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2SK1093

Silicon N-Channel MOS FET

Application

High speed power switching

Features

- Low on-resistance
- High speed switching
- Low drive current
- 4 V gate drive device
  – Can be driven from 5 V source
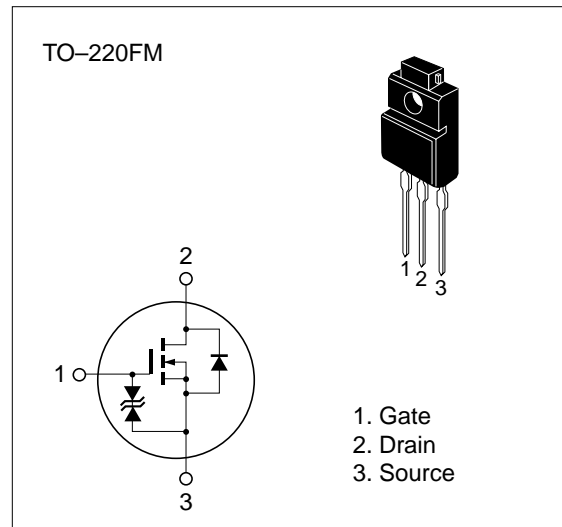- Suitable for motor drive, DC-DC converter, power switch and solenoid drive

TO–220FM

1. Gate
2. Drain
3. Source

Table 1   Absolute Maximum Ratings (Ta = 25°C)

Item	Symbol	Ratings	Unit
Drain to source voltage	V_{DSS}	60	V
Gate to source voltage	V_{GSS}	±20	V
Drain current	I_D	10	A
Drain peak current	$I_{D(pulse)}$*4	0	A
Body to drain diode reverse drain current	I_{DR}	10	A
Channel dissipation	Pch**	20	W
Channel temperature	Tch	150	°C
Storage temperature	Tstg	−55 to +150	°C

*   PW ≤ 10 µs, duty cycle ≤ 1 %
**   Value at T_C = 25 °C

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Table 2 Electrical Characteristics (Ta = 25°C)

Item	Symbol	Min	Typ	Max	Unit	Test conditions
Drain to source breakdown voltage	$V_{(BR)DSS}$	60	—	—	V	I_D = 10 mA, V_{GS} = 0
Gate to source breakdown voltage	$V_{(BR)GSS}$	±20	—	—	V	I_G = ±100 μA, V_{DS} = 0
Gate to source leak current	I_{GSS}	—	—	±10	μA	V_{GS} = ±16 V, V_{DS} = 0
Zero gate voltage drain current	I_{DSS}	—	—	250	μA	V_{DS} = 50 V, V_{GS} = 0
Gate to source cutoff voltage	$V_{GS(off)}$	1.0	—	2.0	V	I_D = 1 mA, V_{DS} = 10 V
Static drain to source on state resistance	$R_{DS(on)}$	—	0.12	0.15	Ω	I_D = 5 A, V_{GS} = 10 V *
			0.17	0.22		I_D = 5 A, V_{GS} = 4 V *
Forward transfer admittance	$|y_{fs}|$	3.5	6.0	—	S	I_D = 5 A, V_{DS} = 10 V *
Input capacitance	Ciss	—	400	—	pF	V_{DS} = 10 V, V_{GS} = 0,
Output capacitance	Coss	—	220	—	pF	f = 1 MHz
Reverse transfer capacitance	Crss	—	60	—	pF	
Turn-on delay time	$t_{d(on)}$	—5		—	ns	I_D = 5 A, V_{GS} = 10 V,
Rise time	t_r	—	55	—	ns	R_L = 6 Ω
Turn-off delay time	$t_{d(off)}$	—	140	—	ns	
Fall time	t_f	—9	0	—	ns	
Body to drain diode forward voltage	V_{DF}	—	1.2	—	V	I_F = 10 A, V_{GS} = 0
Body to drain diode reverse recovery time	t_{rr}	—	125	—	ns	I_F = 10 A, V_{GS} = 0, di_F/dt = 50 A/μs

* Pulse Test

See characteristic curves of 2SK970.

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Power vs. Temperature Derating

Channel Dissipation Pch (W)

30

20

10

0   50   100   150

Case Temperature T_C (°C)

Maximum Safe Operation Area

Drain Current I_D (A)

100

30

10

3

1.0

0.3

0.1

0.1   0.3   1.0   3   10   30   100

Drain to Source Voltage V_{DS} (V)

10 µs
100 µs
1 ms
PW = 10 ms (1 Shot)
DC Operation (T_C = 25°C)

Operation in this area is limited by $R_{DS\,(on)}$

Ta = 25°C

Normalized Transient Thermal Impedance vs. Pulse Width

Normalized Transient Thermal Impedance γ_S (t)

3

1.0

0.3

0.1

0.03

0.01

D = 1
0.5
0.2
0.1
0.05
0.02
0.01
1 Shot Pulse

10 µ   100µ   1 m   10 m   100 m   11   0

Pulse Width PW (s)

T_C = 25°C

$\theta_{ch-c}\,(t) = \gamma_s\,(t) \cdot \theta_{ch-c}$
$\theta_{ch-c} = 6.25°C/W$, $T_C = 25°C$

P_{DM}

PW

T

$D = \dfrac{PW}{T}$