-80	-100	-80	-100	V
GATE-SOURCE VOLTAGE	V_{GS}					V
DRAIN CURRENT, RMS Continuous	I_D					A
Pulsed	I_{DM}					A
POWER DISSIPATION @ $T_c=25^\circ\text{C}$	P_T	100	100	75	75	W
Derate above $T_c=25^\circ\text{C}$		0.8	0.8	0.6	0.6	W/ $^\circ\text{C}$
OPERATING AND STORAGE TEMPERATURE	T_p, T_{slg}		-55 to +150			$^\circ\text{C}$

RFM12P08, RFM12P10, RFP12P08, RFP12P10

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

T-39-23

CHARACTERISTICS	SYMBOL	TEST CONDITIONS	LIMITS				UNITS
			RFM12P08 RFP12P08		RFM12P10 RFP12P10		
			MIN.	MAX.	MIN.	MAX.	
Drain-Source Breakdown Voltage	BV _{DSS}	I _D =1 mA V _{GS} =0	-80	—	-100	—	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} =-65 V V _{DS} =-80 V	—	1	—	— 1	μA
		T _C =125°C V _{DS} =-65 V V _{DS} =-80 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 =6 A V _{GS} =-10 V	—	-1.8	—	-1.8	V
		I _D =12 A V _{GS} =-10 V	—	-4.8	—	-4.8	
Static Drain-Source On Resistance	r _{DS(on)} ^a	I _D =6 A V _{GS} =-10 V	—	.3	—	.3	Ω
Forward Transconductance	g _{fs} ^a	V _{DS} =-10 V I _D =6 A	2	—	2	—	mho
Input Capacitance	C _{iss}	V _{DS} =-25 V	—	1500	—	1500	pF
Output Capacitance	C _{oss}	V _{GS} =0 V	—	700	—	700	
Reverse Transfer Capacitance	C _{rss}	f = 1MHz	—	240	—	240	
Turn-On Delay Time	t _{d(on)}	V _{DD} =50 V	18(typ)	60	18(typ)	60	ns
Rise Time	t _r	I _D =6 A	90(typ)	175	90(typ)	175	
Turn-Off Delay Time	t _{d(off)}	R _{gen} =R _{gs} =50 Ω	144(typ)	275	144(typ)	275	
Fall Time	t _f	V _{GS} =-10 V	94(typ)	175	94(typ)	175	
Thermal Resistance Junction-to-Case	Rθ _{JC}	RFM12P08, RFM12P10	—	1.25	—	1.25	°C/W
		RFP12P08, RFP12P10	—	1.67	—	1.67	

^aPulsed: Pulse duration = 300 μs max., duty cycle = 2%.

SOURCE-DRAIN DIODE RATINGS AND CHARACTERISTICS

CHARACTERISTIC	SYMBOL	TEST CONDITIONS	LIMITS				UNITS
			RFM12P08 RFP12P08		RFM12P10 RFP12P10		
			MIN.	MAX.	MIN.	MAX.	
Diode Forward Voltage	V _{SD}	I _{SD} =6 A	—	1.4	—	1.4	V
Reverse Recovery Time	t _{rr}	I _F =4 A dI _F /d _t =100 A/μs	200(typ)		200(typ)		ns

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

RFM12P08, RFM12P10, RFP12P08, RFP12P10

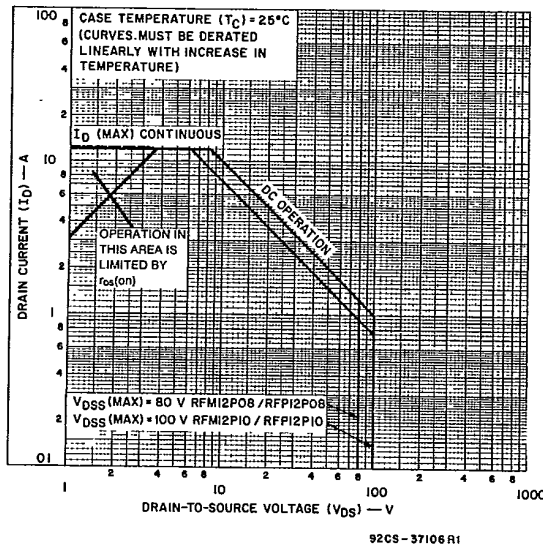


Fig. 1 — Maximum safe operating areas for all types.

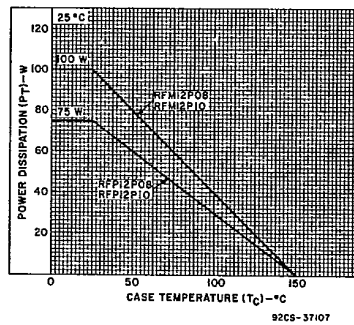


Fig. 2 — Power dissipation vs. case temperature derating curve for all types.

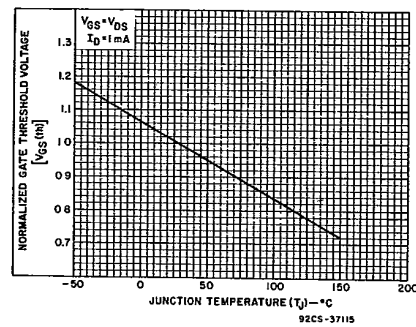


Fig. 3 — Typical normalized gate threshold voltage as a function of junction temperature for all types.

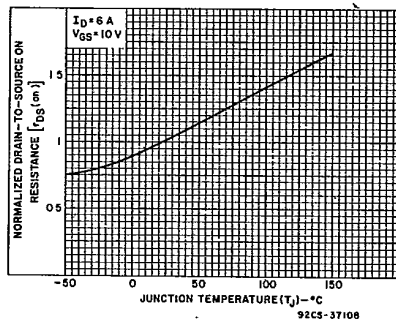


Fig. 4 — Normalized drain-to-source on resistance as a function of junction temperature for all types

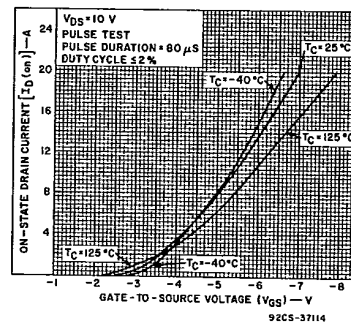


Fig. 5 — Typical transfer characteristics for all types.

RFM12P08, RFM12P10, RFP12P08, RFP12P10

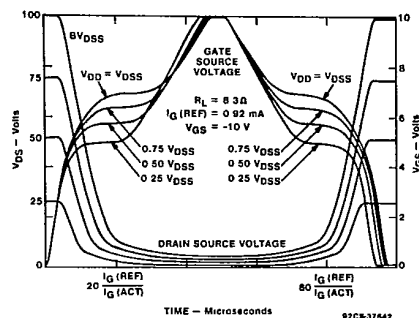


Fig. 6 - Normalized switching waveforms for constant gate-current drive.

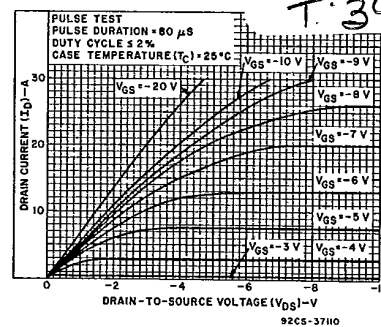


Fig. 7 - Typical saturation characteristics for all types.

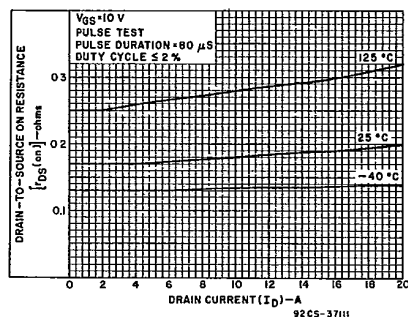


Fig. 8 - Typical drain-to-source on resistance as a function of drain current for all types.

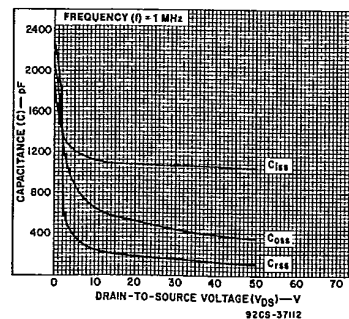


Fig. 9 - Capacitance as a function of drain-to-source voltage for all types.

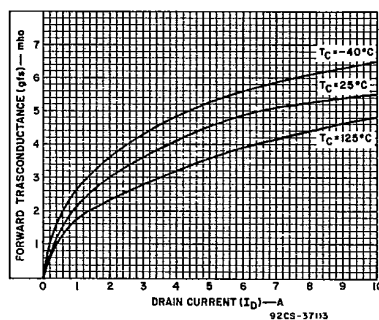


Fig. 10 - Typical forward transconductance as a function of drain current for all types

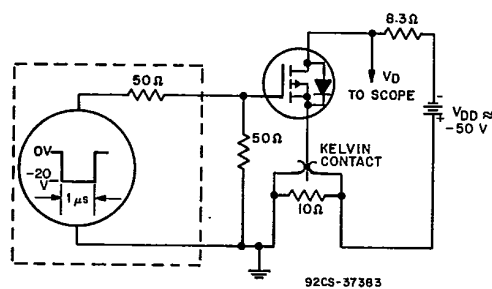


Fig. 11 - Switching Time Test Circuit

Power MOS Field-Effect Transistors

P-Channel Enhancement-Mode
Power Field-Effect Transistors

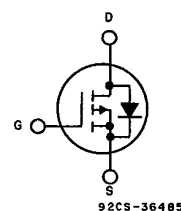
25 A, -80 V - -100 V

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

Features:

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

TERMINAL DIAGRAM



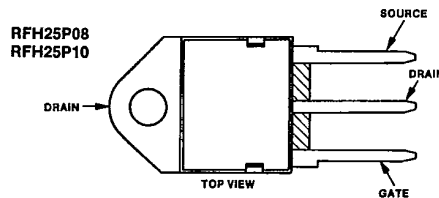
P-CHANNEL ENHANCEMENT MODE

The RFH25P08 and RFH25P10* are p-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 RFH25P08 and RFH25P10 types were formerly RCA developmental numbers TA9577A and TA9577B respectively.

TERMINAL DESIGNATIONS



JEDEC TO-218AC

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

	RFH25P08	RFH25P10	
DRAIN-SOURCE VOLTAGE	-80	-100	V
DRAIN-GATE VOLTAGE, $R_{DS} = 1 \text{ M}\Omega$	-80	-100	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		$^\circ\text{C}$

RFH25P08, RFH25P10

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

CHARACTERISTIC	SYMBOL	TEST CONDITIONS	LIMITS				UNITS
			RFH25P08		RFH25P10		
			Min.	Max.	Min.	Max.	
Drain-Source Breakdown Voltage	BV _{DSS}	I _D = 1 mA V _{GS} = 0	-80	—	-100	—	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} = -80 V	—	—	—	1	μA
		V _{DS} = -65 V	—	1	—	—	
		T _C = 125° C V _{DS} = -80 V	—	—	—	50	
		V _{DS} = -65 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	—	-1.88	—	-1.88	V
		I _D = 25 A V _{GS} = -10 V	—	-4.5	—	-4.5	
Static Drain-Source On Resistance	r _{DS(on)} ^a	I _D = 12.5 A V _{GS} = -10 V	—	0.15	—	0.15	Ω
Forward Transconductance	g _{fs} ^a	V _{DS} = -10 V I _D = 12.5 A	4	—	4	—	mho
Input Capacitance	C _{iss}	V _{DS} = -25 V V _{GS} = 0 V f = 1MHz	—	3000	—	3000	pF
Output Capacitance	C _{oss}		—	1500	—	1500	
Reverse Transfer Capacitance	C _{rss}		—	500	—	500	
Turn-On Delay Time	t _{d(on)}	V _{DD} = -50 V	35(typ)	50	35(typ)	50	ns
Rise Time	t _r	I _D = 12.5 A	165(typ)	250	165(typ)	250	
Turn-Off Delay Time	t _{d(off)}	R _{gen} =R _{gs} =50Ω	270(typ)	400	270(typ)	400	
Fall Time	t _f	V _{GS} = -10 V	165(typ)	250	165(typ)	250	
Thermal Resistance Junction-to-Case	Rθ _{JC}	RFH25P08, RFH25P10 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
			RFH25P08		RFH25P10		
			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 $\leq 2\%$.

Standard Power MOSFETs

RFH25P08, RFH25P10

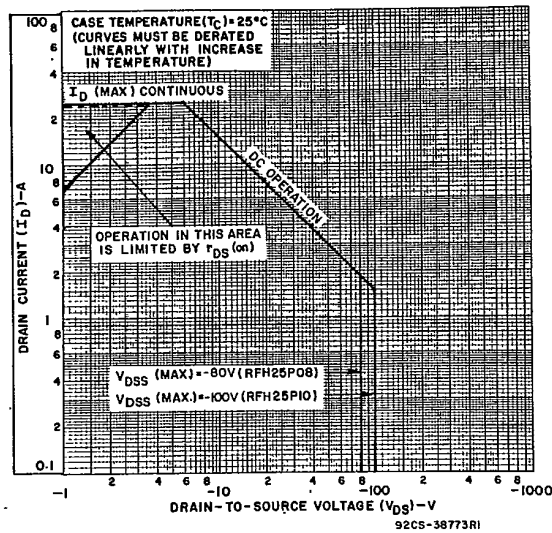


Fig. 1 - Maximum safe operating areas for all types.

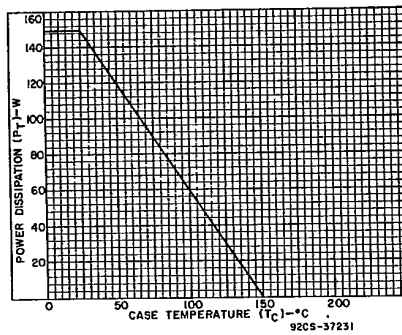


Fig. 2 - Power dissipation vs. temperature derating curve for all types.

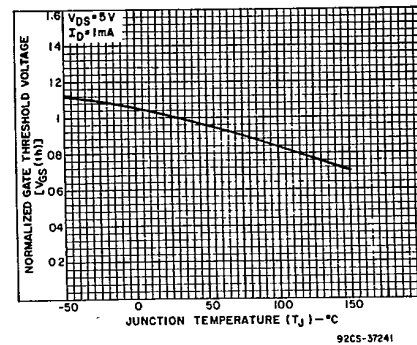


Fig. 3 - Typical normalized gate threshold voltage as a function of junction temperature for all types.

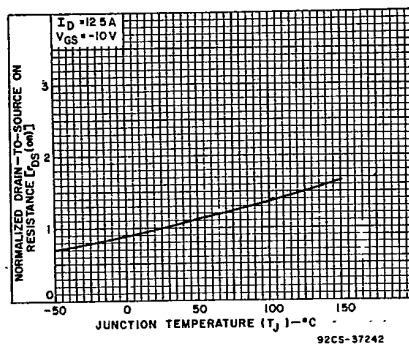


Fig. 4 - Normalized drain-to-source on resistance to junction temperature for all types.

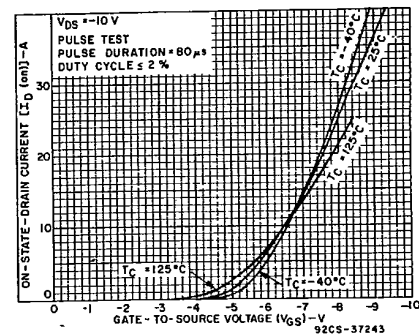


Fig. 5 - Typical transfer characteristics for all types.

RFH25P08, RFH25P10

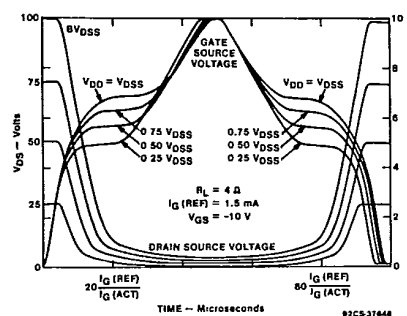


Fig. 6 - Normalized switching waveforms for constant gate-current drive.

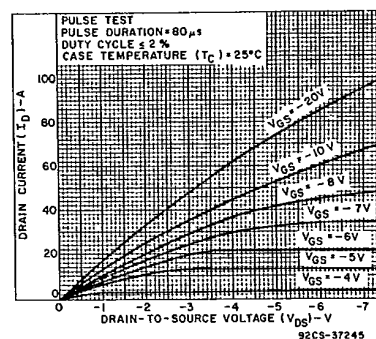


Fig. 7 - Typical saturation characteristics for all types.

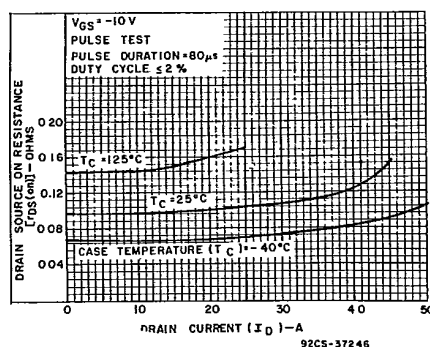


Fig. 8 - Typical drain-to-source on resistance as a function of drain current for all types.

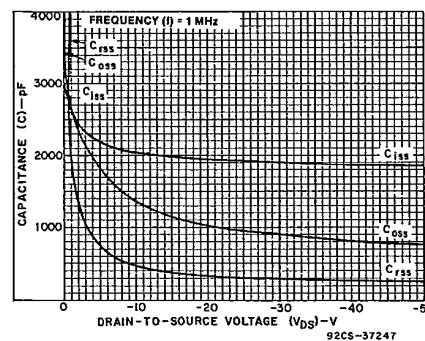


Fig. 9 - Capacitance as a function of drain-to-source voltage for all types.

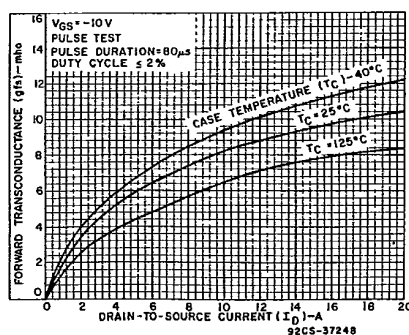


Fig. 10 - Typical forward transconductance as a function of drain current for all types.

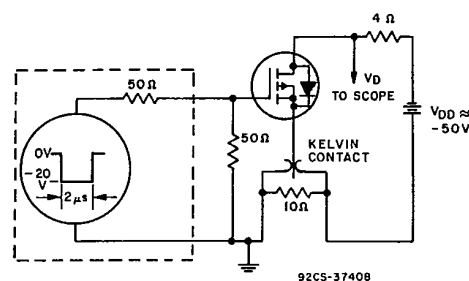


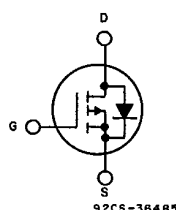
Fig. 11 - Switching Time Test Circuit.

RFK25P08, RFK25P10

File Number 1516

**P-Channel Enhancement-Mode
Power Field-Effect Transistors**25 A, -100 V — -80 V
 $r_{DS(on)}$: 0.15 Ω **Features:**

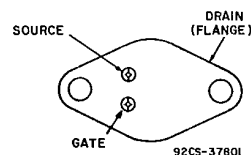
- SOA is power-dissipation limited
- Nanosecond switching speeds
- Linear transfer characteristics
- High input impedance
- Majority carrier device

**P-CHANNEL ENHANCEMENT MODE**

The RFK25P10 and RFK25P08* are p-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 RFK25P10 and RFK25P08 types were formerly RCA developmental numbers TA9412A and TA9412B, respectively.

TERMINAL DESIGNATIONS**JEDEC TO-204AE****MAXIMUM RATINGS, Absolute-Maximum Values ($T_C=25^\circ\text{C}$):**

	RFK25P10	RFK25P08	
DRAIN-SOURCE VOLTAGE	-100	-80	V
DRAIN-GATE VOLTAGE, $R_{DS}=1\text{ M}\Omega$	-100	-80	V
GATE-SOURCE VOLTAGE	± 20		V
DRAIN CURRENT, RMS Continuous	25		A
Pulsed	80		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		$^\circ\text{C}$

RFK25P08, RFK25P10

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

CHARACTERISTIC	SYMBOL	TEST CONDITIONS	LIMITS				UNITS
			RFK25P10		RFK25P08		
			MIN.	MAX.	MIN.	MAX.	
Drain-Source Breakdown Voltage	BV _{DSS}	I _D =1 mA V _{GS} =0	-100	—	-80	—	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} =-80 V	—	1	—	—	μA
		V _{DS} =-65 V	—	—	—	1	
		T _C =125° C V _{DS} =-80 V	—	50	—	—	
		V _{DS} =-65 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	—	-2.5	—	-2.5	V
		I _D =25 A V _{GS} =-10 V	—	-6	—	-6	
Static Drain-Source On Resistance	r _{DS(on)} ^a	I _D =12.5 A V _{GS} =-10 V	—	0.15	—	0.15	Ω
Forward Transconductance	g _{fs} ^a	V _{DS} =-10 V I _D =12.5 A	4	—	4	—	mho
Input Capacitance	C _{iss}	V _{DS} =-25 V	—	3000	—	3000	pF
Output Capacitance	C _{oss}	V _{GS} =0 V	—	1500	—	1500	
Reverse Transfer Capacitance	C _{rss}	f = 1MHz	—	500	—	500	
Turn-On Delay Time	t _{d (on)}	V _{DD} =-50 V	35(typ)	50	35(typ)	50	ns
Rise Time	t _r	I _D =12.5 A	165(typ)	250	165(typ)	250	
Turn-Off Delay Time	t _{d (off)}	R _{gen} =R _{gs} =50 Ω	270(typ)	400	270(typ)	400	
Fall Time	t _f	V _{GS} =-10 V	165(typ)	250	165(typ)	250	
Thermal Resistance Junction-to-Case	R _{θJC}	RFK25P10, RFK25P08	—	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
			RFK25P10		RFK25P08		
			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 $\leq 300\text{ }\mu\text{s}$, Duty Cycle $\leq 2\%$.

Standard Power MOSFETs

RFK25P08, RFK25P10

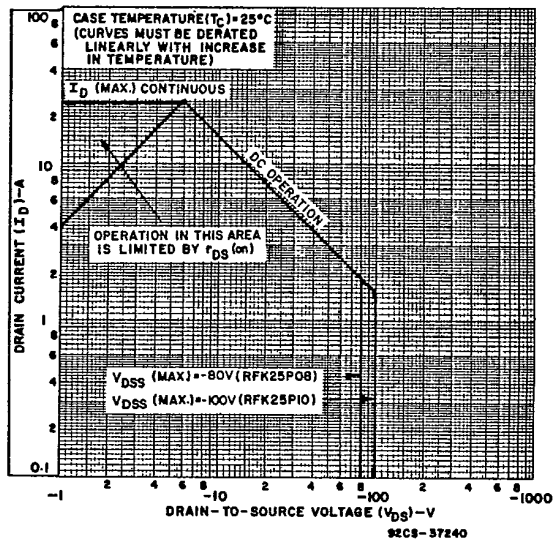


Fig. 1 - Maximum safe operating areas for all types.

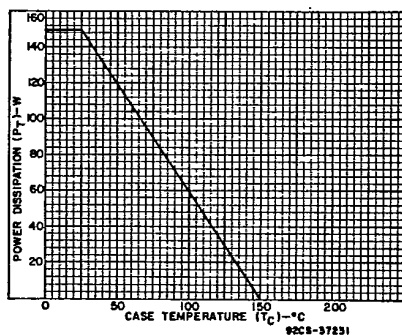


Fig. 2 - Power dissipation vs. temperature derating curve for all types.

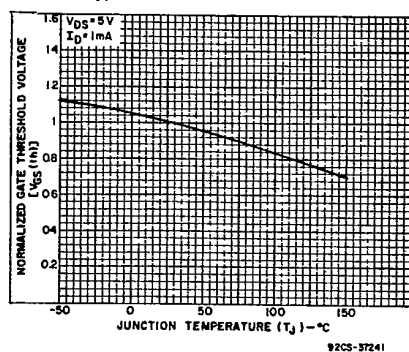


Fig. 3 - Typical normalized gate threshold voltage as a function of junction temperature for all types.

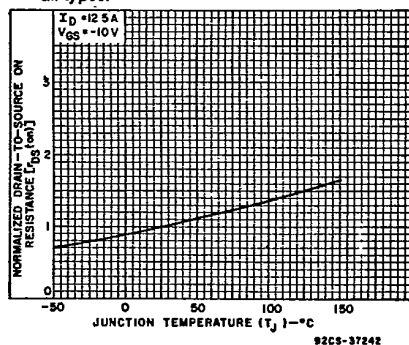


Fig. 4 - Normalized drain-to-source on resistance to junction temperature for all types.

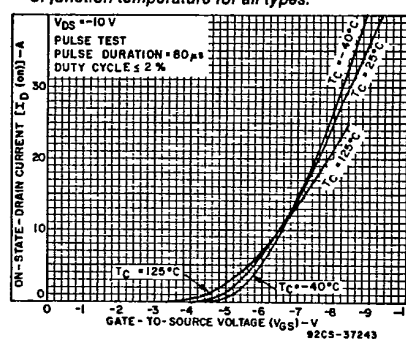


Fig. 5 - Typical transfer characteristics for all types.

RFK25P08, RFK25P10

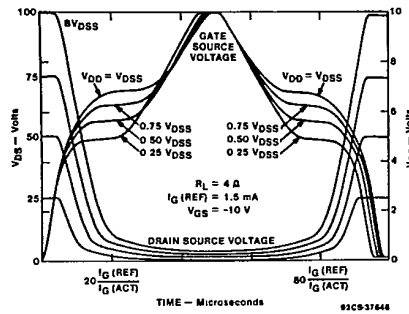


Fig. 6 - Normalized switching waveforms for constant gate-current drive.

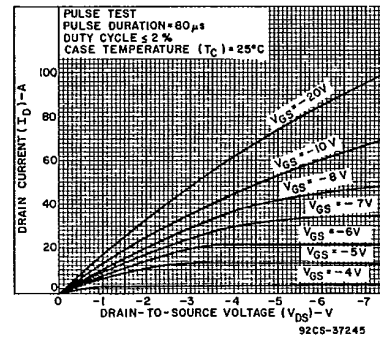


Fig. 7 - Typical saturation characteristics for all types.

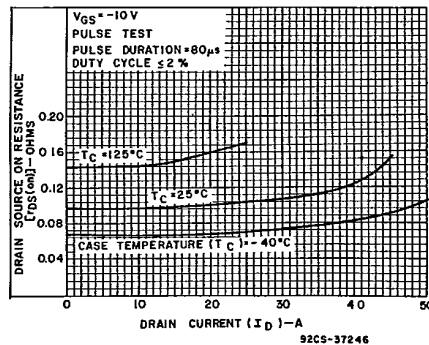


Fig. 8 - Typical drain-to-source on resistance as a function of drain current for all types.

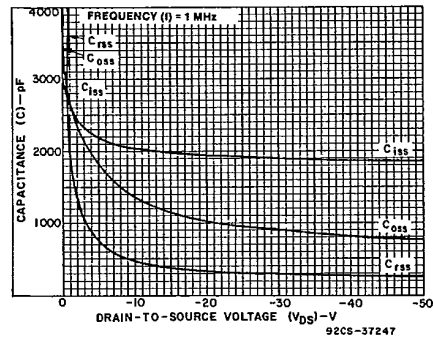


Fig. 9 - Capacitance as a function of drain-to-source voltage for all types.

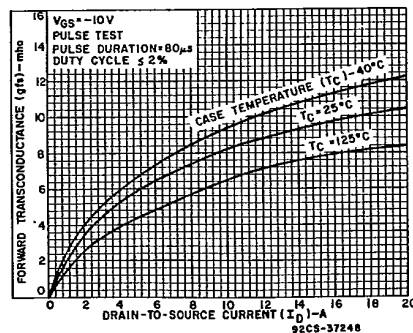


Fig. 10 - Typical forward transconductance as a function of drain current for all types.

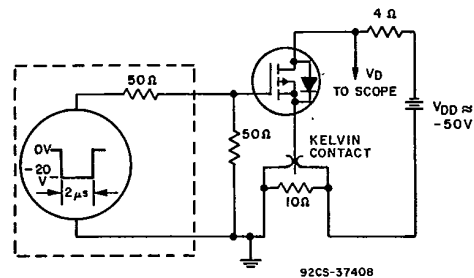


Fig. 11 - Switching time test circuit.