NEC

MOS FIELD EFFECT TRANSISTOR
2SK3408

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

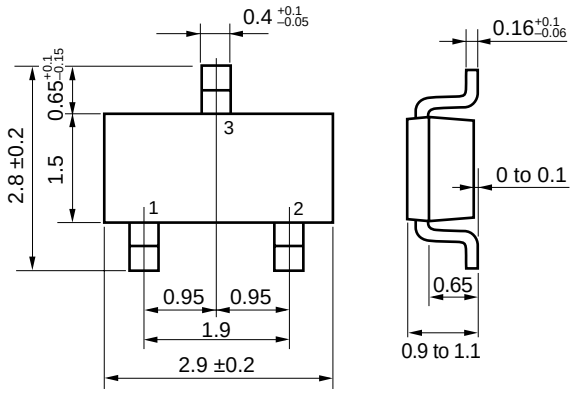
- Can be driven by a 4.0 V power source
- Low on-state resistance
  $R_{DS(on)1}$ = 195 mΩ MAX. (V_{GS} = 10.0 V, I_D = 0.5 A)
  $R_{DS(on)2}$ = 250 mΩ MAX. (V_{GS} = 4.5 V, I_D = 0.5 A)
  $R_{DS(on)3}$ = 260 mΩ MAX. (V_{GS} = 4.0 V, I_D = 0.5 A)
- Built-in G-S protection diode against ESD.

ORDERING INFORMATION

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

Marking: XF

PACKAGE DRAWING (Unit: mm)

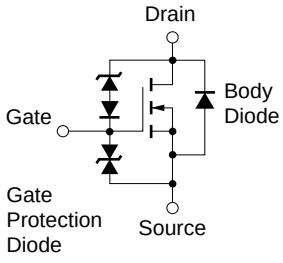


1: Gate
2: Source
3: Drain

ABSOLUTE MAXIMUM RATINGS (T_A = 25°C)

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

EQUIVALENT CIRCUIT



Notes 1. PW ≤ 10 μs, Duty Cycle ≤ 1%

2. Mounted on 250 mm² x 35 μm copper pad connected to drain electrode in 2500 mm² x 1.6 mm FR-4 board, t ≤ 5 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.

Document No. D15016EJ4V0DS00 (4th edition)
Date Published May 2003 NS CP(K)
Printed in Japan

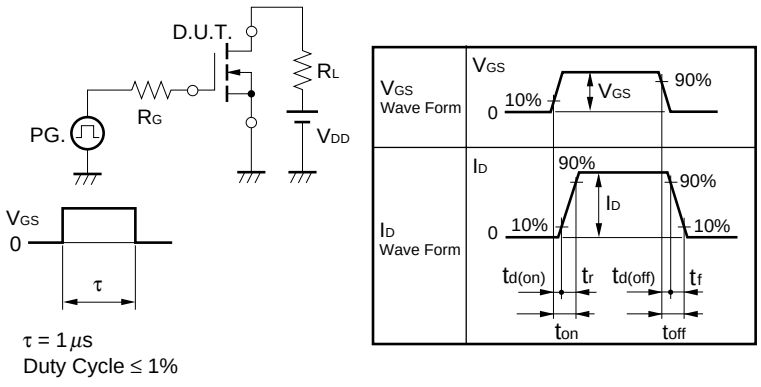
The mark ★ shows major revised points.

★ 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

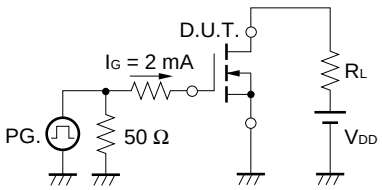
Note Pulsed: PW ≤ 350 μs, Duty Cycle ≤ 2%

TEST CIRCUIT 1 SWITCHING TIME



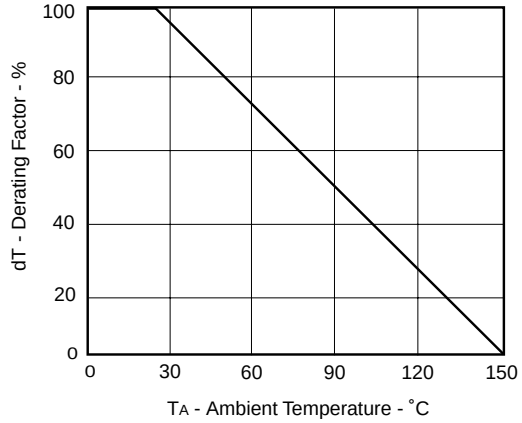
τ = 1 μs
Duty Cycle ≤ 1%

TEST CIRCUIT 2 GATE CHARGE

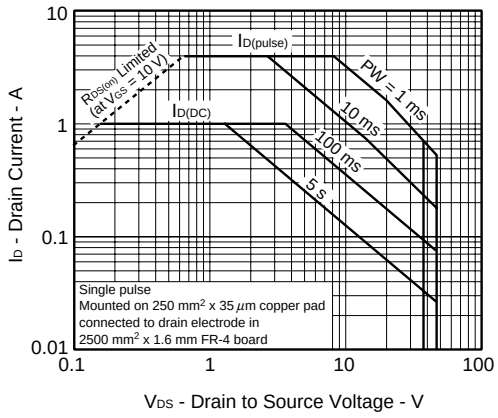


TYPICAL CHARACTERISTICS (T_A = 25°C)

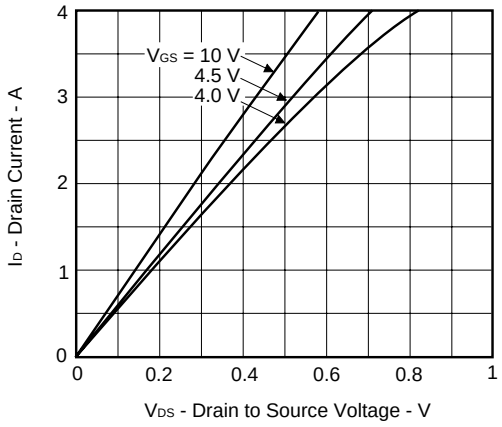
DERATING FACTOR OF FORWARD BIAS SAFE OPERATING AREA



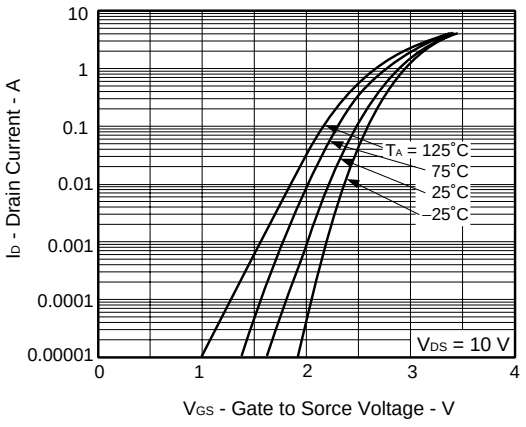
FORWARD BIAS SAFE OPERATING AREA



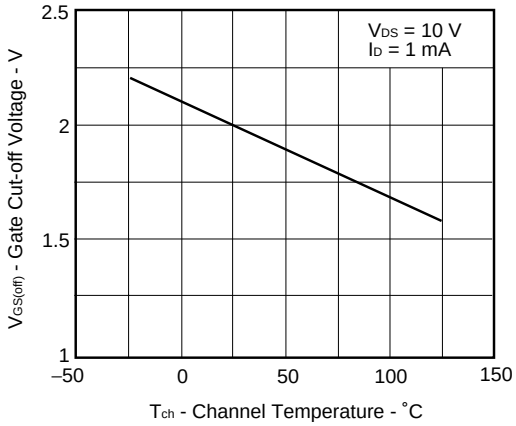
DRAIN CURRENT vs. DRAIN TO SOURCE VOLTAGE



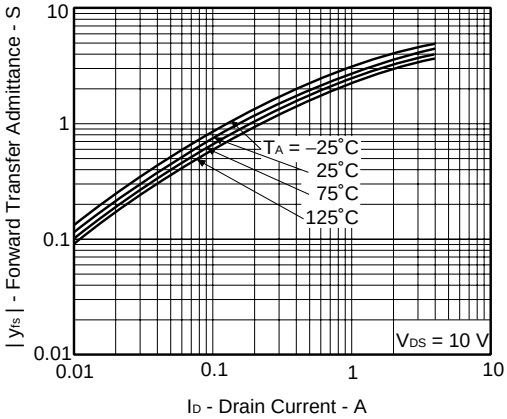
FORWARD TRANSFER CHARACTERISTICS



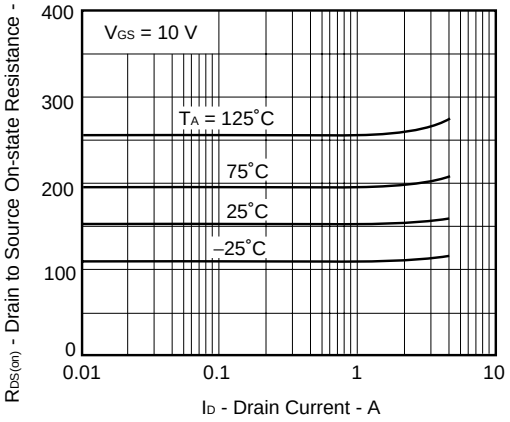
GATE CUT-OFF VOLTAGE vs. CHANNEL TEMPERATURE



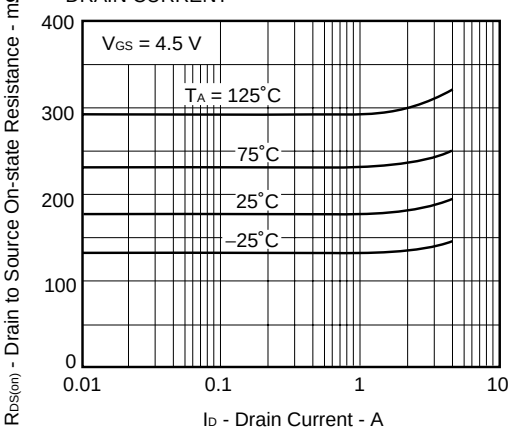
FORWARD TRANSFER ADMITTANCE vs. DRAIN CURRENT



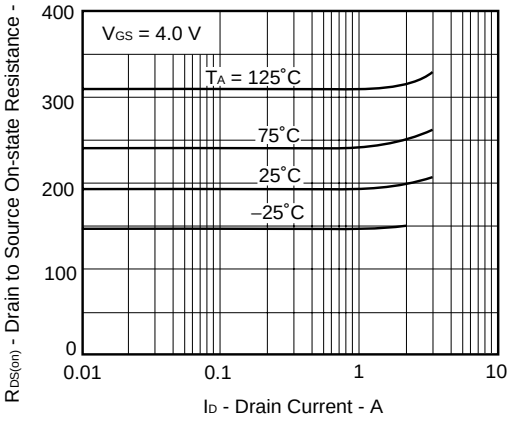
DRAIN TO SOURCE ON-STATE RESISTANCE vs. DRAIN CURRENT



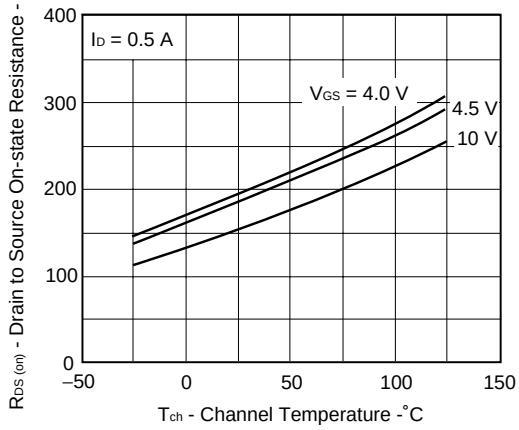
DRAIN TO SOURCE ON-STATE RESISTANCE vs. DRAIN CURRENT



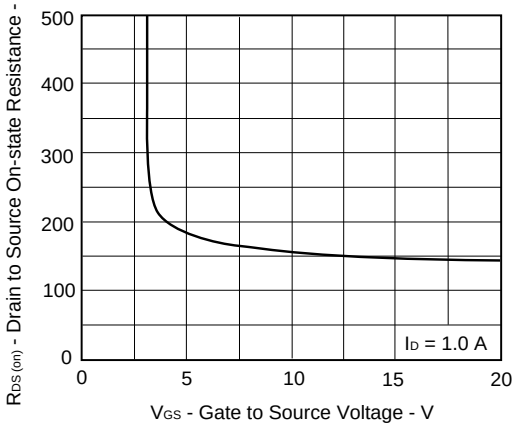
DRAIN TO SOURCE ON-STATE RESISTANCE vs. DRAIN CURRENT



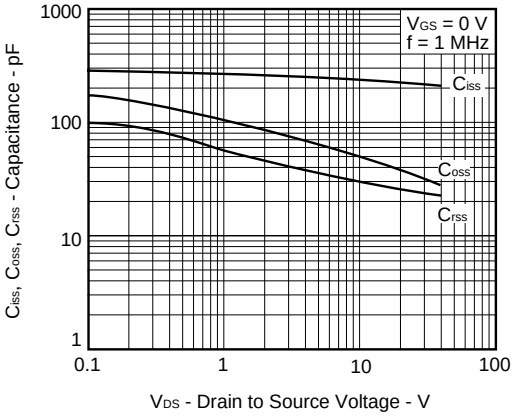
DRAIN TO SOURCE ON-STATE RESISTANCE vs. CHANNEL TEMPERATURE



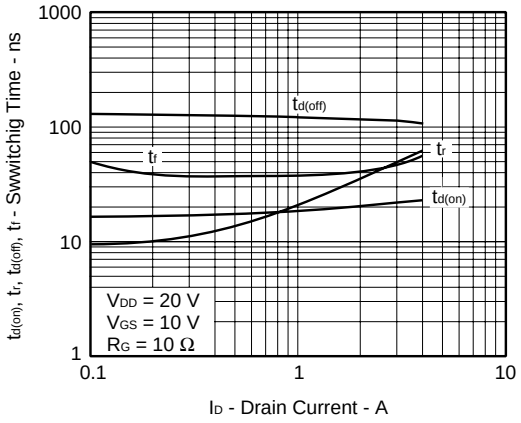
DRAIN TO SOURCE ON-STATE RESISTANCE vs. GATE TO SOURCE VOLTAGE



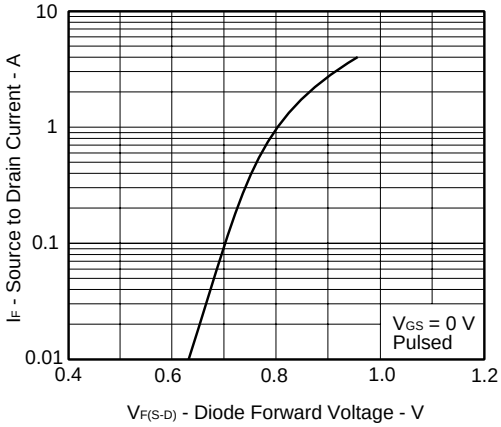
CAPACITANCE vs. DRAIN TO SOURCE VOLTAGE



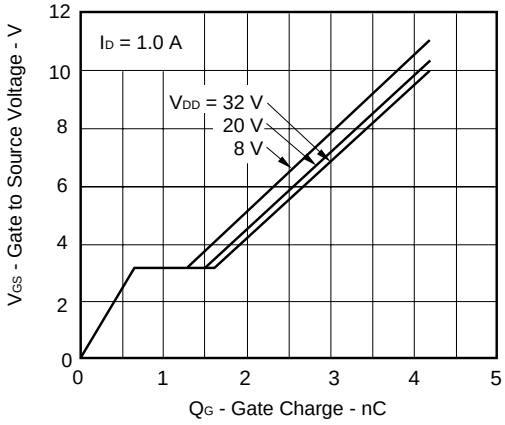
SWITCHING CHARACTERISTICS



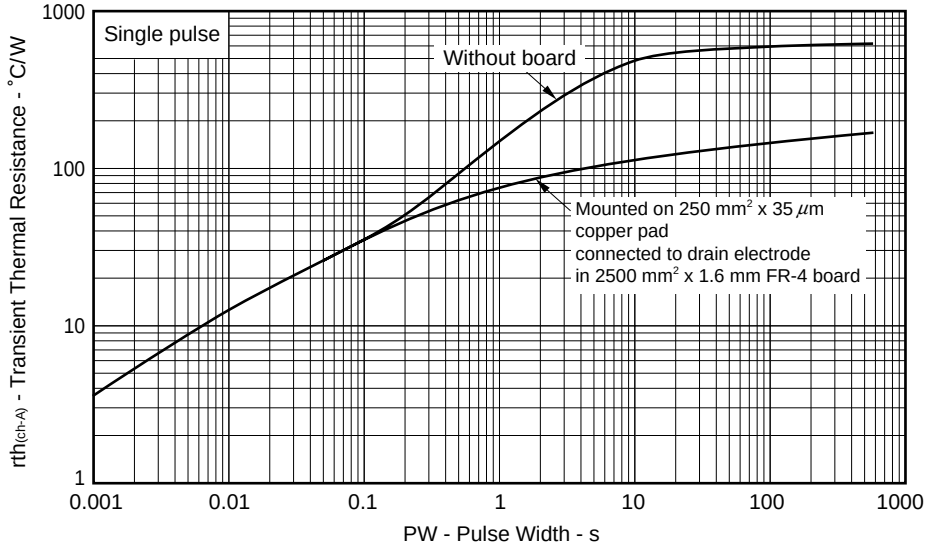
SOURCE TO DRAIN DIODE FORWARD VOLTAGE



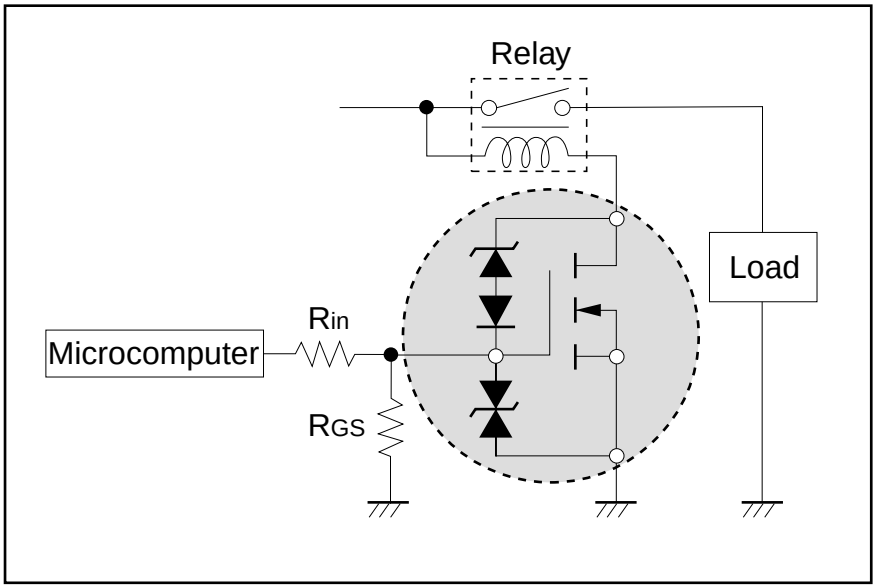
DYNAMIC INPUT CHARACTERISTICS



TRANSIENT THERMAL RESISTANCE vs. PULSE WIDTH



DYNAMIC CLAMP APPLICATION



Remarks 1. Input resistance is necessary to gate terminal.

(range: 1 kΩ to 10 kΩ, recommend: 3 kΩ)

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

(several: 10 kΩ)

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