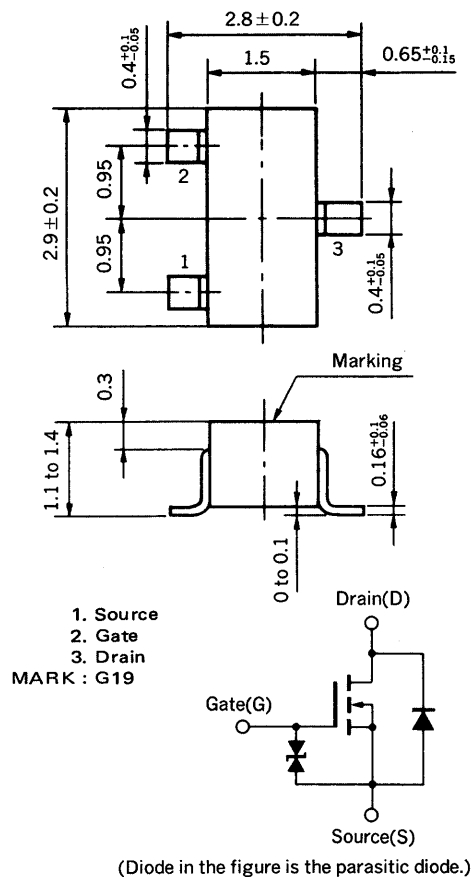


# MOS FIELD EFFECT TRANSISTOR

## 2SK1657

### N-CHANNEL MOS FET FOR SWITCHING

#### PACKAGE DIMENSIONS (Unit: mm)



The 2SK1657 is an N-channel vertical type MOS FET which can be driven by 2.5 V power supply.

As the MOS FET is low Gate Leakage Current, it is suitable for filter circuit.

#### FEATURES

- Directly driven by ICs having a 3 V power supply.
- Has low Gate Leakage Current  
 $I_{GSS} = \pm 5 \text{ nA MAX. @ } V_{GS} = \pm 3.0 \text{ V}$

#### 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.

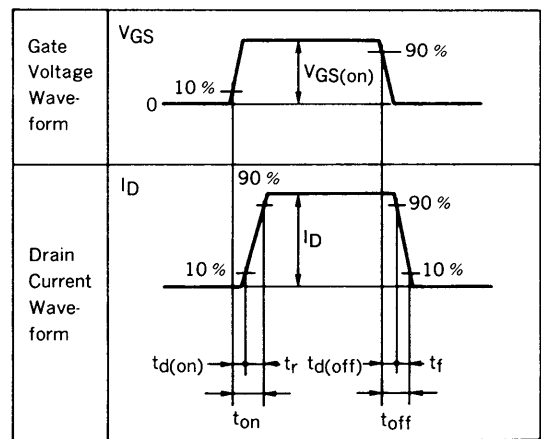
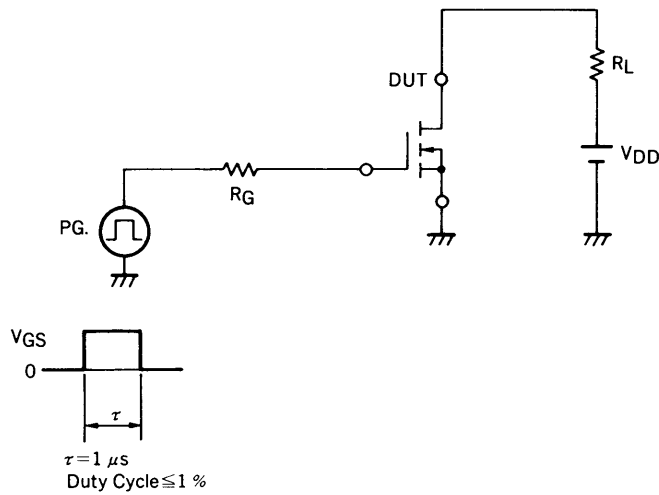
#### ABSOLUTE MAXIMUM RATINGS ( $T_a = 25^\circ\text{C}$ )

PARAMETER	SYMBOL	RATINGS	UNIT	TEST CONDITIONS
Drain to Source Voltage	$V_{DSS}$	30	V	$V_{GS} = 0$
Gate to Source Voltage	$V_{GSS}$	$\pm 7$	V	$V_{DS} = 0$
Drain Current	$I_D(\text{DC})$	$\pm 100$	mA	
Drain Current	$I_D(\text{pulse})$	$\pm 200$	mA	$PW \leq 10 \text{ ms}$ , Duty Cycle $\leq 50 \%$
Total Power Dissipation	$P_T$	200	mW	
Channel Temperature	$T_{ch}$	150	$^\circ\text{C}$	
Operating Temperature	$T_{opt}$	$-55$ to $+80$	$^\circ\text{C}$	
Storage Temperature	$T_{stg}$	$-55$ to $+150$	$^\circ\text{C}$	

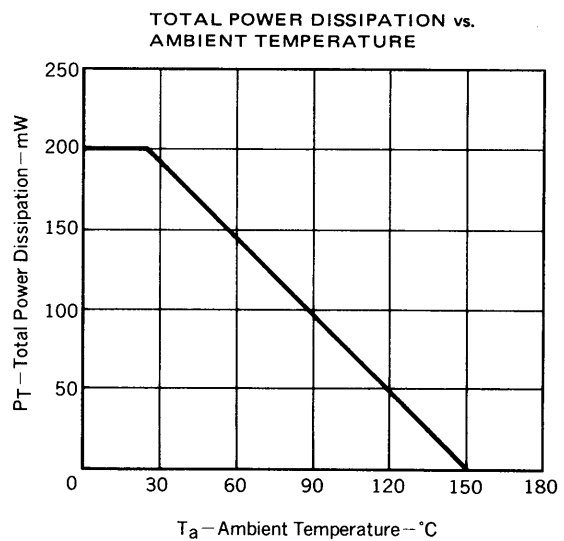
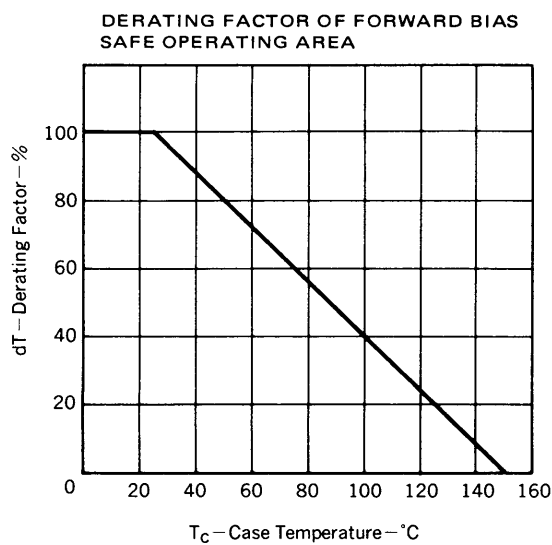
ELECTRICAL CHARACTERISTICS (T<sub>a</sub> = 25 °C)

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST 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>			±5.0	nA	V <sub>GS</sub> = ±3.0 V, V <sub>DS</sub> = 0
Gate Cut-off Voltage	V <sub>GS(off)</sub>	0.9	1.2	1.5	V	V <sub>DS</sub> = 3.0 V, I <sub>D</sub> = 1.0 μA
Forward Transfer Admittance	Y <sub>fs</sub>	20	40		mS	V <sub>DS</sub> = 3.0 V, I <sub>D</sub> = 10 mA
Drain to Source On-State Resistance	R <sub>DS(on)1</sub>		25	45	Ω	V <sub>GS</sub> = 2.5 V, I <sub>D</sub> = 10 mA
Drain to Source On-State Resistance	R <sub>DS(on)2</sub>		18	25	Ω	V <sub>GS</sub> = 4.0 V, I <sub>D</sub> = 10 mA
Input Capacitance	C <sub>iss</sub>		15		pF	V <sub>DS</sub> = 3.0 V, V <sub>GS</sub> = 0, f = 1 MHz
Output Capacitance	C <sub>oss</sub>		10		pF	
Feedback Capacitance	C <sub>rss</sub>		1.5		pF	
Turn-On Delay Time	t <sub>d(on)</sub>		95		ns	V <sub>DD</sub> = 3.0 V, I <sub>D</sub> = 10 mA V <sub>GS(on)</sub> = 3 V, R <sub>G</sub> = 10 Ω R <sub>L</sub> = 300 Ω
Rise Time	t <sub>r</sub>		360		ns	
Turn-Off Delay Time	t <sub>d(off)</sub>		160		ns	
Fall Time	t <sub>f</sub>		150		ns	

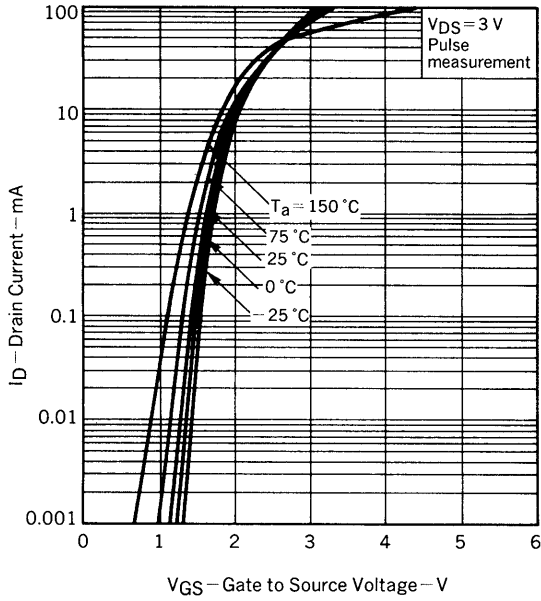
SWITCHING TIME MEASUREMENT CIRCUIT AND CONDITIONS



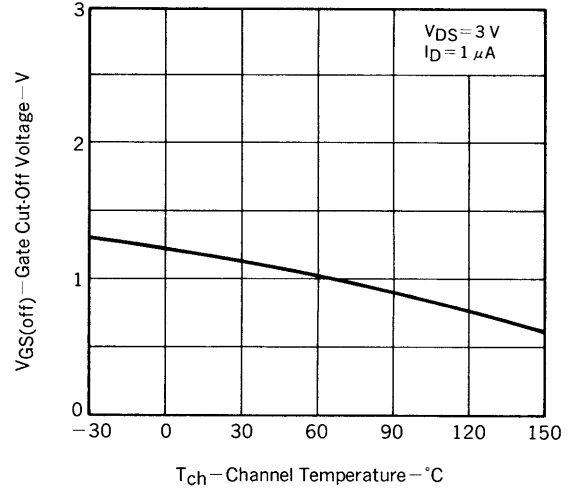
TYPICAL CHARACTERISTICS (T<sub>a</sub> = 25 °C)



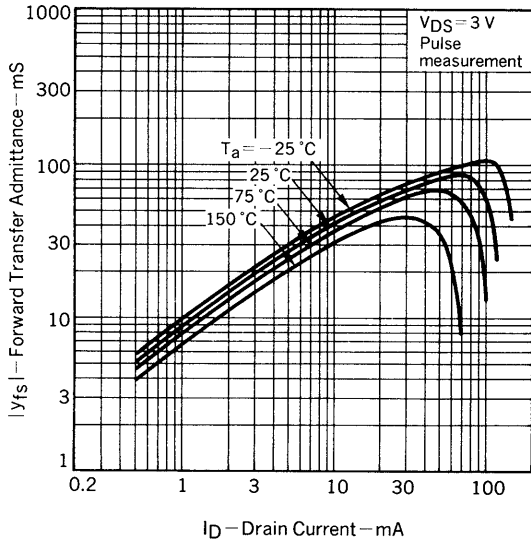
TRANSFER CHARACTERISTICS



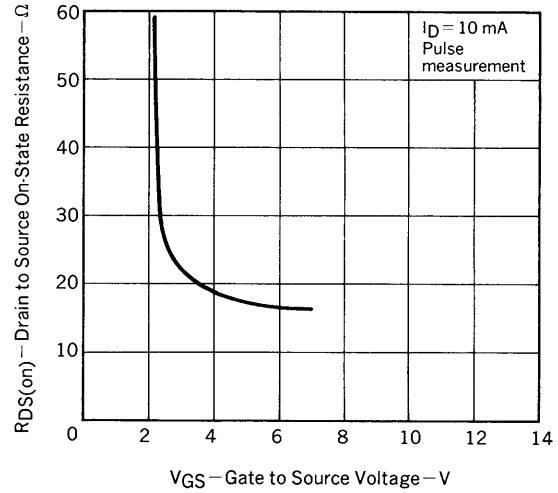
GATE TO SOURCE CUTOFF VOLTAGE vs. CHANNEL TEMPERATURE



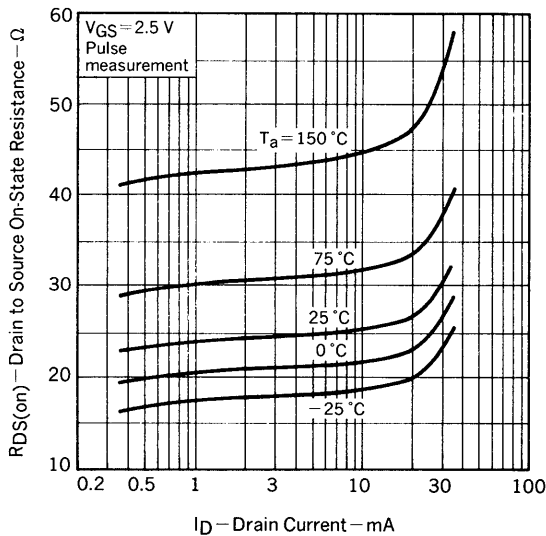
FORWARD TRANSFER ADMITTANCE vs. DRAIN CURRENT



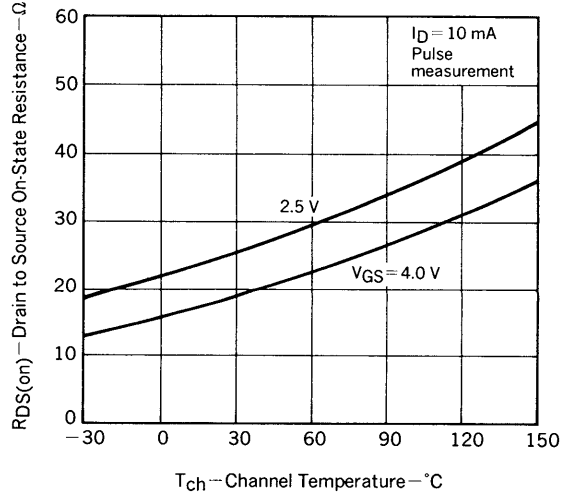
DRAIN TO SOURCE ON-STATE RESISTANCE vs. GATE TO SOURCE VOLTAGE



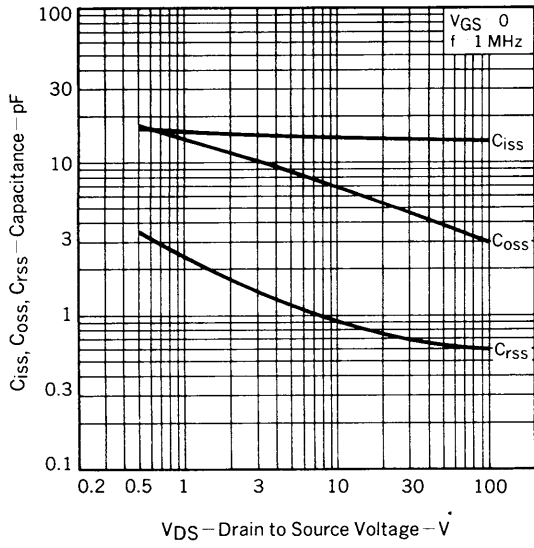
DRAIN TO SOURCE ON-STATE RESISTANCE vs. DRAIN CURRENT



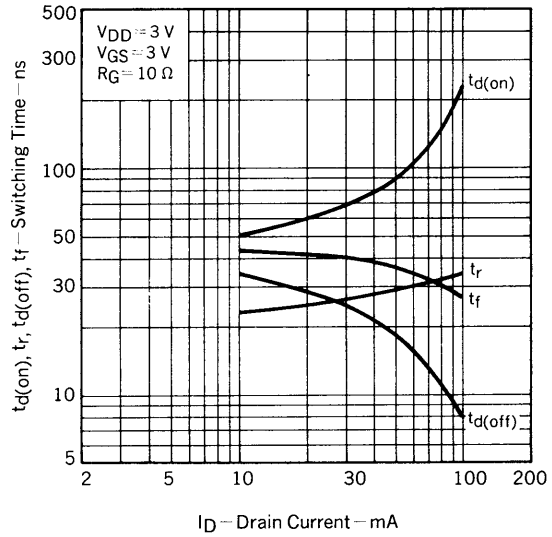
DRAIN TO SOURCE ON-STATE RESISTANCE vs. CHANNEL TEMPERATURE



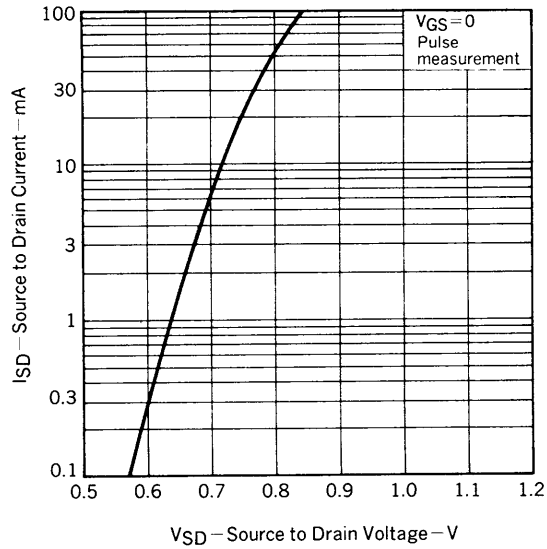
CAPACITANCE vs. DRAIN TO SOURCE VOLTAGE



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 "SMT MANUAL" (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.

[MEMO]

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Application examples recommended by NEC Corporation

Standard: Data processing and office equipment, Communication equipment (terminal, mobile), Test and Measurement equipment, Audio and Video equipment, Other consumer products, etc.

Special: Automotive and Transportation equipment, Communication equipment (trunk line), Train and Traffic control devices, industrial robots, Burning control systems, antidisaster systems, anticrime systems etc.