

To our customers,

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## Old Company Name in Catalogs and Other Documents

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April 1<sup>st</sup>, 2010  
Renesas Electronics Corporation

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**Phase-out/Discontinued**

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

**DESCRIPTION**

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

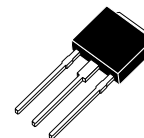
**FEATURES**

- 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<sub>A</sub> = 25 °C)**

Drain to Source Voltage (V <sub>GS</sub> = 0 V)	V <sub>DSS</sub>	30	V
Gate to Source Voltage (V <sub>DS</sub> = 0 V)	V <sub>GSS</sub>	±20	V
Drain Current (DC)	I <sub>D(DC)</sub>	±20	A
Drain Current (Pulse) <sup>Note</sup>	I <sub>D(pulse)</sub>	±80	A
Total Power Dissipation (T <sub>A</sub> = 25 °C)	P <sub>T1</sub>	1	W
Total Power Dissipation (T <sub>C</sub> = 25 °C)	P <sub>T2</sub>	20	W
Channel Temperature	T <sub>ch</sub>	150	°C
Storage Temperature	T <sub>stg</sub>	-55 to + 150	°C

(TO-252)



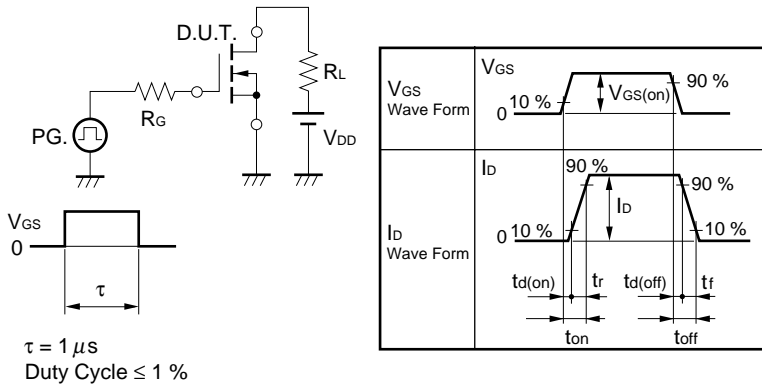
**Note** PW ≤ 10 μs, Duty cycle ≤ 1 %

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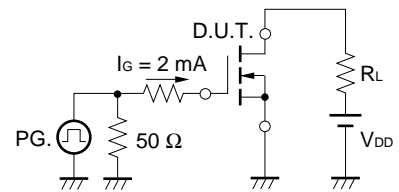
**ELECTRICAL CHARACTERISTICS (T<sub>A</sub> = 25 °C)**

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**

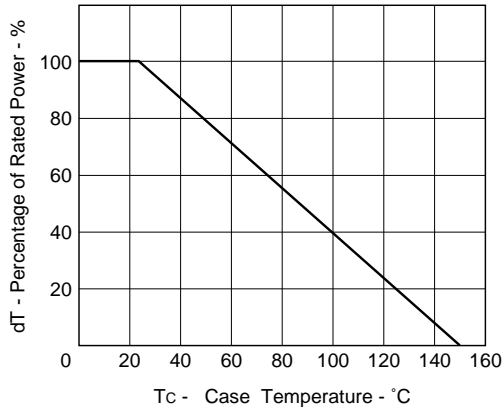


**TEST CIRCUIT 2 GATE CHARGE**

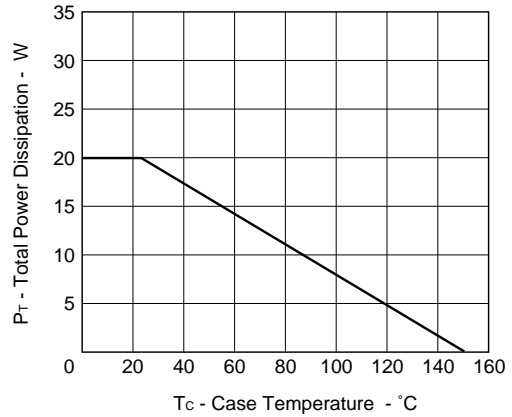


TYPICAL CHARACTERISTICS (T<sub>A</sub> = 25 °C)

DERATING FACTOR OF FORWARD BIAS SAFE OPERATING AREA

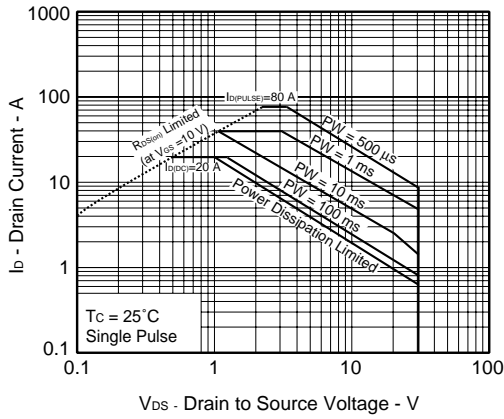


TOTAL POWER DISSIPATION vs. CASE TEMPERATURE

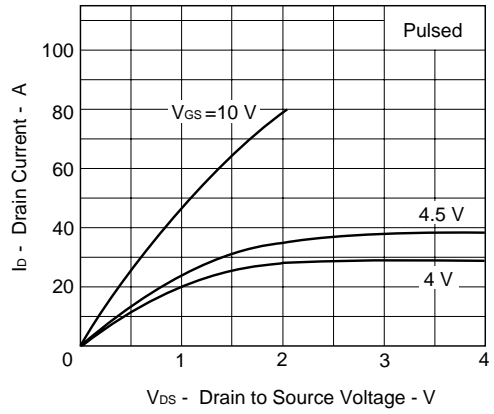


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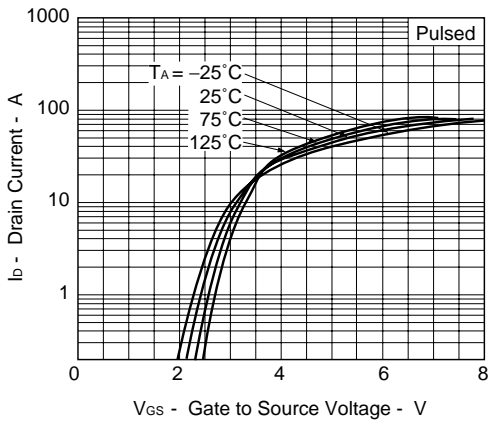
FORWARD BIAS SAFE OPERATING AREA



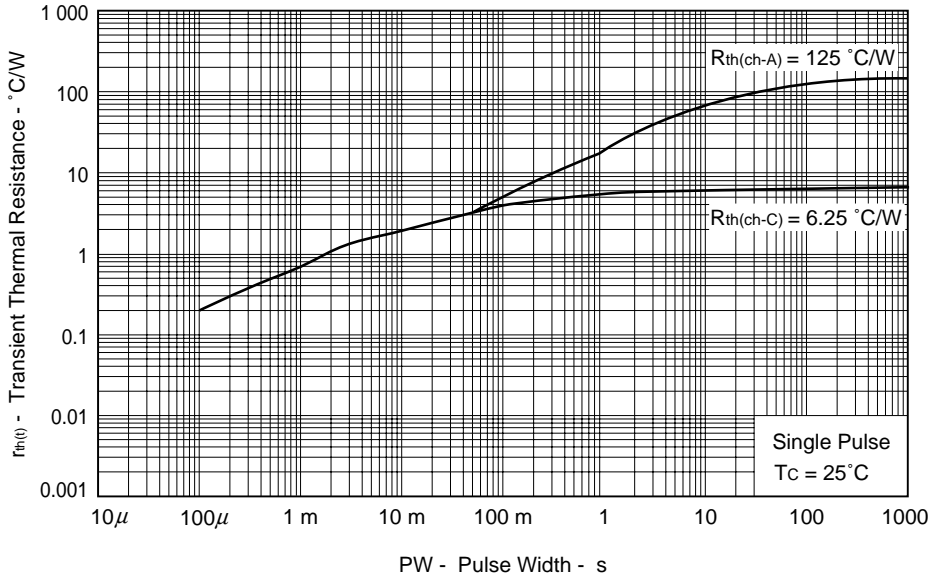
DRAIN CURRENT vs. DRAIN TO SOURCE VOLTAGE



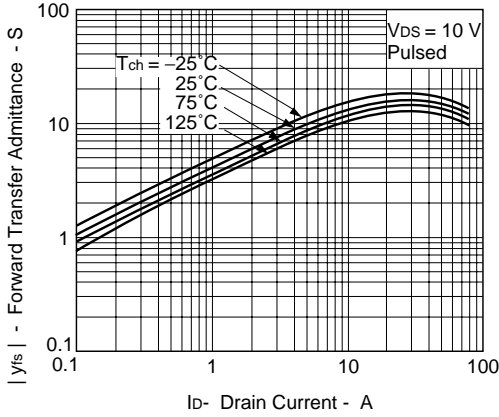
FORWARD TRANSFER CHARACTERISTICS



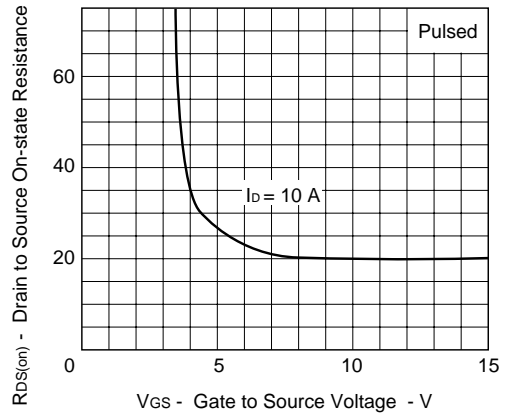
TRANSIENT THERMAL RESISTANCE vs. PULSE WIDTH



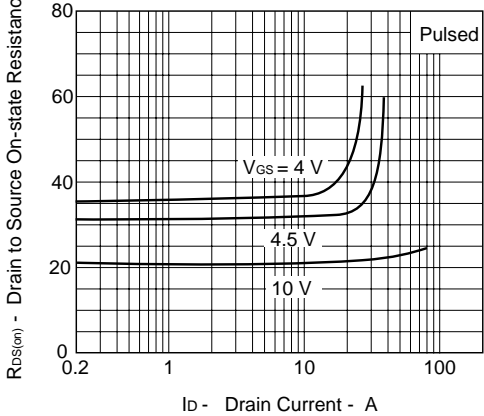
FORWARD TRANSFER ADMITTANCE vs. DRAIN CURRENT



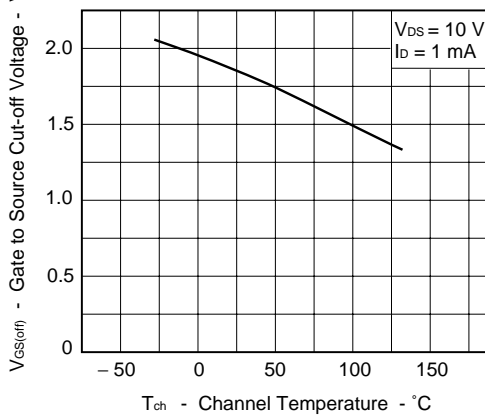
DRAIN TO SOURCE ON-STATE RESISTANCE vs. GATE TO SOURCE VOLTAGE



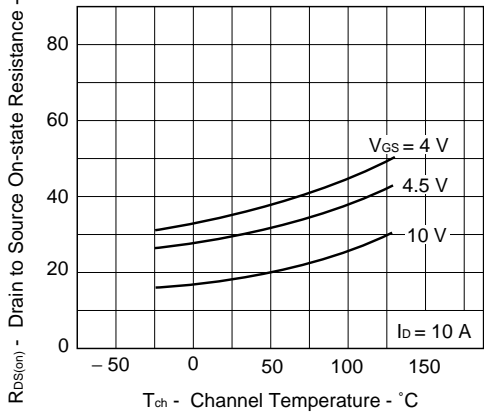
DRAIN TO SOURCE ON-STATE RESISTANCE vs. DRAIN CURRENT



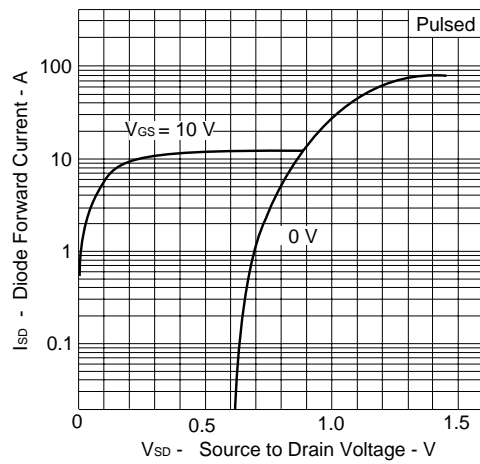
GATE TO SOURCE CUT-OFF VOLTAGE vs. CHANNEL TEMPERATURE



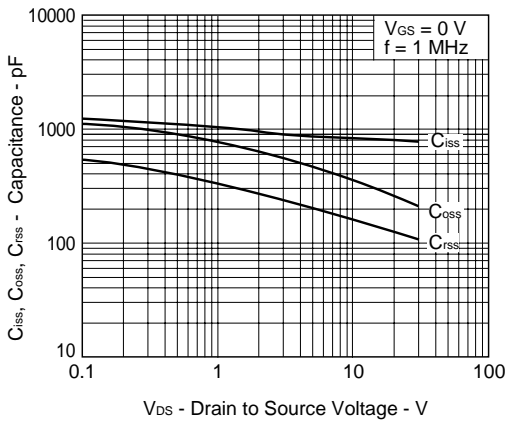
DRAIN TO SOURCE ON-STATE RESISTANCE vs. CHANNEL TEMPERATURE



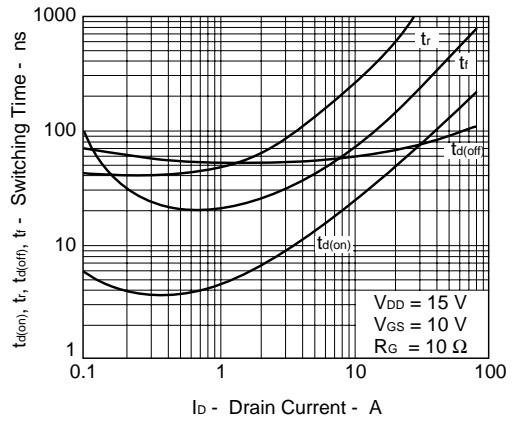
SOURCE TO DRAIN DIODE FORWARD VOLTAGE



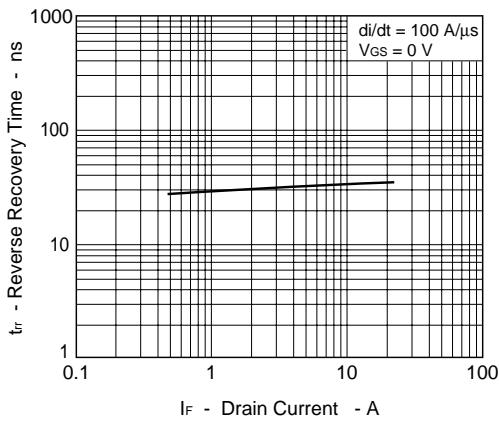
CAPACITANCE vs. DRAIN TO SOURCE VOLTAGE



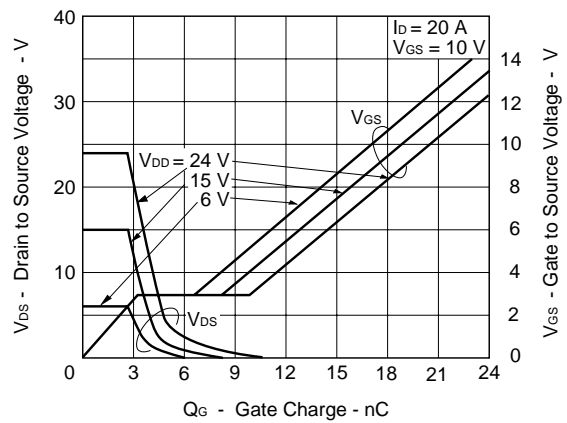
SWITCHING CHARACTERISTICS



REVERSE RECOVERY TIME vs. DRAIN CURRENT

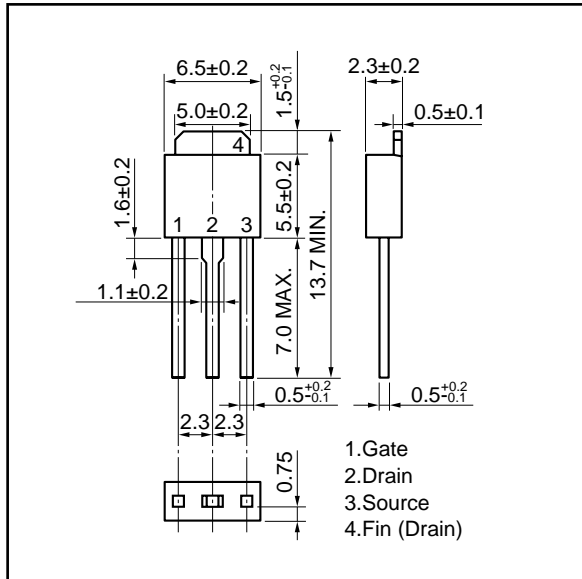


DYNAMIC INPUT/OUTPUT CHARACTERISTICS

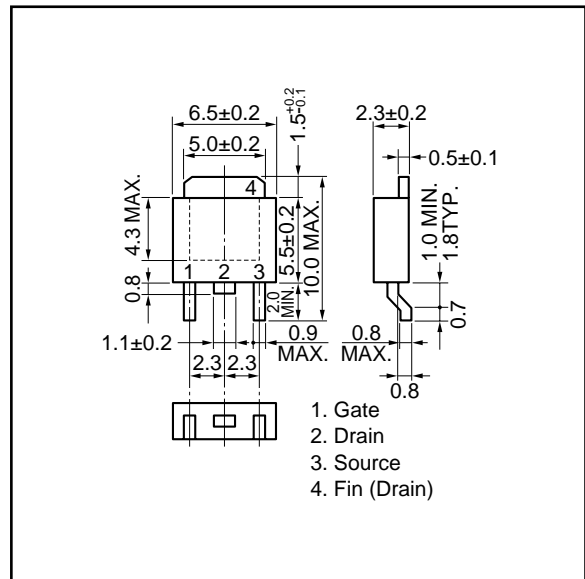


PACKAGE DRAWINGS (Unit : mm)

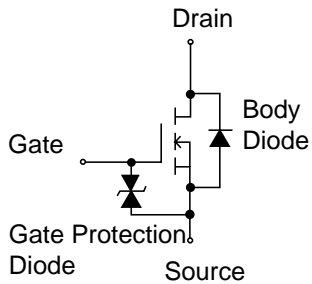
1)TO-251 (MP-3)



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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