

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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N-CHANNEL MOS FIELD EFFECT TRANSISTOR
FOR SWITCHING

DESCRIPTION

The 2SK3408 is a switching device which can be driven directly by a 4.0 V power source.

The 2SK3408 features a low on-state resistance and excellent switching characteristics, and is suitable for applications such as power switch of dynamic clamp of relay and so on.

FEATURES

- Can be driven by a 4.0 V power source
- Low on-state resistance
 $R_{DS(on)1} = 195 \text{ m}\Omega \text{ MAX. (} V_{GS} = 10.0 \text{ V, } I_D = 0.5 \text{ A)}$
 $R_{DS(on)2} = 250 \text{ m}\Omega \text{ MAX. (} V_{GS} = 4.5 \text{ V, } I_D = 0.5 \text{ A)}$
 $R_{DS(on)3} = 260 \text{ m}\Omega \text{ MAX. (} V_{GS} = 4.0 \text{ V, } I_D = 0.5 \text{ A)}$
- Built-in G-S protection diode against ESD.

ORDERING INFORMATION

PART NUMBER	PACKAGE
2SK3408	SC-96 Mini Mold (Thin Type)

Marking: XF

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

Drain to Source Voltage ($V_{GS} = 0 \text{ V}$)	V_{DSS}	43 \pm 5	V
Drain to Gate Voltage ($V_{GS} = 0 \text{ V}$)	V_{DGS}	43 \pm 5	V
Gate to Source Voltage ($V_{DS} = 0 \text{ V}$)	V_{GSS}	\pm 20	V
★ Drain Current (DC) ($T_A = 25^\circ\text{C}$)	$I_{D(DC)}$	\pm 1.0	A
Drain Current (pulse) ^{Note1}	$I_{D(pulse)}$	\pm 4.0	A
★ Total Power Dissipation ($T_A = 25^\circ\text{C}$)	P_{T1}	0.20	W
Total Power Dissipation ($T_A = 25^\circ\text{C}$) ^{Note2}	P_{T2}	1.25	W
Channel Temperature	T_{ch}	150	$^\circ\text{C}$
Storage Temperature	T_{stg}	-55 to +150	$^\circ\text{C}$

Notes 1. $PW \leq 10 \mu\text{s}$, Duty Cycle $\leq 1\%$

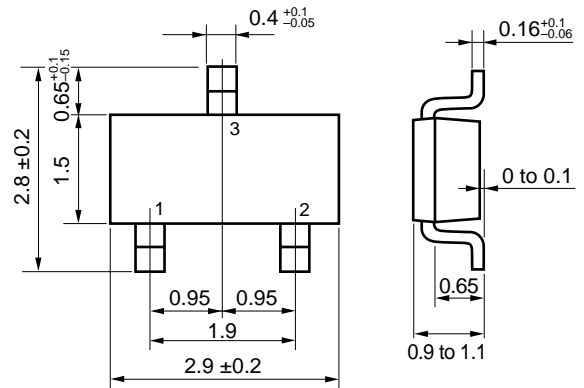
2. Mounted on $250 \text{ mm}^2 \times 35 \mu\text{m}$ copper pad connected to drain electrode in $2500 \text{ mm}^2 \times 1.6 \text{ mm}$ FR-4 board, $t \leq 5 \text{ sec}$.

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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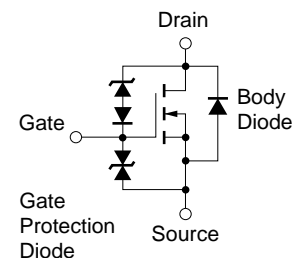
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PACKAGE DRAWING (Unit: mm)



1: Gate
2: Source
3: Drain

EQUIVALENT CIRCUIT

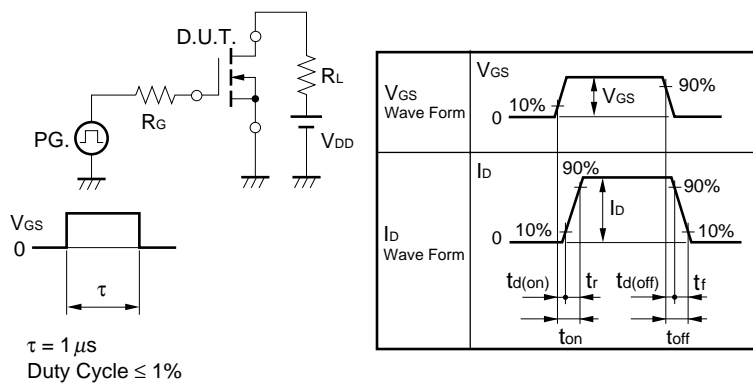


★ ELECTRICAL CHARACTERISTICS (T_A = 25°C)

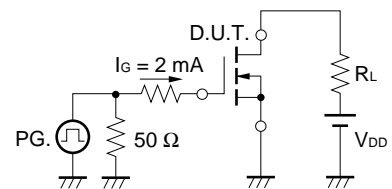
CHARACTERISTICS	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNIT
Zero Gate Voltage Drain Current	I _{DSS}	V _{DS} = 30.4 V, V _{GS} = 0 V			10	μA
Gate Leakage Current	I _{GSS}	V _{GS} = ±16 V, V _{DS} = 0 V			±10	μA
Gate Cut-off Voltage	V _{GS(off)}	V _{DS} = 10 V, I _D = 1 mA	1.5	2.0	2.5	V
Forward Transfer Admittance ^{Note}	y _{fs}	V _{DS} = 10 V, I _D = 0.5 A	1.0	2.0		S
Drain to Source On-state Resistance ^{Note}	R _{DS(on)1}	V _{GS} = 10 V, I _D = 0.5 A		155	195	mΩ
	R _{DS(on)2}	V _{GS} = 4.5 V, I _D = 0.5 A		185	250	mΩ
	R _{DS(on)3}	V _{GS} = 4.0 V, I _D = 0.5 A		195	260	mΩ
Input Capacitance	C _{iss}	V _{DS} = 10 V		230		pF
Output Capacitance	C _{oss}	V _{GS} = 0 V		50		pF
Reverse Transfer Capacitance	C _{rss}	f = 1 MHz		30		pF
Turn-on Delay Time	t _{d(on)}	V _{DD} = 20 V, I _D = 0.5 A		18		ns
Rise Time	t _r	V _{GS} = 10 V		14		ns
Turn-off Delay Time	t _{d(off)}	R _G = 10 Ω		115		ns
Fall Time	t _f			38		ns
Total Gate Charge	Q _G	V _{DD} = 30.4 V		4.0		nC
Gate to Source Charge	Q _{GS}	V _{GS} = 10 V		1.0		nC
Gate to Drain Charge	Q _{GD}	I _D = 1.0 A		1.0		nC
Body Diode Forward Voltage ^{Note}	V _{F(S-D)}	I _F = 1.0 A, V _{GS} = 0 V		0.81		V
Reverse Recovery Time	t _{rr}	I _F = 1.0 A, V _{GS} = 0 V		25		ns
Reverse Recovery Charge	Q _{rr}	di/dt = 100 A/μs		16		nC

Note Pulsed: PW ≤ 350 μs, Duty Cycle ≤ 2%

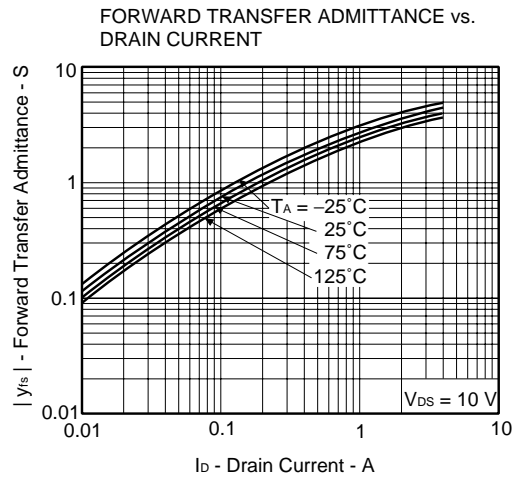
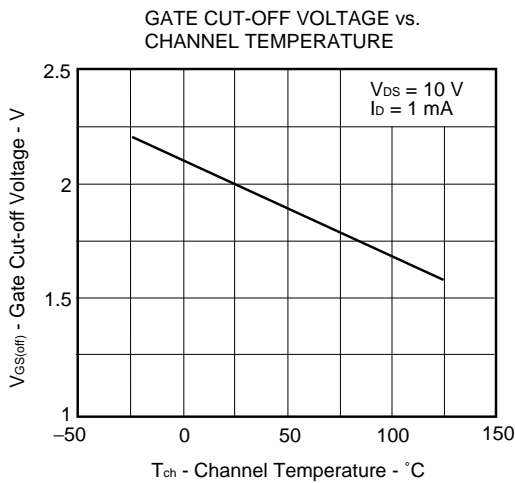
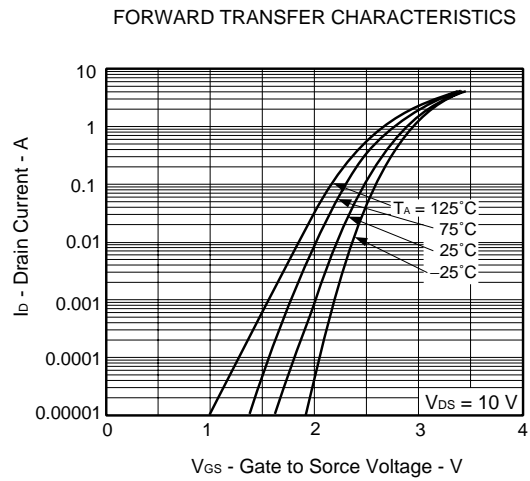
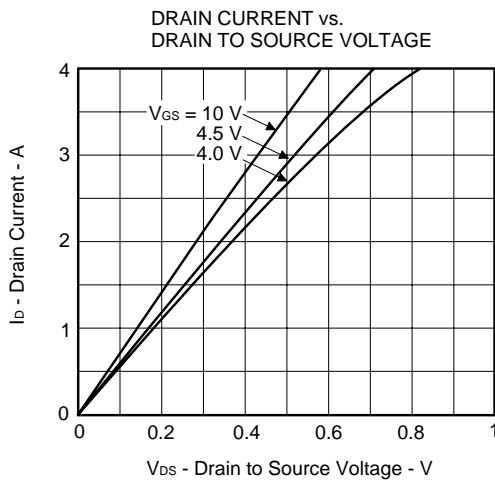
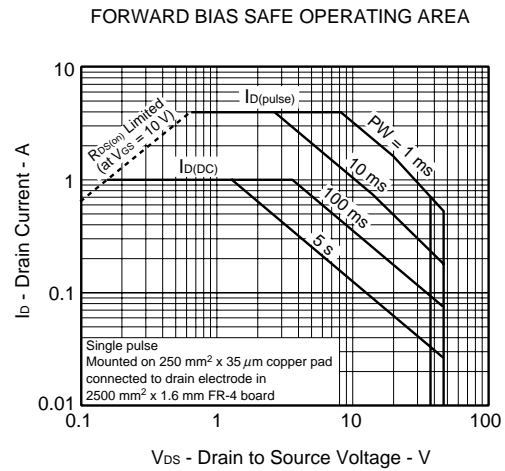
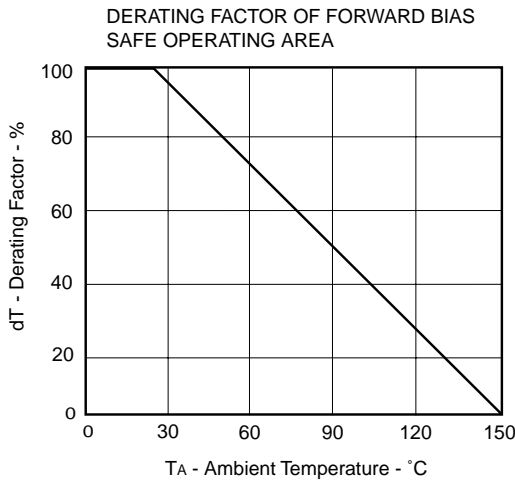
TEST CIRCUIT 1 SWITCHING TIME

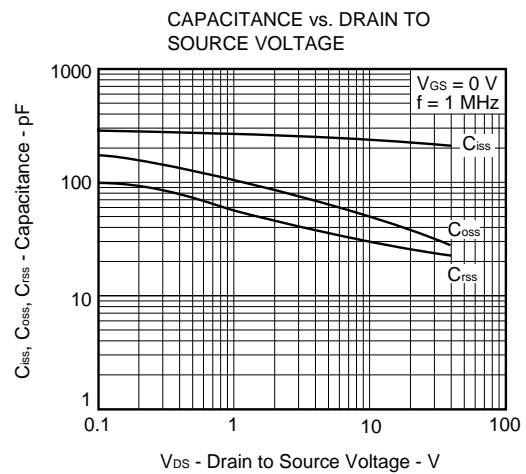
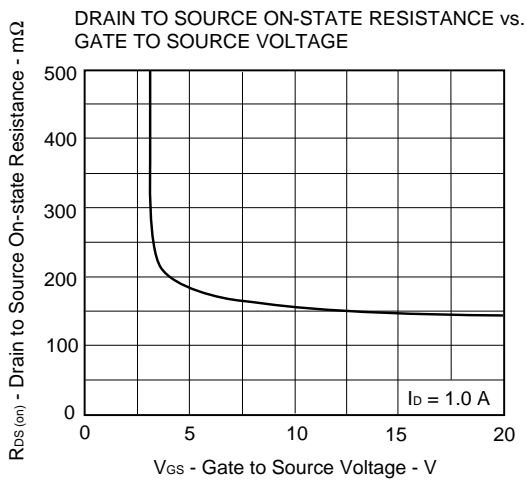
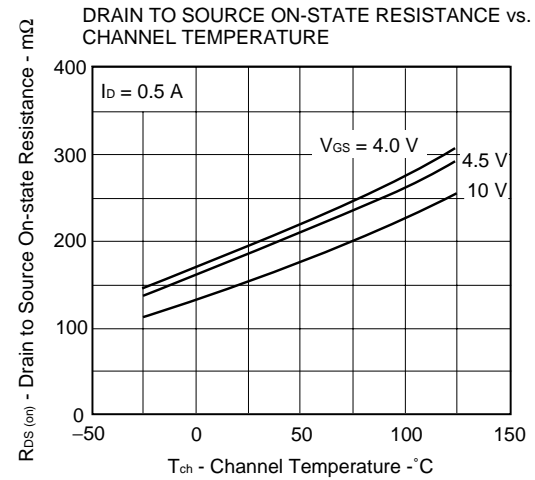
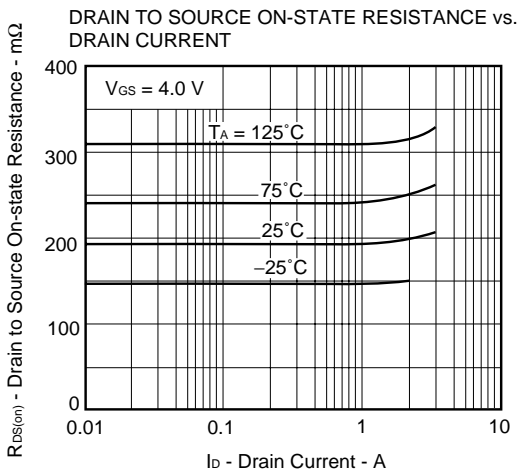
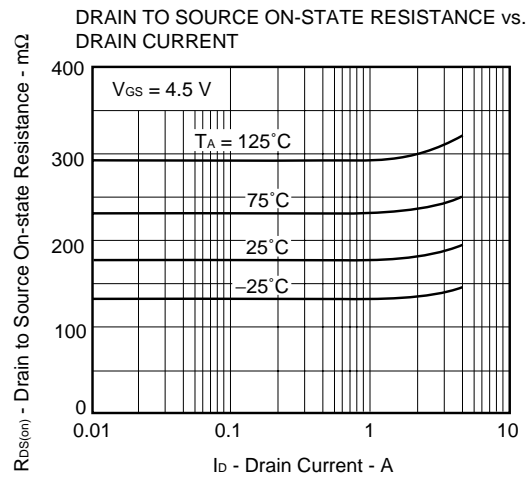
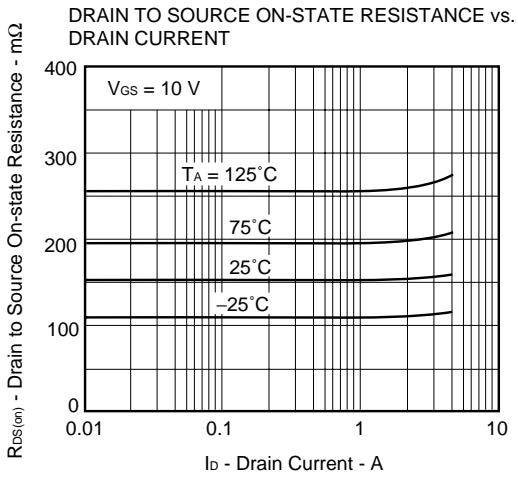


TEST CIRCUIT 2 GATE CHARGE

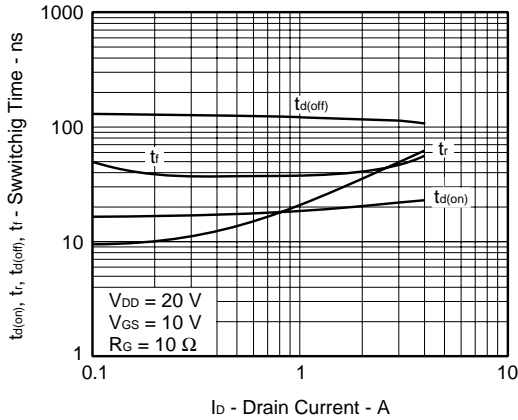


TYPICAL CHARACTERISTICS (T_A = 25°C)

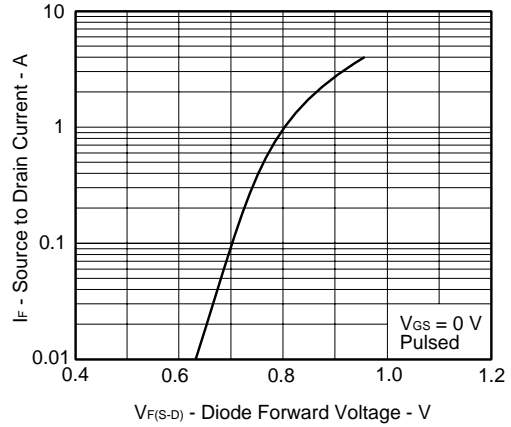




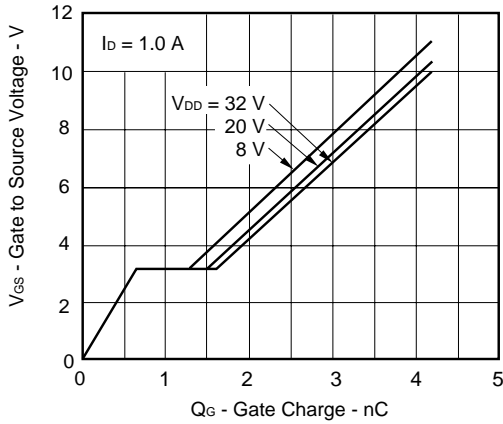
SWITCHING CHARACTERISTICS



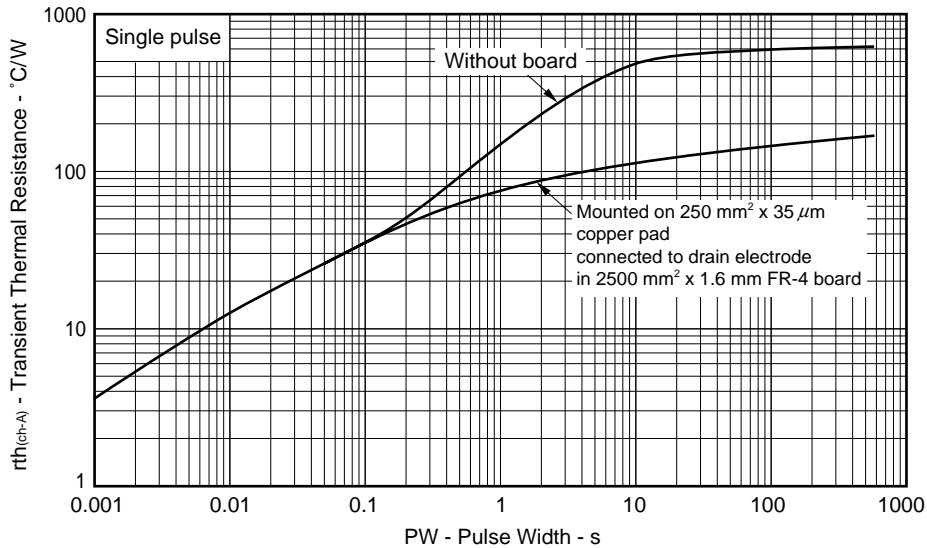
SOURCE TO DRAIN DIODE FORWARD VOLTAGE



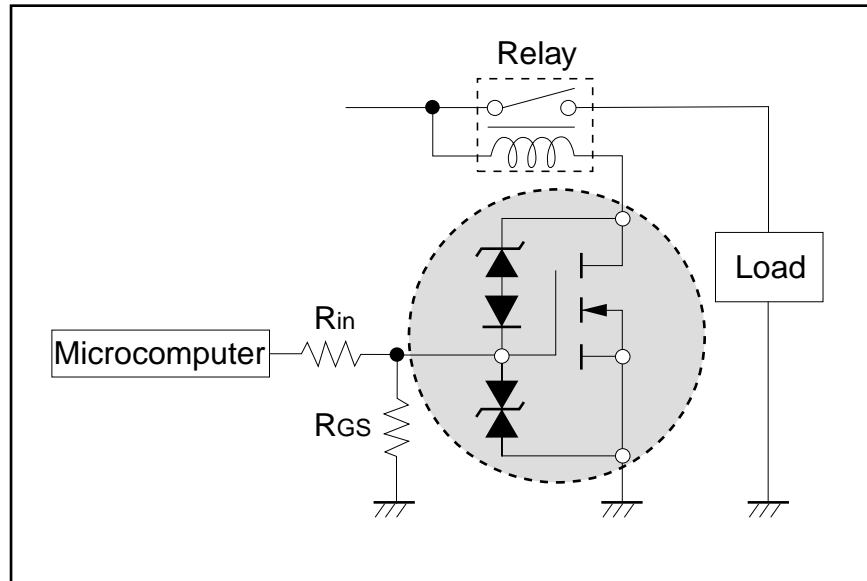
DYNAMIC INPUT CHARACTERISTICS



TRANSIENT THERMAL RESISTANCE vs. PULSE WIDTH



DYNAMIC CLAMP APPLICATION



Remarks 1. Input resistance is necessary to gate terminal.

(range: 1 k Ω to 10 k Ω , recommend: 3 k Ω)

2. Pull down resistance is necessary between gate to source.

(several: 10 k Ω)

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