HARRIS

HARRIS SEMICOND SECTOR

RFM25N06
RFP25N06

N-Channel Enhancement-Mode Power Field-Effect Transistors

August 1991

T-39-01

Features

- 25A, 50V and 60V
- $r_{DS(on)} = 0.07\Omega$
- SOA is Power-Dissipation Limited
- Nanosecond Switching Speeds
- Linear Transfer Characteristics
- High Input Impedance
- Majority Carrier Device

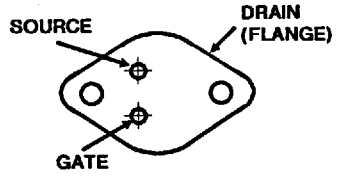
Description

The RFM25N06 and RFP25N06 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.

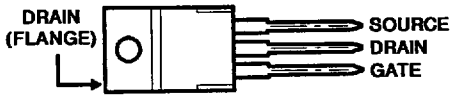
The RFM-type is supplied in the JEDEC TO-204AA steel package and the RFP-type in the JEDEC TO-220AB plastic package.

Package

TO-204AA

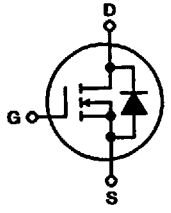


TO-220AB
TOP VIEW



Terminal Diagram

N-CHANNEL ENHANCEMENT MODE



Absolute Maximum Ratings (T_C = +25°C), Unless Otherwise Specified

		RFM25N06	RFP25N06	UNITS
Drain-Source Voltage	V_{DSS}	60	60	V
Drain-Gate Voltage (R_{GS} = 1MΩ)	V_{DGR}	60	60	V
Continuous Drain Current	I_D	25	25	A
Pulsed Drain Current	I_{DM}	60	60	A
Gate-Source Voltage	V_{GS}	±20	±20	V
Maximum Power Dissipation T_C = +25°C	P_D	100	75	W
Linear Derating Factor		0.8	0.6	W/°C
Operating and Storage Temperature	T_J, T_{STG}	-55 to +150	-55 to +150	°C

Caution: These devices are sensitive to electrostatic discharge. Proper I.C. handling procedures should be followed.

File Number 1492.1

ELECTRICAL CHARACTERISTICS *At Case Temperature (T_C) = 25° C Unless Otherwise Specified*

CHARACTERISTICS	SYMBOL	TEST CONDITIONS	LIMITS RFM25N06 RFP25N06 MIN.	LIMITS RFM25N06 RFP25N06 MAX.	UNITS
Drain-Source Breakdown Voltage	BV_{DSS}	$I_D = 1$ mA, $V_{GS} = 0$	60	—	V
Gate Threshold Voltage	$V_{GS(th)}$	$V_{GS} = V_{DS}$, $I_D = 1$ mA	2	4	V
Zero Gate Voltage Drain Current	I_{DSS}	$V_{DS} = 40$ V $V_{DS} = 50$ V	— —	— 1	μA
		$T_c = 125$ °C $V_{DS} = 40$ V $V_{DS} = 50$ V	— —	— 50	
Gate-Source Leakage Current	I_{GSS}	$V_{GS} = \pm 20$ V, $V_{DS} = 0$	—	100	nA
Drain-Source On Voltage	$V_{DS(on)}$[a]	$I_D = 12.5$ A, $V_{GS} = 10$ V	—	0.875	V
		$I_D = 25$ A, $V_{GS} = 10$ V	—	2.5	
Static Drain-Source On Resistance	$r_{DS(on)}$[a]	$I_D = 12.5$ A, $V_{GS} = 10$ V	—	0.07	Ω
Forward Transconductance	g_{fs}[a]	$V_{DS} = 10$ V, $I_D = 12.5$ A	5	—	mho
Input Capacitance	C_{iss}	$V_{DS} = 25$ V	—	1700	pF
Output Capacitance	C_{oss}	$V_{GS} = 0$ V	—	900	
Reverse Transfer Capacitance	C_{rss}	$f = 0.1$ MHz	—	400	
Turn-On Delay Time	$t_{d(on)}$	$V_{DD} = 30$ V	18 (typ.)	60	ns
Rise Time	t_r	$I_D = 12.5$ A	120 (typ.)	225	
Turn-Off Delay Time	$t_{d(off)}$	$R_{gen} = R_{gs} = 50\ \Omega$	123 (typ.)	225	
Fall Time	t_f	$V_{GS} = 10$ V	123 (typ.)	200	
Thermal Resistance Junction-to-Case	$R_{\theta JC}$	RFM25N06	—	1.25	°C/W
		RFP25N06	—	1.67	

[a]Pulsed: Pulse duration = 300 μs max., duty cycle = 2%.

SOURCE-DRAIN DIODE RATINGS AND CHARACTERISTICS

CHARACTERISTIC	SYMBOL	TEST CONDITIONS	LIMITS RFM25N06 RFP25N06 MIN.	LIMITS RFM25N06 RFP25N06 MAX.	UNITS
Diode Forward Voltage	V_{SD}	$I_{SD} = 12.5$ A	—	1.4	V
Reverse Recovery Time	t_{rr}	$I_F = 4$ A, $dI_F/dt = 100$ A/μs	150(typ.)		ns

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

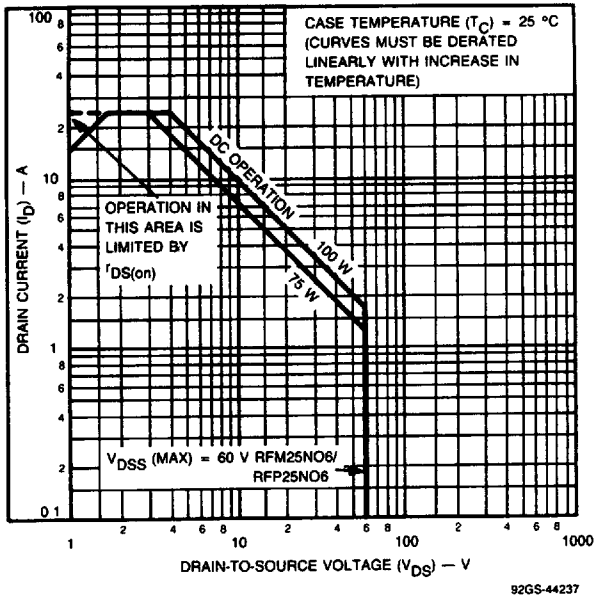


Fig. 1 — Maximum operating areas for all types.

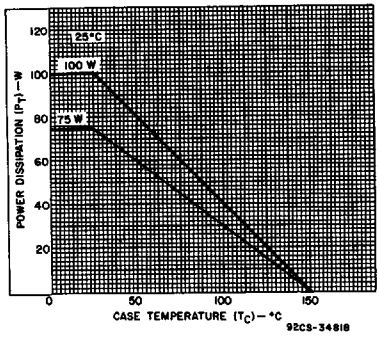


Fig. 2 — Power dissipation vs. case temperature derating curve for all types.

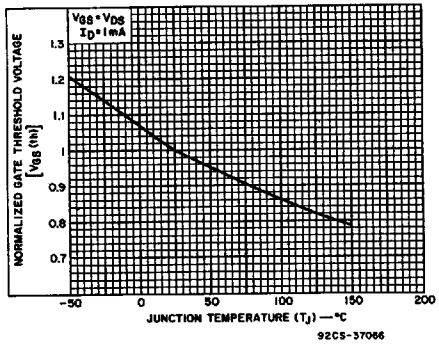


Fig. 3 — Typical normalized gate threshold voltage as a function of junction temperature for all types.

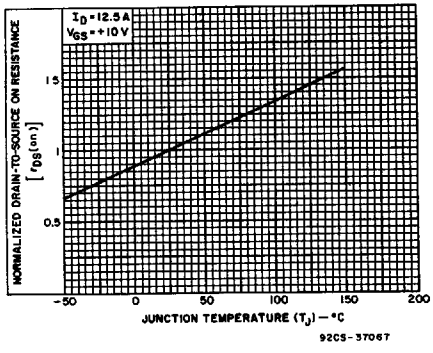


Fig. 4 — Normalized drain-to-source on resistance to junction temperature for all types.

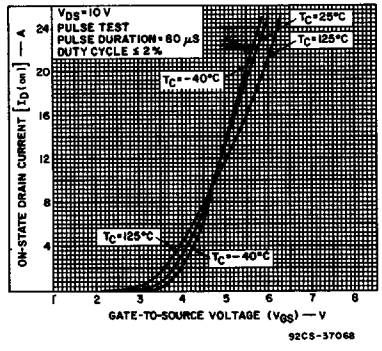


Fig. 5 — Typical transfer characteristics for all types.

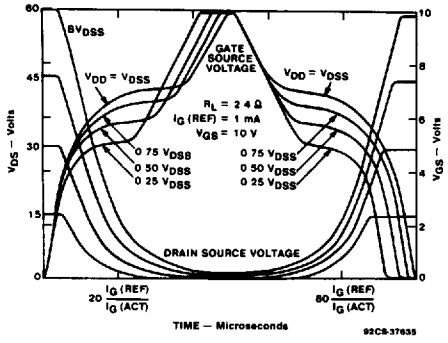


Fig. 6 – Normalized switching waveforms for constant gate-current. Refer to Harris application notes AN-7254 and AN-7260

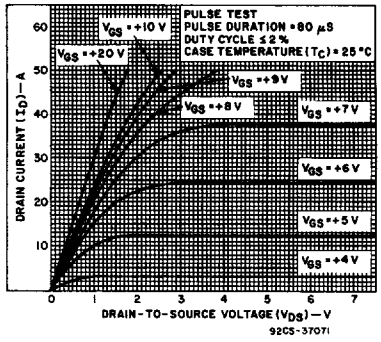


Fig. 7 — Typical saturation characteristics for all types.

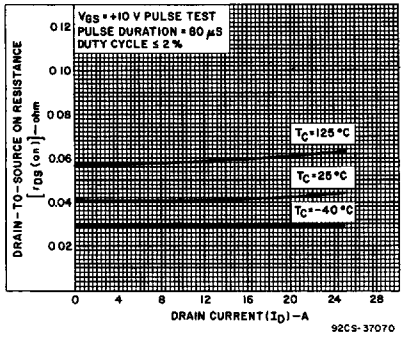


Fig. 8 — Typical drain-to-source on resistance as a function of drain current for all types

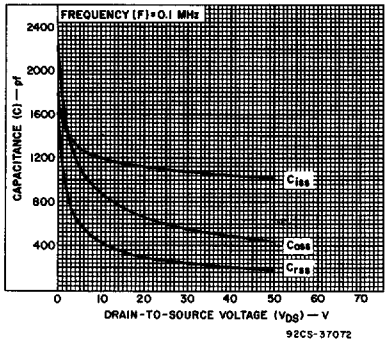


Fig. 9 — Capacitance as a function of drain-to-source voltage for all types.

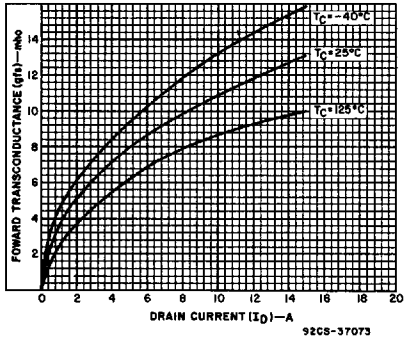


Fig. 10 — Typical forward transconductance as a function of drain current for all types

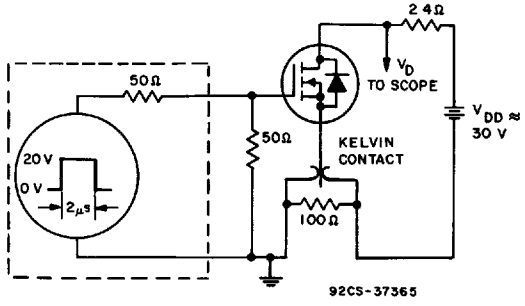


Fig. 11 — Switching Time Test Circuit