

### SWITCHING N-CHANNEL POWER MOS FET INDUSTRIAL USE

#### DESCRIPTION

The 2SK2981 is N-channel MOS Field Effect Transistor designed for high current switching applications.

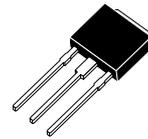
#### FEATURES

- Low on-state resistance  
 $R_{DS(on)1} = 27 \text{ m}\Omega \text{ MAX. (} V_{GS} = 10 \text{ V, } I_D = 10 \text{ A)}$   
 $R_{DS(on)2} = 40 \text{ m}\Omega \text{ MAX. (} V_{GS} = 4.5 \text{ V, } I_D = 10 \text{ A)}$   
 $R_{DS(on)3} = 50 \text{ m}\Omega \text{ MAX. (} V_{GS} = 4 \text{ V, } I_D = 10 \text{ A)}$
- Low  $C_{iss}$  :  $C_{iss} = 860 \text{ pF TYP.}$
- Built-in gate protection diode

#### ORDERING INFORMATION

PART NUMBER	PACKAGE
2SK2981	TO-251
2SK2981-Z	TO-252

(TO-251)



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

Drain to Source Voltage ( $V_{GS} = 0 \text{ V}$ )	$V_{DSS}$	30	V
Gate to Source Voltage ( $V_{DS} = 0 \text{ V}$ )	$V_{GSS}$	$\pm 20$	V
Drain Current (DC)	$I_{D(DC)}$	$\pm 20$	A
Drain Current (Pulse) <sup>Note</sup>	$I_{D(pulse)}$	$\pm 80$	A
Total Power Dissipation ( $T_A = 25 \text{ }^\circ\text{C}$ )	$P_{T1}$	1	W
Total Power Dissipation ( $T_C = 25 \text{ }^\circ\text{C}$ )	$P_{T2}$	20	W
Channel Temperature	$T_{ch}$	150	$^\circ\text{C}$
Storage Temperature	$T_{stg}$	-55 to + 150	$^\circ\text{C}$

(TO-252)



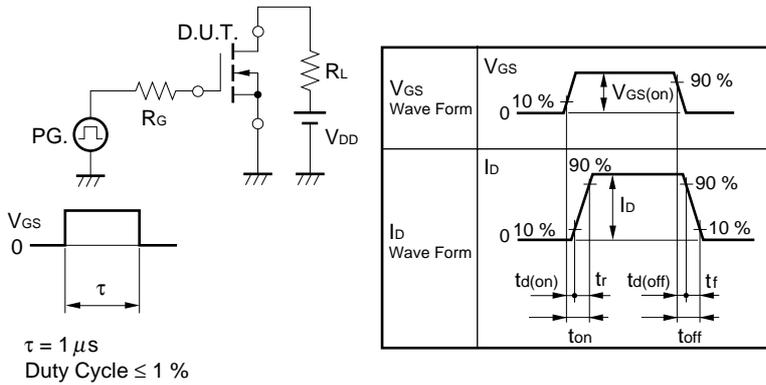
**Note**  $PW \leq 10 \text{ } \mu\text{s}$ , Duty cycle  $\leq 1 \%$

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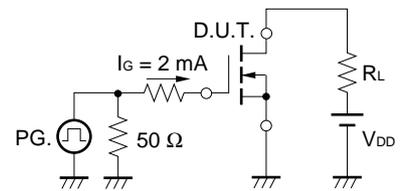
**ELECTRICAL CHARACTERISTICS (T<sub>A</sub> = 25 °C)**

CHARACTERISTICS	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNIT
Drain to Source On-state Resistance	R <sub>DS(on)1</sub>	V <sub>GS</sub> = 10 V, I <sub>D</sub> = 10 A		20	27	mΩ
	R <sub>DS(on)2</sub>	V <sub>GS</sub> = 4.5 V, I <sub>D</sub> = 10 A		30	40	mΩ
	R <sub>DS(on)3</sub>	V <sub>GS</sub> = 4 V, I <sub>D</sub> = 10 A		35	50	mΩ
Gate to Source Cut-off Voltage	V <sub>GS(off)</sub>	V <sub>DS</sub> = 10 V, I <sub>D</sub> = 1 mA	1.0	1.5	2.0	V
Forward Transfer Admittance	y <sub>fs</sub>	V <sub>DS</sub> = 10 V, I <sub>D</sub> = 10 A	6.0	13.0		S
Drain Leakage Current	I <sub>DSS</sub>	V <sub>DS</sub> = 30 V, V <sub>GS</sub> = 0 V			10	μA
Gate to Source Leakage Current	I <sub>GSS</sub>	V <sub>GS</sub> = ±20 V, V <sub>DS</sub> = 0 V			±10	μA
Input Capacitance	C <sub>iSS</sub>	V <sub>DS</sub> = 10 V, V <sub>GS</sub> = 0 V, f = 1 MHz		860		pF
Output Capacitance	C <sub>oSS</sub>			350		pF
Reverse Transfer Capacitance	C <sub>rSS</sub>			160		pF
Turn-on Delay Time	t <sub>d(on)</sub>	I <sub>D</sub> = 10 A, V <sub>GS(on)</sub> = 10 V, V <sub>DD</sub> = 15 V R <sub>G</sub> = 10 Ω		25		ns
Rise Time	t <sub>r</sub>			270		ns
Turn-off Delay Time	t <sub>d(off)</sub>			65		ns
Fall Time	t <sub>f</sub>			65		ns
Total Gate Charge	Q <sub>G</sub>	I <sub>D</sub> = 20 A, V <sub>DD</sub> = 24 V, V <sub>GS</sub> = 10 V		20		nC
Gate to Source Charge	Q <sub>GS</sub>			3.5		nC
Gate to Drain Charge	Q <sub>GD</sub>			6.5		nC
Body Diode forward Voltage	V <sub>F(S-D)</sub>	I <sub>F</sub> = 20 A, V <sub>GS</sub> = 0 V		0.8		V
Reverse Recovery Time	t <sub>rr</sub>	I <sub>F</sub> = 20 A, V <sub>GS</sub> = 0 V di/dt = 100 A/μs		35		ns
Reverse Recovery Charge	Q <sub>rr</sub>			30		nC

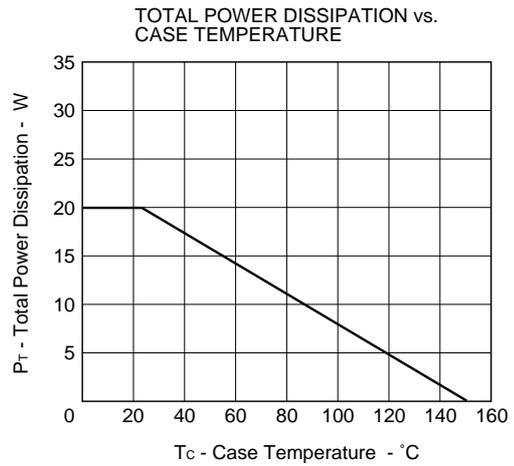
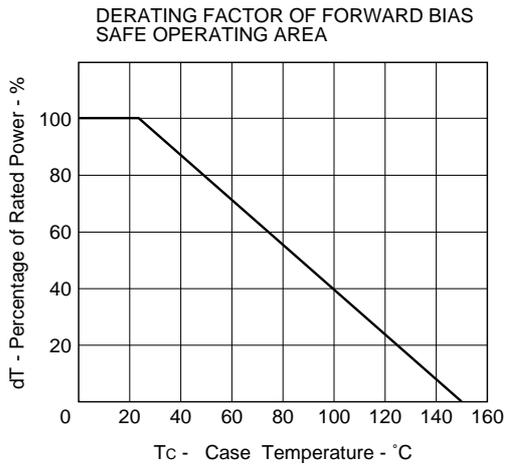
**TEST CIRCUIT 1 SWITCHING TIME**



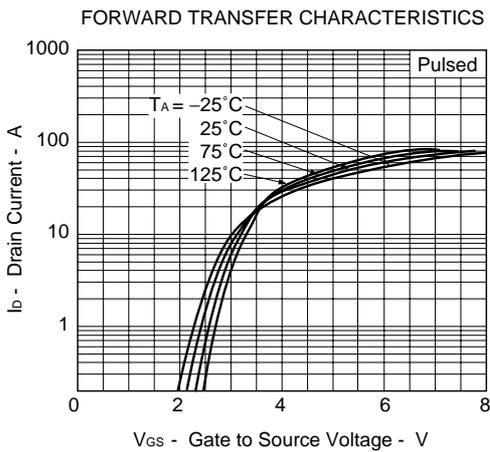
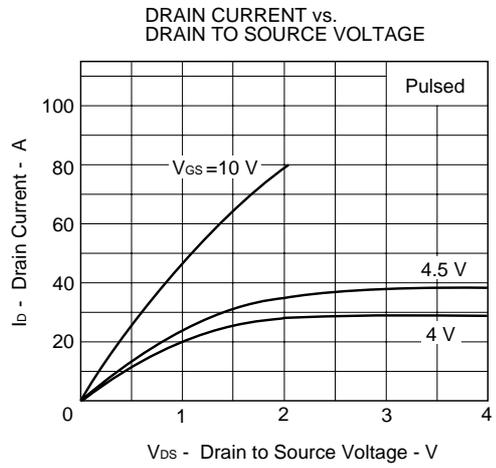
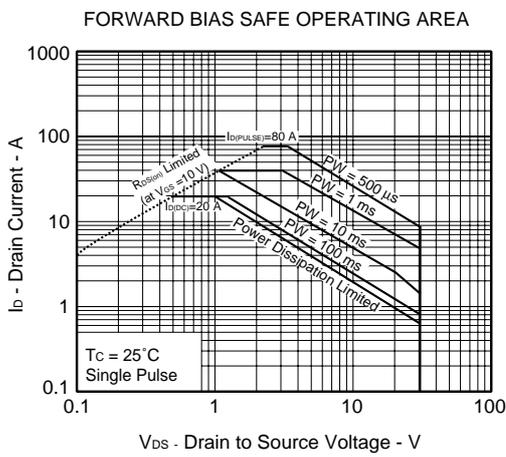
**TEST CIRCUIT 2 GATE CHARGE**



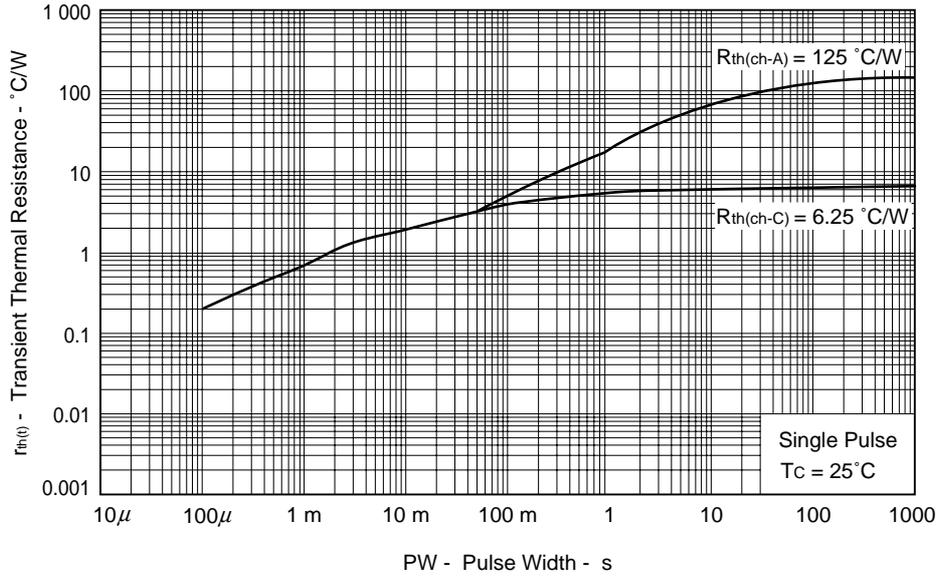
TYPICAL CHARACTERISTICS (T<sub>A</sub> = 25 °C)



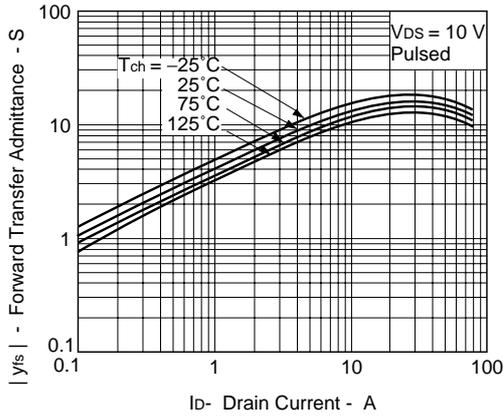
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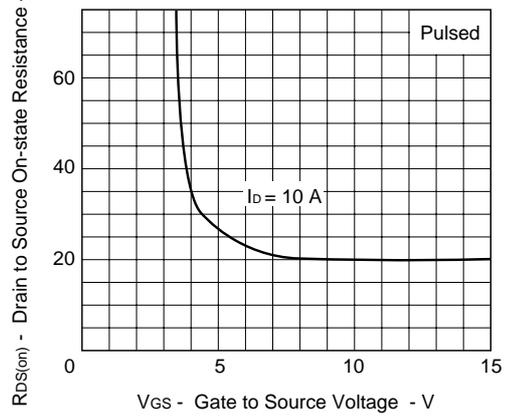
TRANSIENT THERMAL RESISTANCE vs. PULSE WIDTH



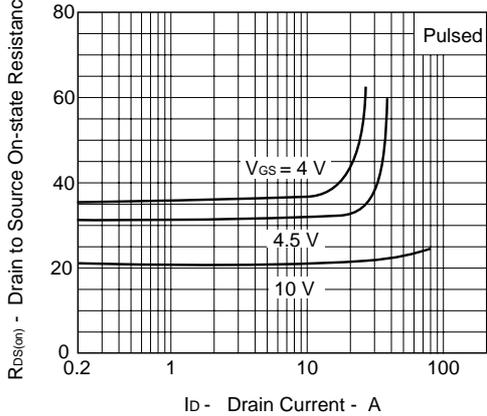
FORWARD TRANSFER ADMITTANCE vs. DRAIN CURRENT



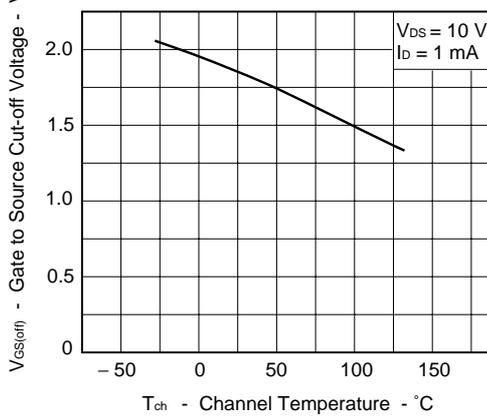
DRAIN TO SOURCE ON-STATE RESISTANCE vs. GATE TO SOURCE VOLTAGE



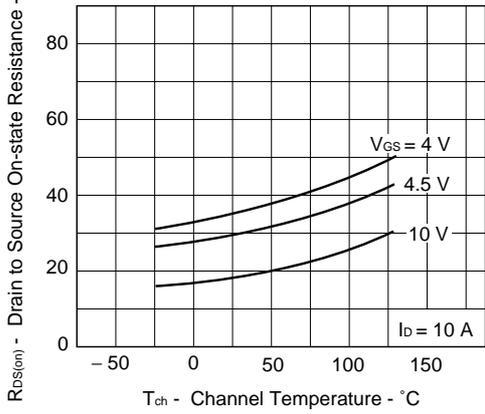
DRAIN TO SOURCE ON-STATE RESISTANCE vs. DRAIN CURRENT



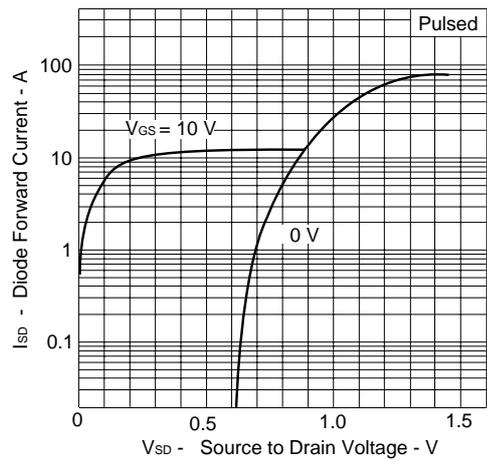
GATE TO SOURCE CUT-OFF VOLTAGE vs. CHANNEL TEMPERATURE



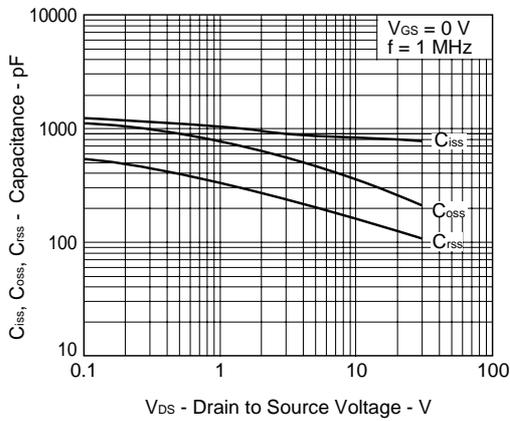
DRAIN TO SOURCE ON-STATE RESISTANCE vs. CHANNEL TEMPERATURE



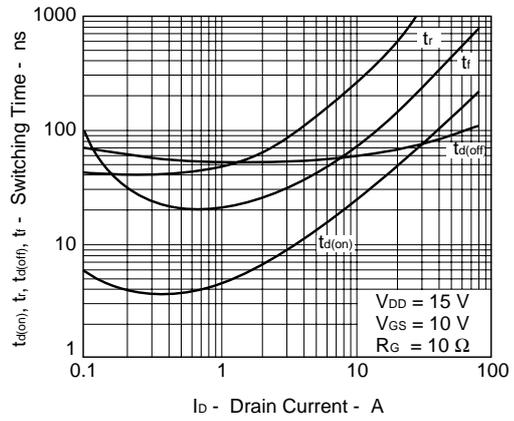
SOURCE TO DRAIN DIODE FORWARD VOLTAGE



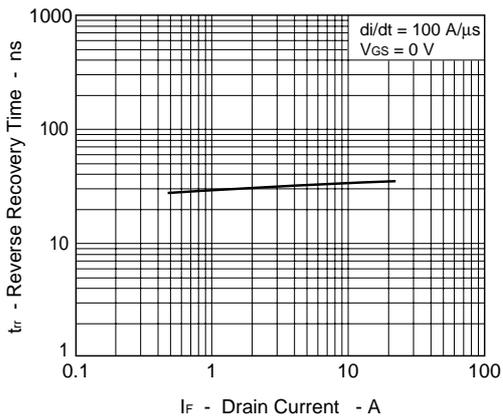
CAPACITANCE vs. DRAIN TO SOURCE VOLTAGE



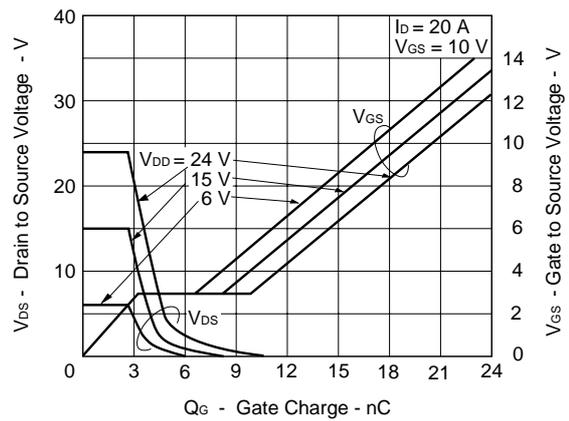
SWITCHING CHARACTERISTICS



REVERSE RECOVERY TIME vs. DRAIN CURRENT

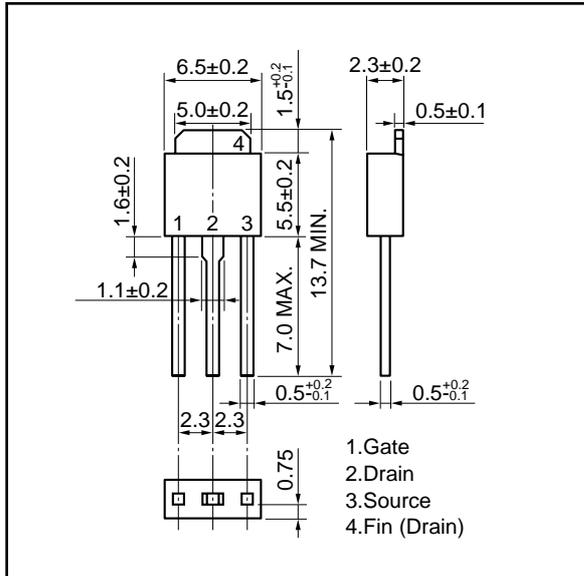


DYNAMIC INPUT/OUTPUT CHARACTERISTICS

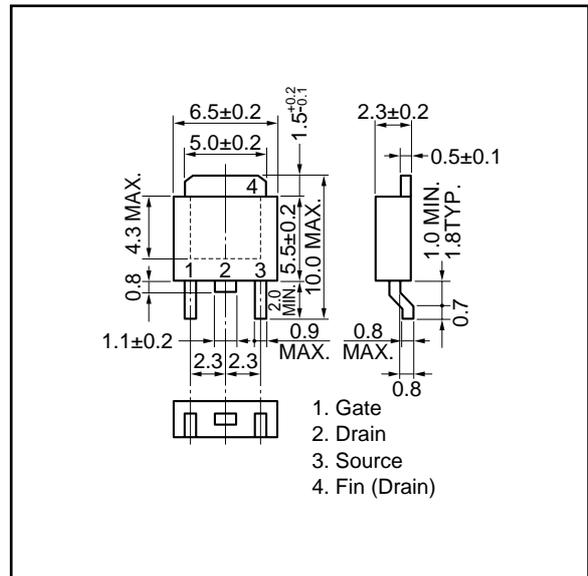


PACKAGE DRAWINGS (Unit : mm)

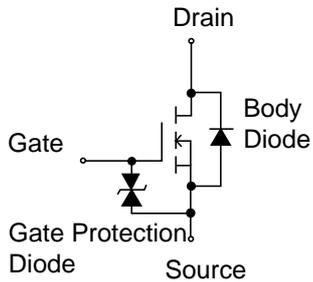
1)TO-251 (MP-3)



2)TO-252 (MP-3Z)



EQUIVALENT CIRCUIT



**Remark** The diode connected between the gate and source of the transistor serves as a protector against ESD. When this device actually used, an additional protection circuit is externally required if a voltage exceeding the rated voltage may be applied to this device.

[MEMO]

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