

Transistor

# 4V Drive Nch+Nch MOSFET

## SP8K31

**●Structure**

Silicon N-channel  
MOSFET

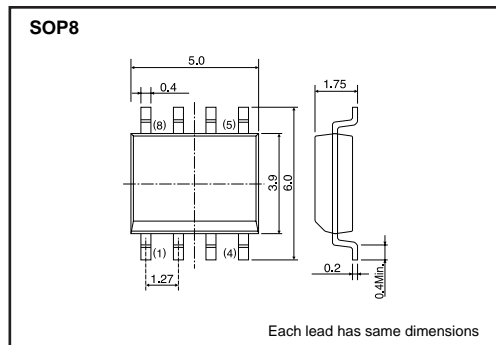
**●Features**

- 1) Built-in G-S Protection Diode.
- 2) Small surface Mount Package (SOP8).

**●Applications**

Switching

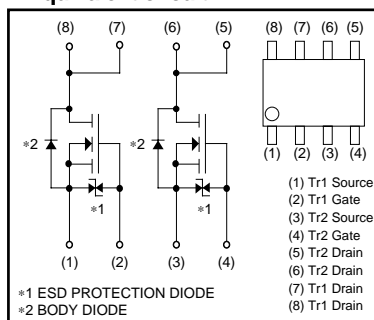
**●Dimensions (Unit : mm)**



**●Packaging dimensions**

Type	Package	Taping
	Code	TB
	Basic ordering unit (pieces)	2500
SP8K31		○

**●Equivalent circuit**



\*1 A protection diode is included between the gate and the source terminals to protect the diode against static electricity when the product is in use. Use the protection circuit when the fixed voltages are exceeded.

**●Absolute maximum ratings (Ta=25°C)**

<It is the same ratings for the Tr1 and Tr2.>

Parameter	Symbol	Limits	Unit	
Drain-source voltage	V <sub>DSS</sub>	60	V	
Gate-source voltage	V <sub>GSS</sub>	±20	V	
Drain current	Continuous	I <sub>D</sub>	±3.5	A
	Pulsed	I <sub>DP</sub> *1	±14	A
Source current (Body diode)	Continuous	I <sub>S</sub>	1.0	A
	Pulsed	I <sub>SP</sub> *1	14	A
Total power dissipation	P <sub>D</sub> *2	2.0	W	
Channel temperature	T <sub>ch</sub>	150	°C	
Range of storage temperature	T <sub>stg</sub>	-55 to +150	°C	

\*1 P<sub>w</sub> ≤ 10μs, Duty cycle ≤ 1%  
\*2 Mounted on a ceramic board.

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## ●Electrical characteristics (Ta=25°C)

&lt;It is the same characteristics for the Tr1 and Tr2.&gt;

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Gate-source leakage	I <sub>GSS</sub>	–	–	±10	μA	V <sub>GS</sub> =±20V, V <sub>DS</sub> =0V
Drain-source breakdown voltage	V <sub>(BR) DSS</sub>	60	–	–	V	I <sub>D</sub> = 1mA, V <sub>GS</sub> =0V
Zero gate voltage drain current	I <sub>DSS</sub>	–	–	1	μA	V <sub>DS</sub> = 60V, V <sub>GS</sub> =0V
Gate threshold voltage	V <sub>GS(th)</sub>	1.0	–	2.5	V	V <sub>DS</sub> = 10V, I <sub>D</sub> = 1mA
Static drain-source on-state resistance	R <sub>DS(on)</sub> *	–	85	120	mΩ	I <sub>D</sub> = 3.5A, V <sub>GS</sub> = 10V
		–	100	140	mΩ	I <sub>D</sub> = 3.5A, V <sub>GS</sub> = 4.5V
		–	105	150	mΩ	I <sub>D</sub> = 3.5A, V <sub>GS</sub> = 4.0V
Forward transfer admittance	Y <sub>fs</sub>  *	2.5	–	–	S	V <sub>DS</sub> = 10V, I <sub>D</sub> = 3.5A
Input capacitance	C <sub>iss</sub>	–	250	–	pF	V <sub>DS</sub> = 10V
Output capacitance	C <sub>oss</sub>	–	60	–	pF	V <sub>GS</sub> =0V
Reverse transfer capacitance	C <sub>rss</sub>	–	30	–	pF	f=1MHz
Turn-on delay time	t <sub>d(on)</sub> *	–	7	–	ns	V <sub>DD</sub> ≐ 30V I <sub>D</sub> = 1.8A
Rise time	t <sub>r</sub> *	–	14	–	ns	V <sub>GS</sub> = 10V
Turn-off delay time	t <sub>d(off)</sub> *	–	25	–	ns	R <sub>L</sub> = 17Ω
Fall time	t <sub>f</sub> *	–	7	–	ns	R <sub>G</sub> =10Ω
Total gate charge	Q <sub>g</sub> *	–	3.7	5.2	nC	V <sub>DD</sub> ≐ 30V, V <sub>GS</sub> = 5V
Gate-source charge	Q <sub>gs</sub> *	–	1.2	–	nC	I <sub>D</sub> = 3.5A
Gate-drain charge	Q <sub>gd</sub> *	–	1.2	–	nC	R <sub>L</sub> = 8.6Ω, R <sub>G</sub> = 10Ω

\*Pulsed

## ●Body diode characteristics (Source-drain) (Ta=25°C)

&lt;It is the same characteristics for the Tr1 and Tr2.&gt;

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Forward voltage	V <sub>SD</sub> *	–	–	1.2	V	I <sub>S</sub> =3.5A, V <sub>GS</sub> =0V

\*Pulsed

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●Electrical characteristic curves

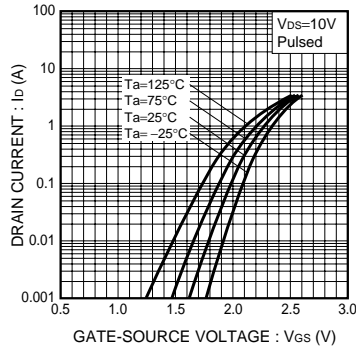


Fig.1 Typical Transfer Characteristics

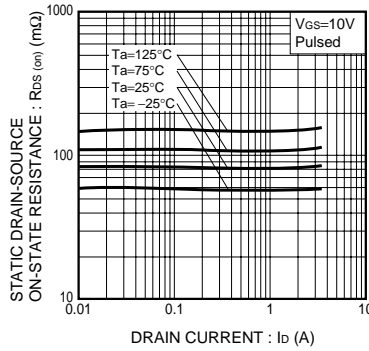


Fig.2 Static Drain-Source On-State Resistance vs. Drain Current(I)

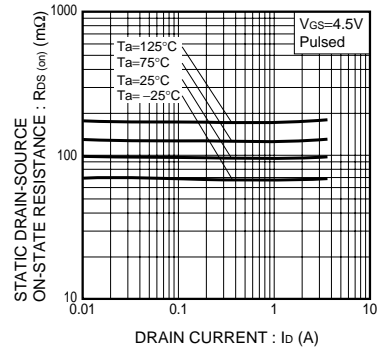


Fig.3 Static Drain-Source On-State Resistance vs. Drain Current(II)

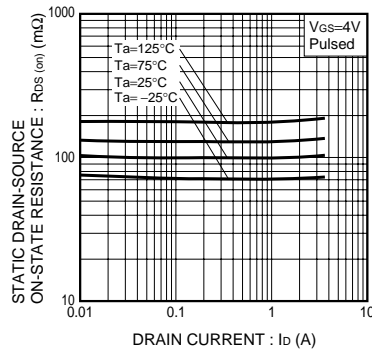


Fig.4 Static Drain-Source On-State Resistance vs. Drain Current(III)

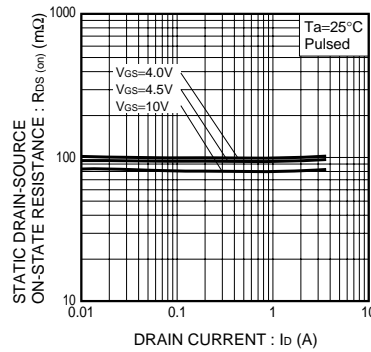


Fig.5 Static Drain-Source On-State Resistance vs. Drain Current(IV)

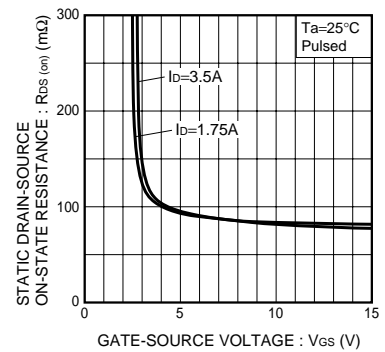


Fig.6 Static Drain-Source On-State Resistance vs. Gate-Source Voltage

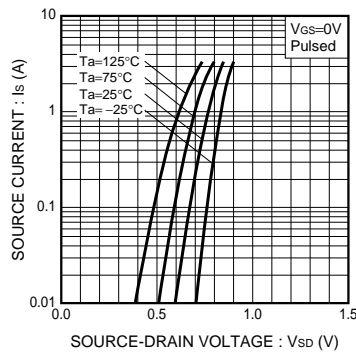


Fig.7 Source Current vs. Source-Drain Voltage

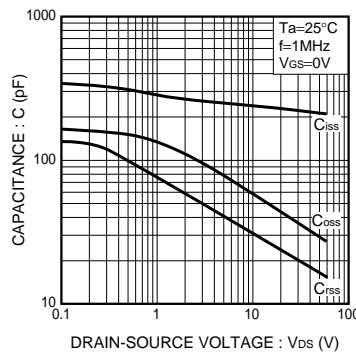


Fig.8 Typical Capacitance vs. Drain-Source Voltage

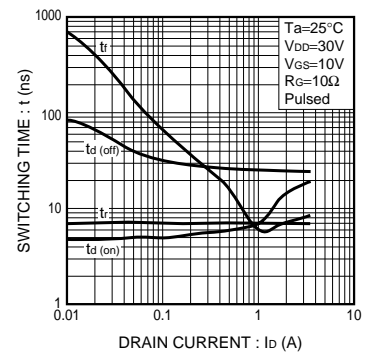


Fig.9 Switching Characteristics

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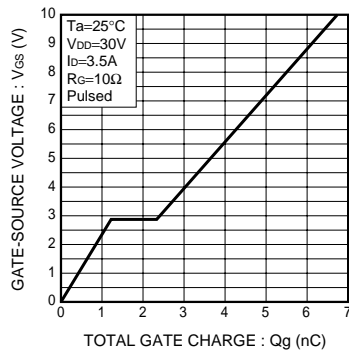


Fig.10 Dynamic Input Characteristics

● Measurement circuits

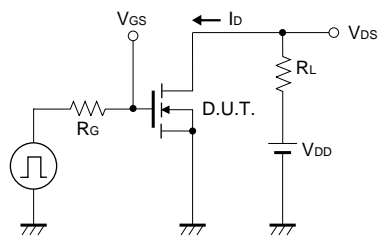


Fig.11 Switching Time Test Circuit

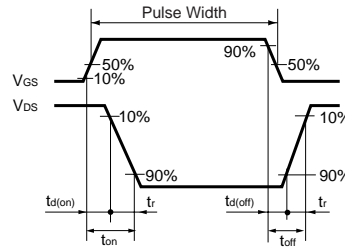


Fig.12 Switching Time Waveforms

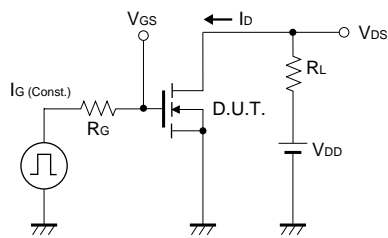


Fig.13 Gate Charge Test Circuit

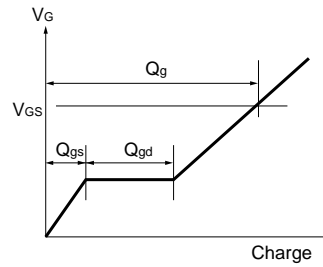


Fig.14 Gate Charge Waveform

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#### Как с нами связаться

**Телефон:** 8 (812) 309 58 32 (многоканальный)

**Факс:** 8 (812) 320-02-42

**Электронная почта:** [org@eplast1.ru](mailto:org@eplast1.ru)

**Адрес:** 198099, г. Санкт-Петербург, ул. Калинина, дом 2, корпус 4, литера А.