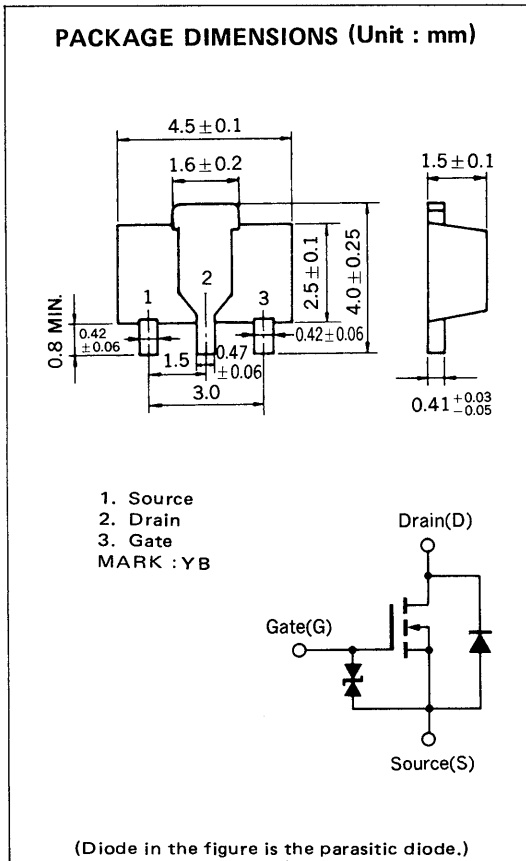


# MOS FIELD EFFECT TRANSISTOR 2SK680A

## N-CHANNEL MOS FET FOR HIGH SPEED SWITCHING



The 2SK680A, N-channel vertical type MOS FET, is a switching device which can be driven directly by the output of ICs having a 5 V power source.

The MOS FET has excellent switching characteristics and is suitable for use as a high-speed switching device in digital circuits.

### FEATURES

- Directly driven by ICs having a 5 V power source.
- Not necessary to consider driving current because of its high input impedance.
- Possible to reduce the number of parts by omitting the bias resistor.
- Has low on-state resistance

$$R_{DS(on)} = 1.0 \Omega \text{ MAX. @ } V_{GS} = 4.0 \text{ V, } I_D = 0.5 \text{ A}$$

$$R_{DS(on)} = 0.7 \Omega \text{ MAX. @ } V_{GS} = 10 \text{ V, } I_D = 0.5 \text{ A}$$

### QUALITY GRADE

Standard

Please refer to "Quality grade on NEC Semiconductor Devices" (Document number IEI-1209) published by NEC Corporation to know the specification of quality grade on the devices and its recommended applications.

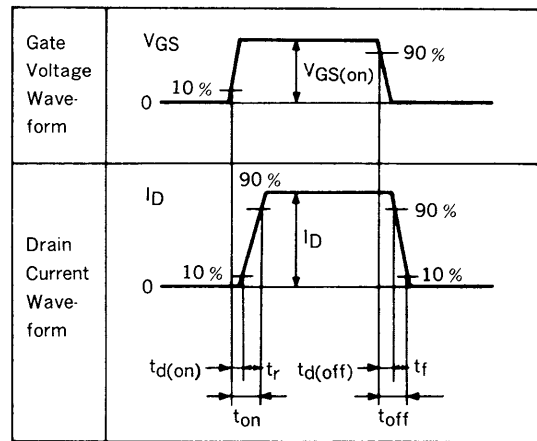
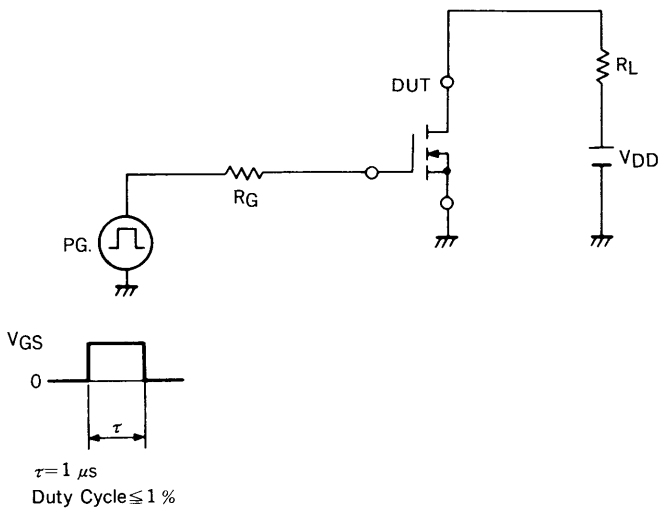
### ABSOLUTE MAXIMUM RATINGS ( $T_a = 25^\circ\text{C}$ )

PARAMETER	SYMBOL	RATINGS	UNIT	TEST CONDITIONS
Drain to Source Voltage	$V_{DSS}$	30	V	$V_{GS} = 0$
Gate to Source Voltage	$V_{GSS}$	$\pm 20$	V	$V_{DS} = 0$
Drain Current	$I_D(\text{DC})$	$\pm 1.0$	A	
Drain Current	$I_D(\text{pulse})$	$\pm 2.0$	A	$PW \leq 10 \text{ ms, Duty Cycle} \leq 50 \%$
Total Power Dissipation	$P_T$	2.0	W	when using ceramic board of $16 \text{ cm}^2 \times 0.7 \text{ mm}$
Channel Temperature	$T_{ch}$	150	$^\circ\text{C}$	
Storage Temperature	$T_{stg}$	-55 to +150	$^\circ\text{C}$	

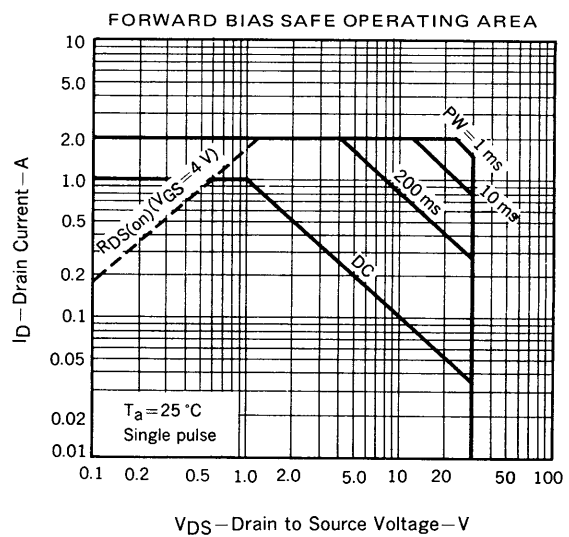
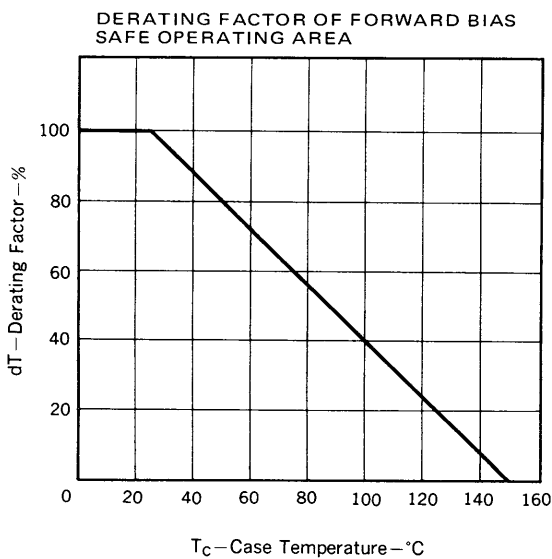
ELECTRICAL CHARACTERISTICS (T<sub>a</sub> = 25 °C)

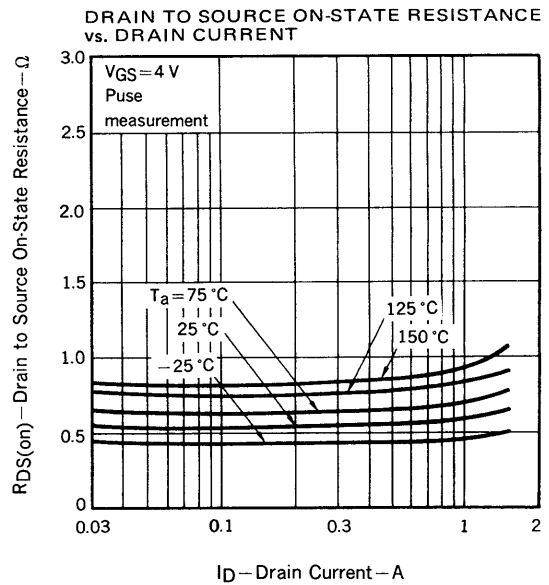
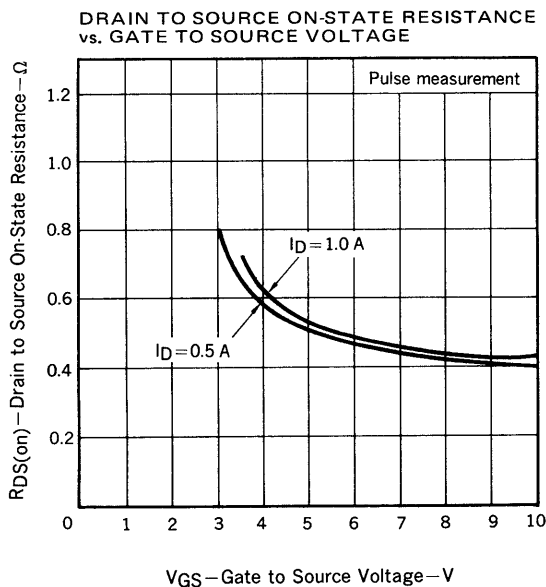
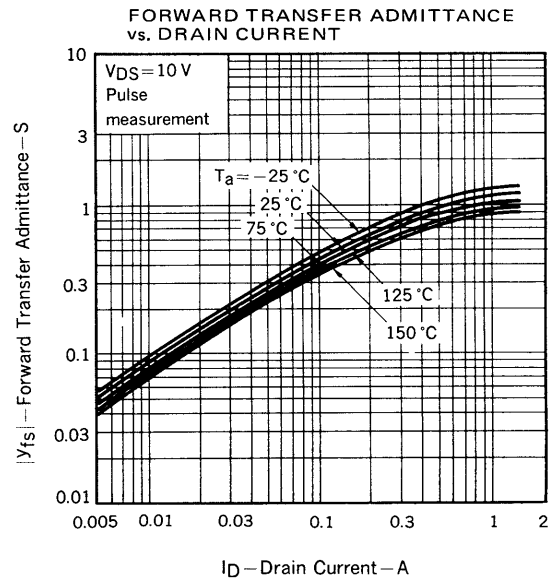
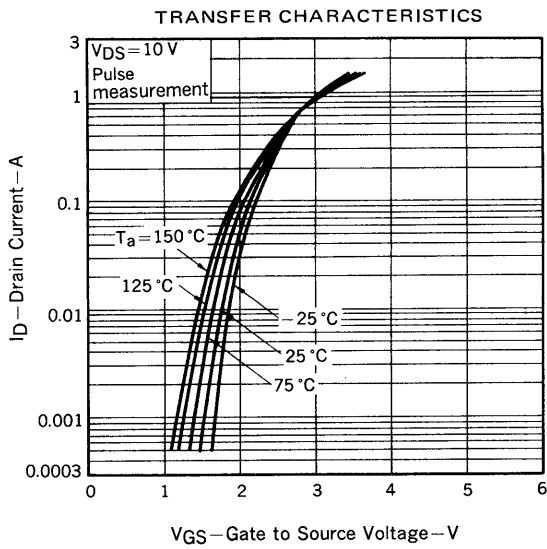
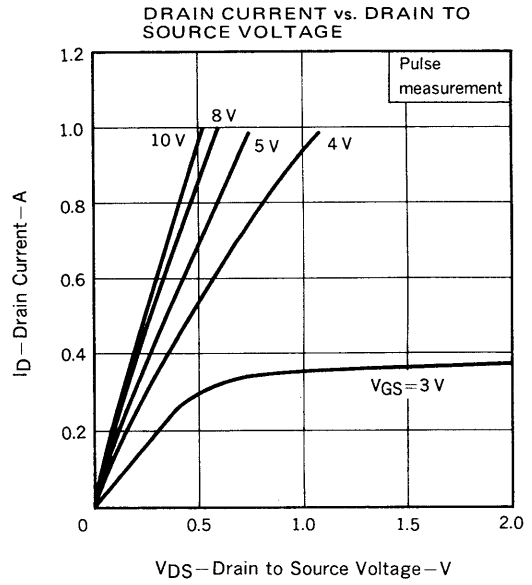
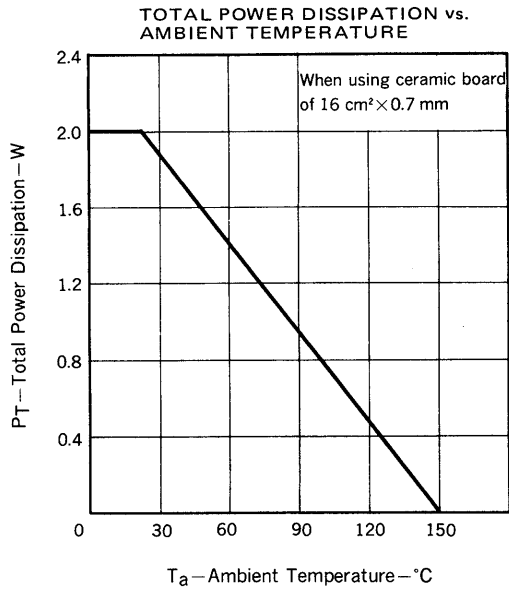
CHARACTERISTIC	SYMBOL	MIN.	TYP.	MAX.	UNIT	CONDITIONS
Drain Cut-off Current	I <sub>DSS</sub>			10	μA	V <sub>DS</sub> = 30 V, V <sub>GS</sub> = 0
Gate Leakage Current	I <sub>GSS</sub>			±10	μA	V <sub>GS</sub> = ±20 V, V <sub>DS</sub> = 0
Gate Cut-off Voltage	V <sub>GS(off)</sub>	1.0	1.6	2.5	V	V <sub>DS</sub> = 10 V, I <sub>D</sub> = 1 mA
Forward Transfer Admittance	Y <sub>fs</sub>	0.4			S	V <sub>DS</sub> = 10 V, I <sub>D</sub> = 0.5 A
Drain to Source On-State Resistance	R <sub>DS(on)1</sub>		0.6	1.0	Ω	V <sub>GS</sub> = 4.0 V, I <sub>D</sub> = 0.5 A
Drain to Source On-State Resistance	R <sub>DS(on)2</sub>		0.4	0.7	Ω	V <sub>GS</sub> = 10 V, I <sub>D</sub> = 0.5 A
Input Capacitance	C <sub>iss</sub>		130		pF	V <sub>DS</sub> = 5.0 V, V <sub>GS</sub> = 0, f = 1 MHz
Output Capacitance	C <sub>oss</sub>		70		pF	
Feedback Capacitance	C <sub>rss</sub>		30		pF	
Turn-On Delay Time	t <sub>d(on)</sub>		12		ns	V <sub>GS(on)</sub> = 10 V, R <sub>G</sub> = 10 Ω V <sub>DD</sub> = 25 V, I <sub>D</sub> = 0.5 A R <sub>L</sub> = 50 Ω
Rise Time	t <sub>r</sub>		44		ns	
Turn-Off Delay Time	t <sub>d(off)</sub>		310		ns	
Fall Time	t <sub>f</sub>		160		ns	

SWITCHING TIME MEASUREMENT CIRCUIT AND CONDITIONS

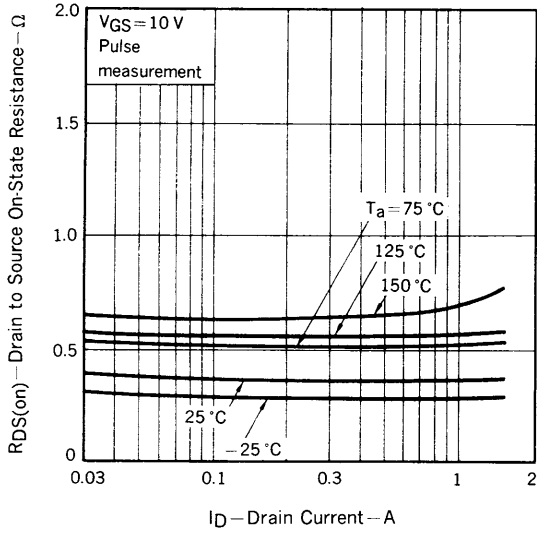


TYPICAL CHARACTERISTICS (T<sub>a</sub> = 25 °C)

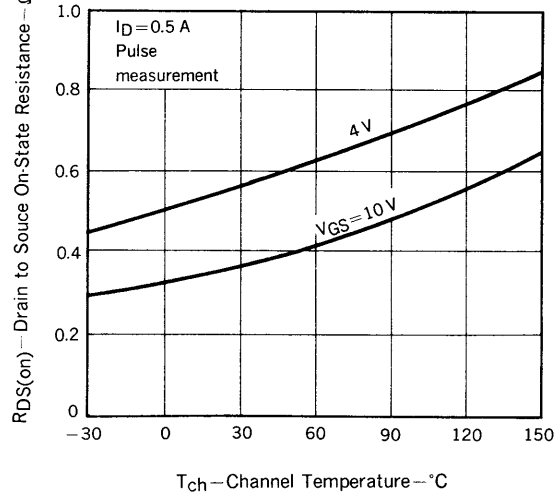




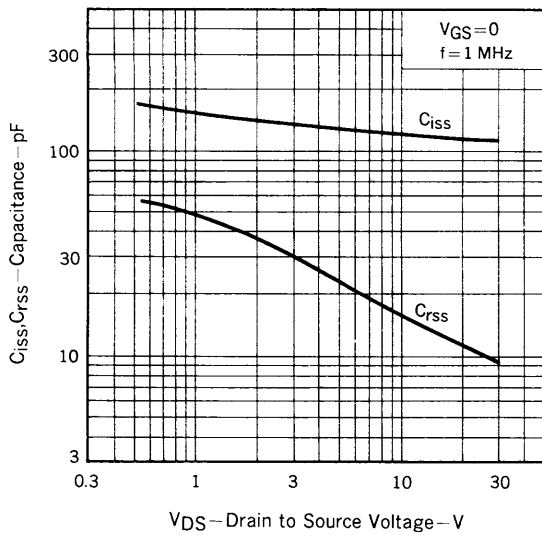
DRAIN TO SOURCE ON-STATE RESISTANCE vs. DRAIN CURRENT



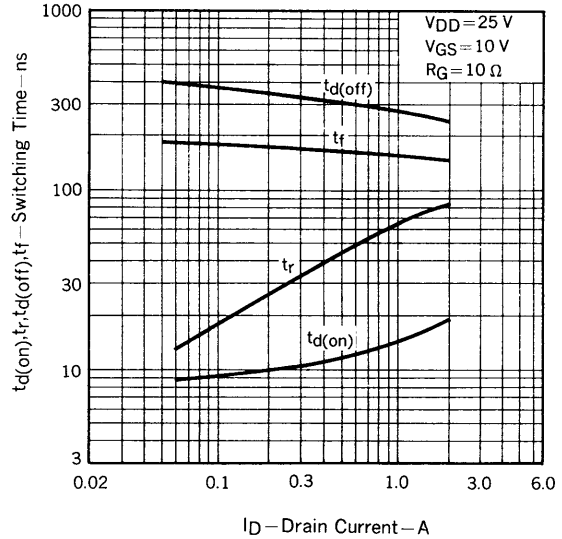
DRAIN TO SOURCE ON-STATE RESISTANCE vs. CHANNEL TEMPERATURE



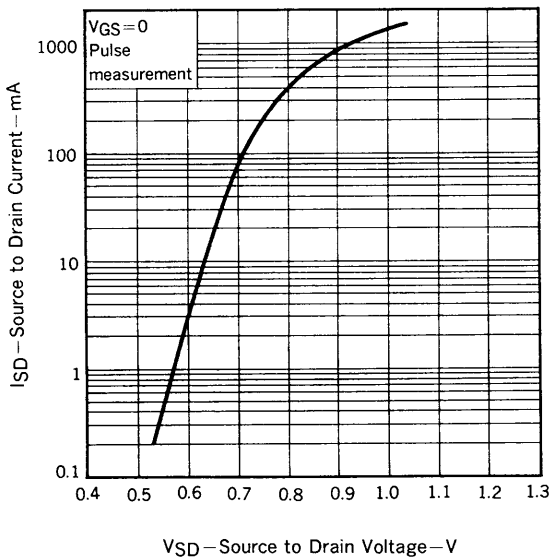
CAPACITANCE vs. DRAIN TO SOURCE VOLTAGE



SWITCHING CHARACTERISTICS



SOURCE TO DRAIN DIODE FORWARD VOLTAGE



**RECOMMENDED SOLDERING CONDITIONS**

Mounting of this product by soldering should be done under the following conditions.  
Please consult our representatives about soldering methods and conditions other than these.

**SURFACE MOUNT TYPE**

For details of the recommended soldering conditions, see the information document.  
"Device Mounting Manual for Surface Mounting (IEI-1207)."

Soldering Method	Soldering Conditions	Symbol for Recommended Conditions
Infrared Reflow	Package peak temp.: 230 °C Soldering time: within 30 sec (above 210 °C) Soldering times: 1, Days limitation: none*	IR30-00
Vapor Phase Soldering	Package peak temp.: 215 °C Soldering time: within 40 sec (above 200 °C) Soldering times: 1, Days limitation: none*	VP15-00
Wave Soldering	Soldering bath temp.: below 260 °C Soldering time: within 10 sec Soldering times: 1, Days limitation: none*	WS60-00

\*: Stored days under storage conditions at 25 °C and below 65 % R.H. after the dry-pack has been opened.

**Note 1** Combination of soldering methods should be avoided.

**REFERENCE**

Document Name	Document No.
NEC semiconductor device reliability/quality control system.	TEI-1202
Quality grade on NEC semiconductor devices.	IEI-1209
Semiconductor device mounting technology manual.	IEI-1207
Semiconductor device package manual.	IEI-1213
Guide to quality assurance for semiconductor devices.	MEI-1202
Semiconductor selection guide.	MF-1134

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Special: Automotive and Transportation equipment, Traffic control systems, Antidisaster systems, Anticrime systems, etc.