To our customers,

Old Company Name in Catalogs and Other Documents

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Renesas Electronics website: http://www.renesas.com

April 1st, 2010
Renesas Electronics Corporation

Issued by: Renesas Electronics Corporation (http://www.renesas.com)

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DATA SHEET

MOS FIELD EFFECT TRANSISTOR

Phase-out/Discontinued

2SK1123

SWITCHING
N-CHANNEL POWER MOS FET

DESCRIPTION

The 2SK1123 is N-Channel MOS Field Effect Transistor designed for solenoid, motor and lamp driver.

FEATURES

- Low on-state resistance
  $R_{DS(on)1}$ = 27 mΩ MAX. (V_{GS} = 10 V, I_D = 20 A)
  $R_{DS(on)2}$ = 50 mΩ MAX. (V_{GS} = 4 V, I_D = 20 A)
- Low C_{iss} C_{iss} = 3250 pF TYP.
- Built-in G-S gate protection diodes

ABSOLUTE MAXIMUM RATINGS (T_A = 25°C)

Drain to Source Voltage (V_{GS} = 0 V)	V_{DSS}	60	V
Gate to Source Voltage (V_{DS} = 0 V)	$V_{GSS(AC)}$	±20	V
	$V_{GSS(DC)}$	+20, −10	V
Drain Current (DC)	$I_{D(DC)}$	±40	A
Drain Current (pulse) **Note**	$I_{D(pulse)}$	±160	A
Total Power Dissipation (T_C = 25°C)	P_{T1}	100	W
Total Power Dissipation (T_A = 25°C)	P_{T2}	3.0	W
Channel Temperature	T_{ch}	150	°C
Storage Temperature	T_{stg}	−55 to +150	°C

Note PW ≤ 10 μs, Duty cycle ≤ 1%

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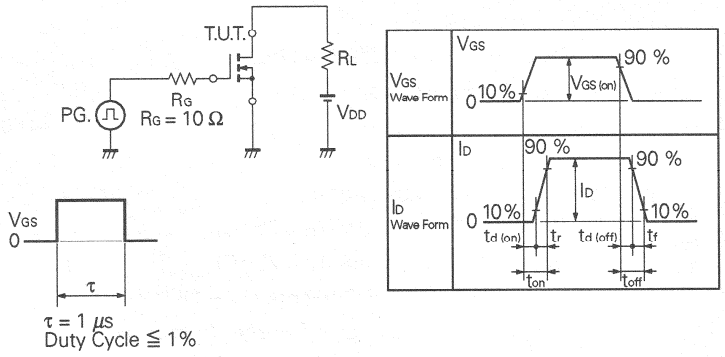
Date Published November 2006 NS CP(K)
Printed in Japan

The mark <R> shows major revised points.
The revised points can be easily searched by copying an "<R>" in the PDF file and specifying it in the "Find what:" field.

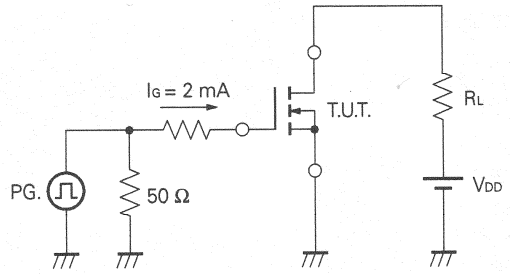
ELECTRICAL CHARACTERISTICS (T_a = 25 °C)

CHARACTERISTIC	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITIONS
Drain to Source On-state Resistance	$R_{DS(on)1}$		22	27	mΩ	V_{GS} = 10 V, I_D = 20 A
Drain to Source On-state Resistance	$R_{DS(on)2}$		30	50	mΩ	V_{GS} = 4 V, I_D = 20 A
Gate to Source Cutoff Voltage	$V_{GS(off)}$	1.0		2.5	V	V_{DS} = 10 V, I_D = 1 mA
Forward Transfer Admittance	$\|y_{fs}\|$	12			S	V_{DS} = 10 V, I_D = 20 A
Drain Leakage Current	I_{DSS}			10	μA	V_{DS} = 60 V, V_{GS} = 0
Gate to Source Leakage Current	I_{GSS}			±10	μA	V_{GS} = ±20 V, V_{DS} = 0
Input Capacitance	C_{iss}		3 250		pF	V_{DS} = 10 V V_{GS} = 0 f = 1 MHz
Output Capacitance	C_{oss}		1 200		pF	
Reverse Transfer Capacitance	C_{rss}		380		pF	
Turn-On Delay Time	$t_{d(on)}$		60		ns	$V_{GS(on)}$ = 10 V V_{DD} = 30 V I_D = 20 A, R_G = 10 Ω R_L = 1.5 Ω
Rise Time	t_r		500		ns	
Turn-Off Delay Time	$t_{d(off)}$		250		ns	
Fall Time	t_f		160		ns	
Total Gate Charge	Q_G		85		nC	V_{GS} = 10 V I_D = 40 A V_{DD} = 48 V
Gate to Source Charge	Q_{GS}		10		nC	
Gate to Drain Charge	Q_{GD}		35		nC	
Diode Forward Voltage	V_{SD}		1.2		V	I_{SD} = 40 A, V_{GS} = 0
Reverse Recovery Time	t_{rr}		130		ns	I_F = 40 A, V_{GS} = 0 di/dt = 50 A/μs
Reverse Recovery Charge	Q_{rr}		200		nC	

Test Circuit 1: Switching Time

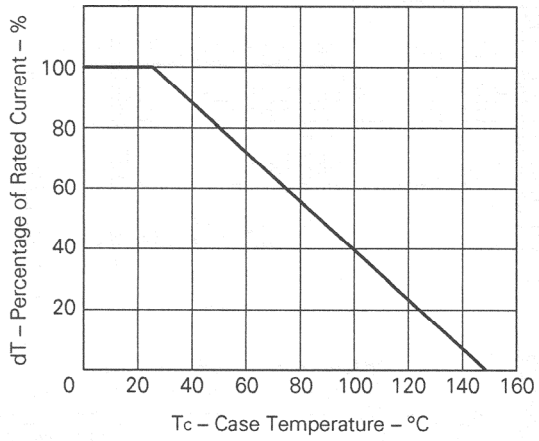


Test Circuit 2: Gate Charge

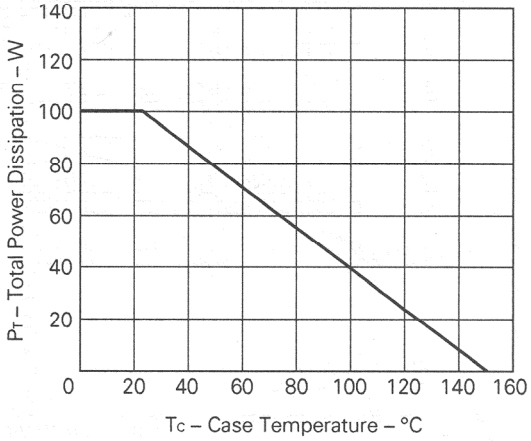


TYPICAL CHARACTERISTICS (T_a = 25 °C)

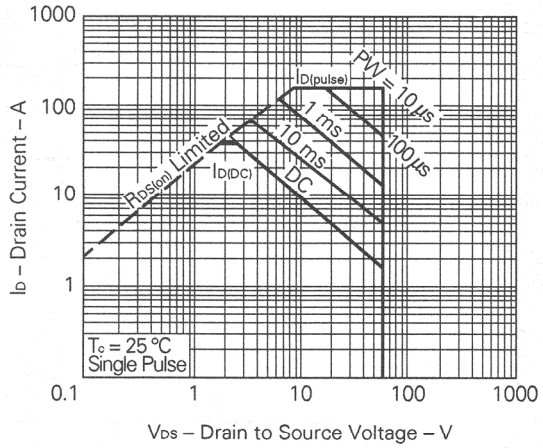
DERATING FACTOR OF FORWARD BIAS SAFE OPERATING AREA



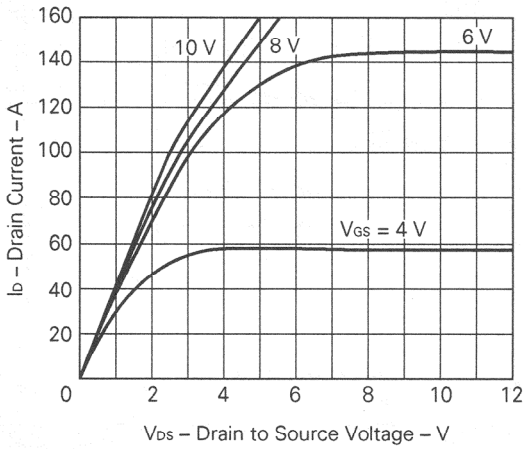
TOTAL POWER DISSIPATION vs. CASE TEMPERATURE



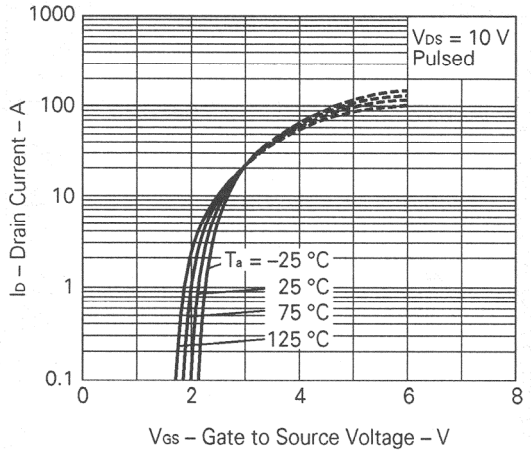
FORWARD BIAS SAFE OPERATING AREA



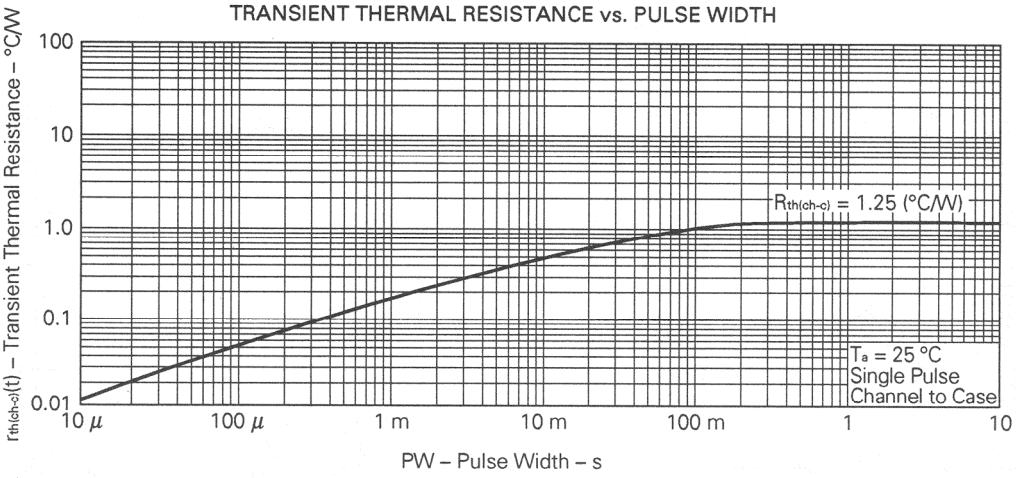
DRAIN CURRENT vs. DRAIN TO SOURCE VOLTAGE



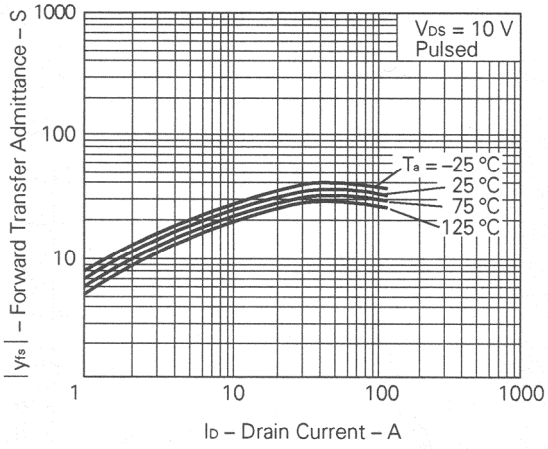
TRANSFER CHARACTERISTICS



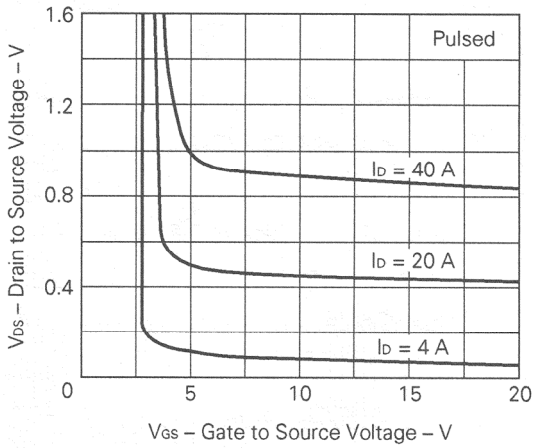
TRANSIENT THERMAL RESISTANCE vs. PULSE WIDTH



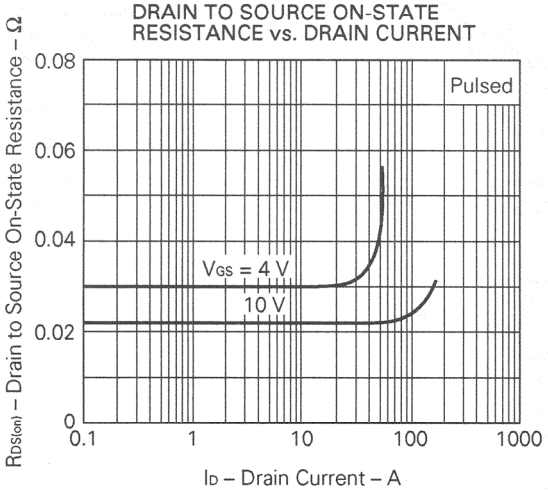
FORWARD TRANSFER ADMITTANCE vs. DRAIN CURRENT



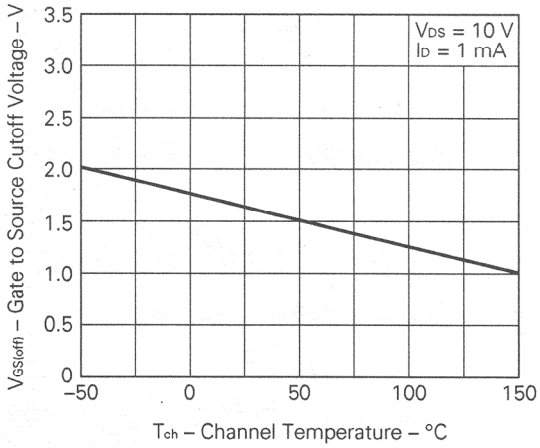
DRAIN TO SOURCE VOLTAGE vs. GATE TO SOURCE VOLTAGE



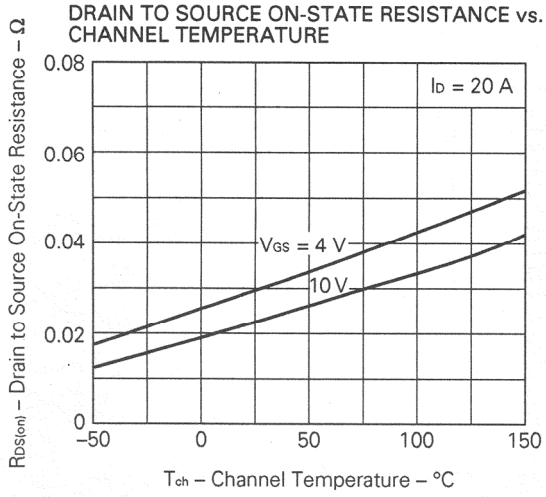
DRAIN TO SOURCE ON-STATE RESISTANCE vs. DRAIN CURRENT



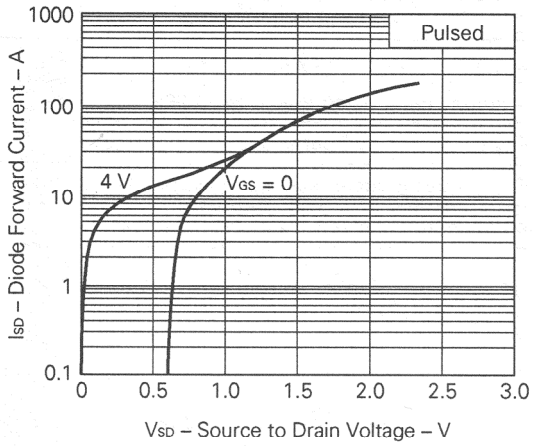
GATE TO SOURCE CUTOFF VOLTAGE vs. CHANNEL TEMPERATURE



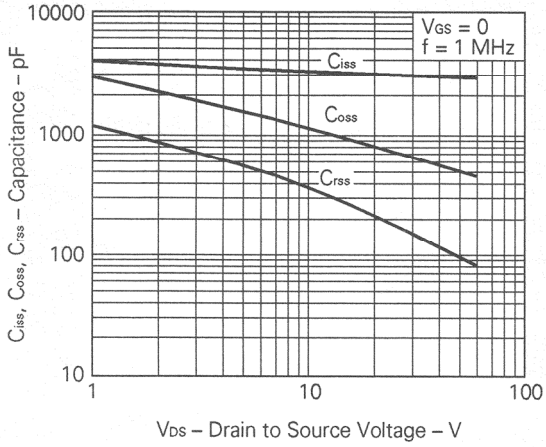
DRAIN TO SOURCE ON-STATE RESISTANCE vs. CHANNEL TEMPERATURE



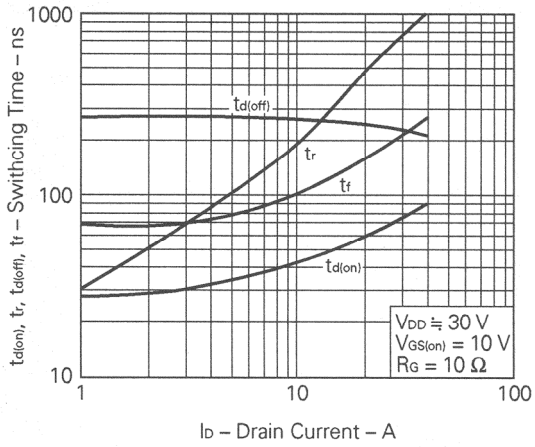
SOURCE TO DRAIN DIODE FORWARD VOLTAGE



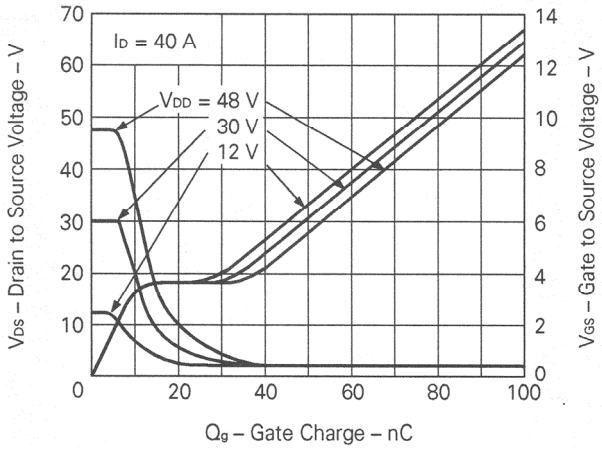
CAPACITANCE vs. DRAIN TO SOURCE VOLTAGE



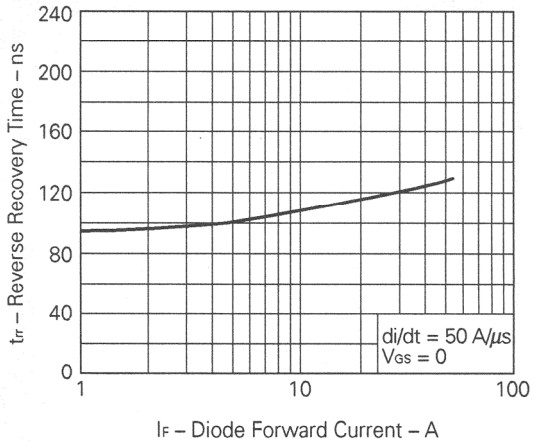
SWITCHING CHARACTERISTICS



DYNAMIC INPUT CHARACTERISTICS

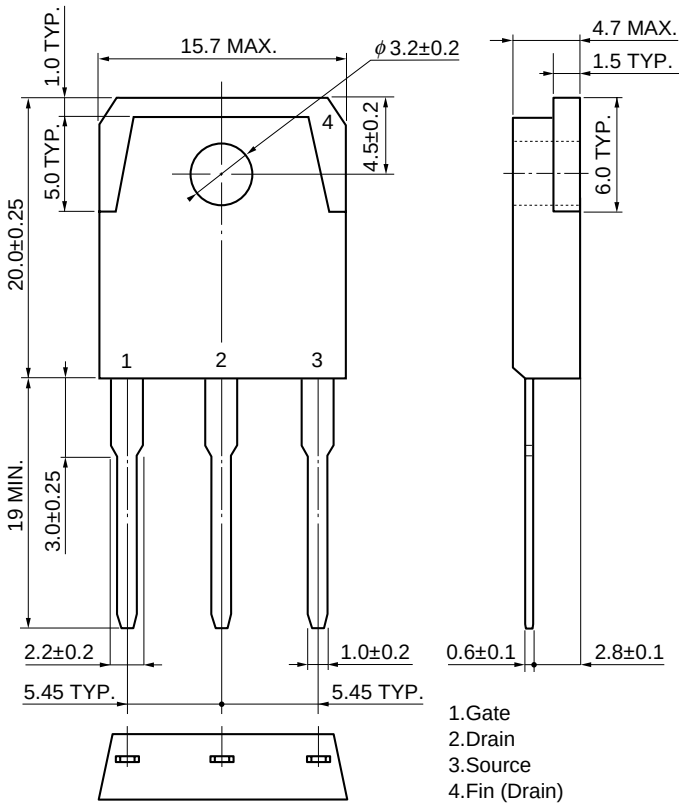


REVERSE RECOVERY TIME vs. DIODE FORWARD CURRENT

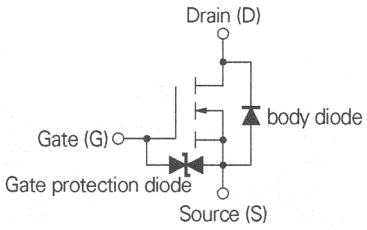


PACKAGE DRAWING (Unit: mm)

<R> **TO-3P (MP-88)**



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.

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