

To our customers,

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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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SWITCHING
N-CHANNEL POWER MOS FET
INDUSTRIAL USE

DESCRIPTION

The 2SK3110 is N channel MOS FET device that features a low on-state resistance and excellent switching characteristics, and designed for high voltage applications such as DC/DC converter, actuator driver.

ORDERING INFORMATION

PART NUMBER	PACKAGE
2SK3110	Isolated TO-220

FEATURES

- Gate voltage rating ± 30 V
- Low on-state resistance
 $R_{DS(on)} = 180 \text{ m}\Omega \text{ MAX. (} V_{GS} = 10 \text{ V, } I_D = 7.0 \text{ A)}$
- Low input capacitance
 $C_{iss} = 1000 \text{ pF TYP. (} V_{DS} = 10 \text{ V, } V_{GS} = 0 \text{ V)}$
- Built-in gate protection diode
- Avalanche capability rated
- Isolated TO-220 package

ABSOLUTE MAXIMUM RATING (T_A = 25°C)

Drain to Source Voltage ($V_{GS} = 0 \text{ V}$)	V_{DSS}	200	V
Gate to Source Voltage ($V_{DS} = 0 \text{ V}$)	V_{GSS}	± 30	V
Drain Current(DC) ($T_C = 25^\circ\text{C}$)	$I_{D(DC)}$	± 14	A
Drain Current(pulse) ^{Note1}	$I_{D(pulse)}$	± 42	A
Total Power Dissipation ($T_A = 25^\circ\text{C}$)	P_{T1}	2.0	W
Total Power Dissipation ($T_C = 25^\circ\text{C}$)	P_{T2}	35	W
Channel Temperature	T_{ch}	150	°C
Storage Temperature	T_{stg}	-55 to +150	°C
Single Avalanche Current ^{Note2}	I_{AS}	14	A
Single Avalanche Energy ^{Note2}	E_{AS}	98	mJ

Note1. $PW \leq 10 \mu\text{s}$, Duty Cycle $\leq 1 \%$

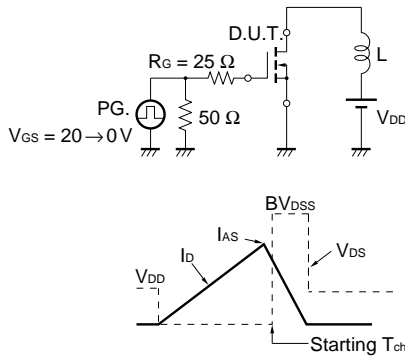
2. Starting $T_{ch} = 25^\circ\text{C}$, $V_{DD} = 100 \text{ V}$, $R_G = 25 \Omega$, $V_{GS} = 20 \text{ V} \rightarrow 0 \text{ V}$

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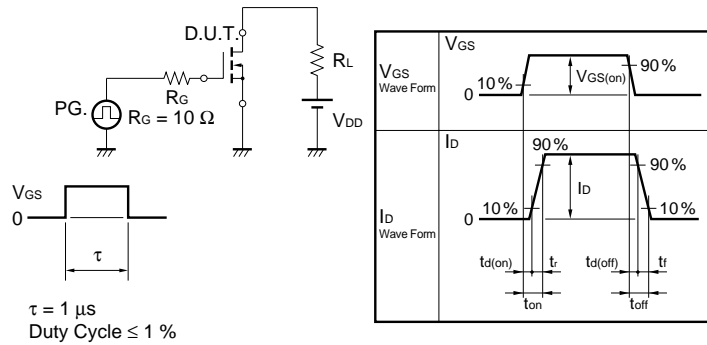
ELECTRICAL CHARACTERISTICS (T_A = 25°C)

Characteristics	Symbol	Test Conditions	MIN.	TYP.	MAX.	Unit
Drain Leakage Current	I _{DSS}	V _{DS} = 200 V, V _{GS} = 0 V			100	μA
Gate Leakage Current	I _{GSS}	V _{GS} = ±30 V, V _{DS} = 0 V			±10	μA
Gate Cut-off Voltage	V _{GS(off)}	V _{DS} = 10 V, I _D = 1 mA	2.5		4.5	V
Forward Transfer Admittance	y _{fs}	V _{DS} = 10 V, I _D = 7.0 A	3.0			S
Drain to Source On-state Resistance	R _{DS(on)}	V _{GS} = 10 V, I _D = 7.0 A		120	180	mΩ
Input Capacitance	C _{iss}	V _{DS} = 10 V		1000		pF
Output Capacitance	C _{oss}	V _{GS} = 0 V		300		pF
Reverse Transfer Capacitance	C _{rss}	f = 1 MHz		150		pF
Turn-on Delay Time	t _{d(on)}	V _{DD} = 100 V, I _D = 7.0 A		25		ns
Rise Time	t _r	V _{GS(on)} = 10 V		70		ns
Turn-off Delay Time	t _{d(off)}	R _G = 10 Ω		80		ns
Fall Time	t _f			40		ns
Total Gate Charge	Q _G	V _{DD} = 160 V		40		nC
Gate to Source Charge	Q _{GS}	V _{GS} = 10 V		7		nC
Gate to Drain Charge	Q _{GD}	I _D = 14 A		25		nC
Diode Forward Voltage	V _{F(S-D)}	I _F = 14 A, V _{GS} = 0 V		1.0		V
Reverse Recovery Time	t _{rr}	I _F = 14 A, V _{GS} = 0 V		300		ns
Reverse Recovery Charge	Q _{rr}	di/dt = 50 A/μs		1.5		μC

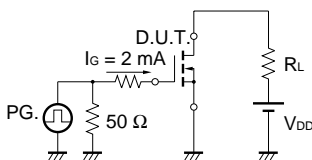
TEST CIRCUIT 1 AVALANCHE CAPABILITY



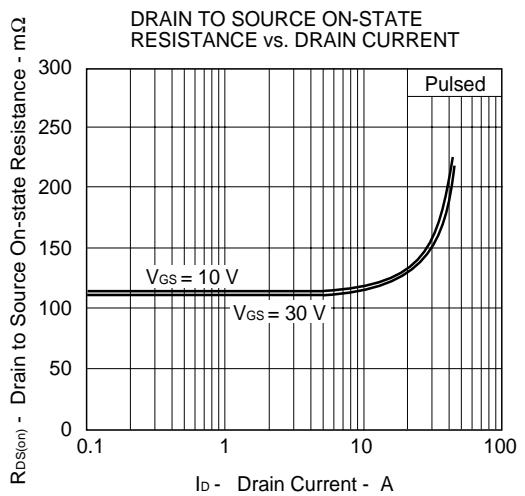
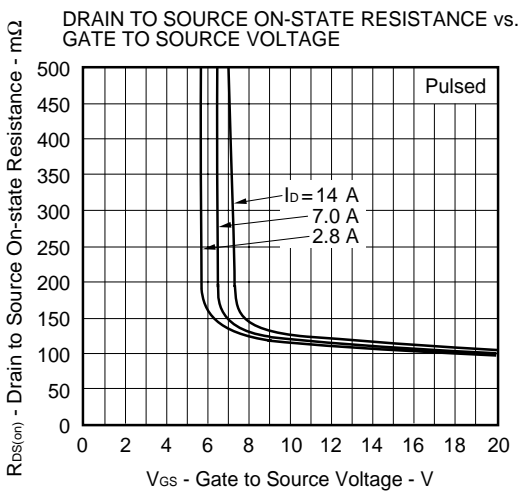
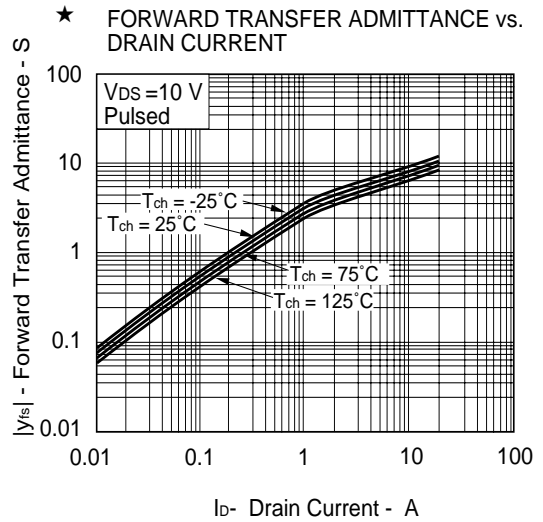
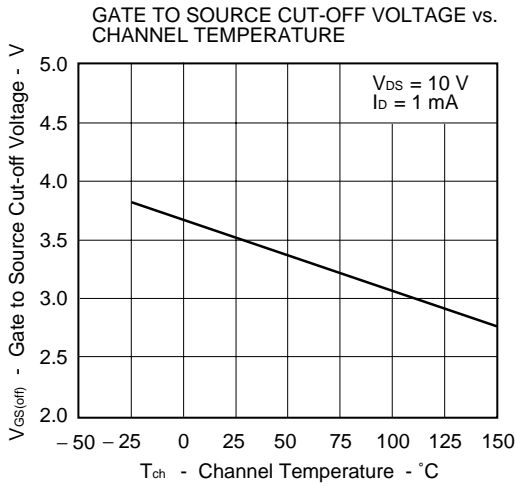
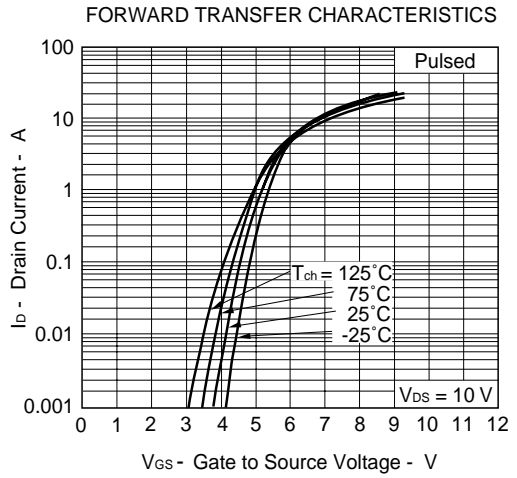
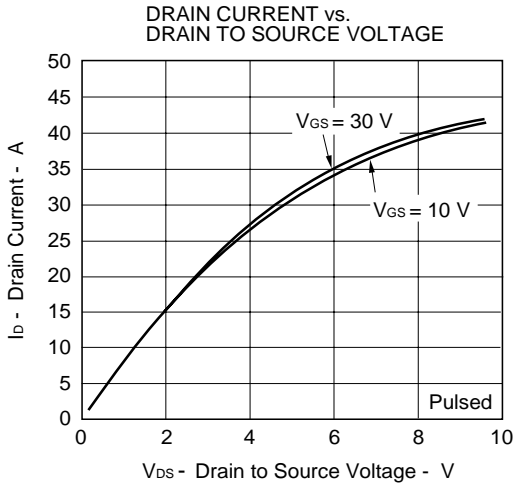
TEST CIRCUIT 2 SWITCHING TIME

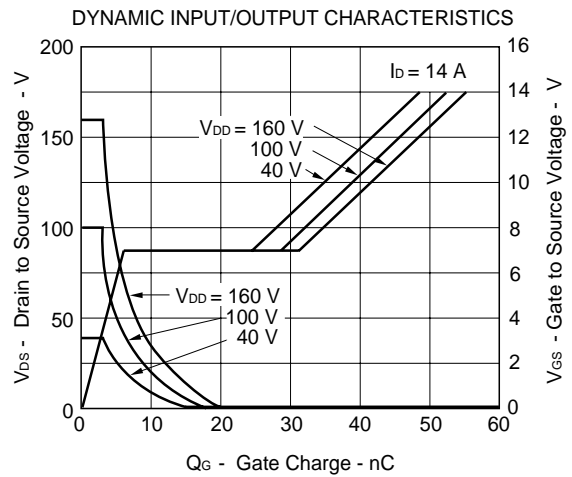
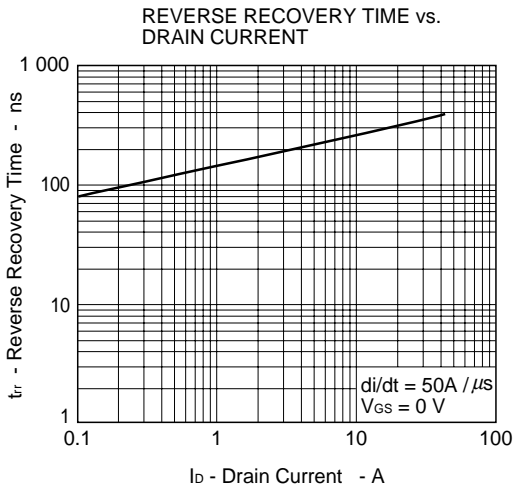
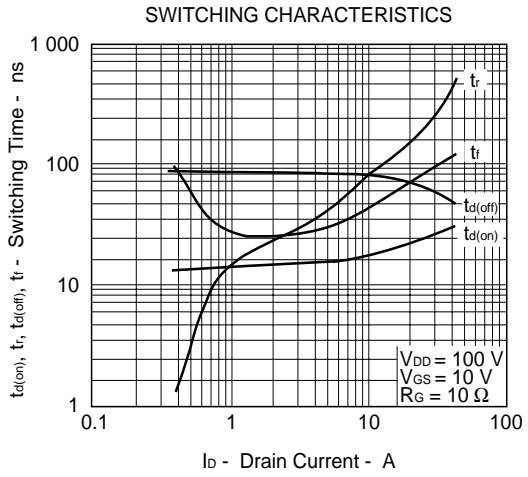
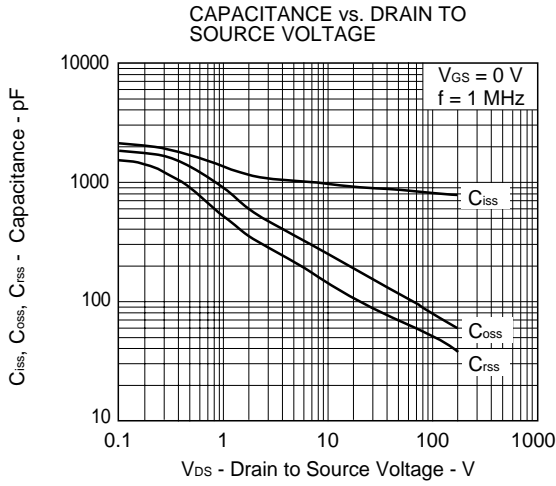
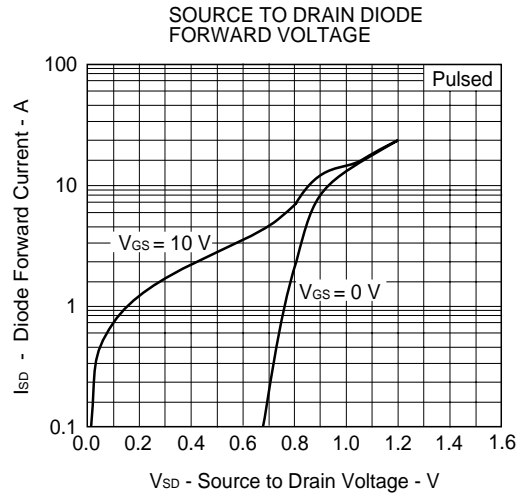
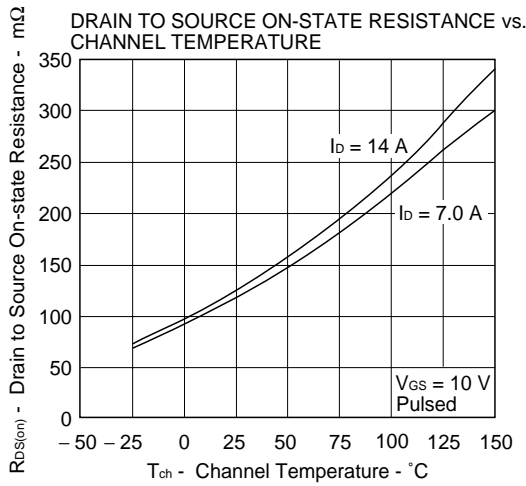


TEST CIRCUIT 3 GATE CHARGE

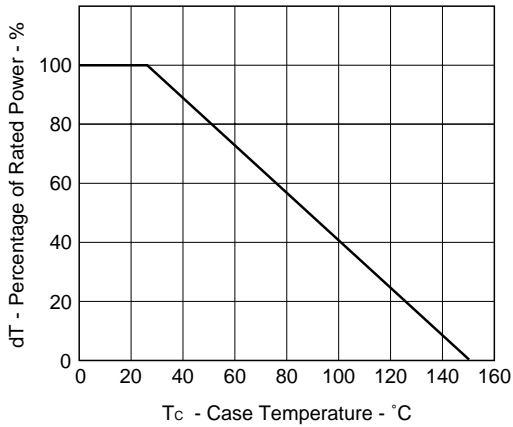


TYPICAL CHARACTERISTICS (T_A = 25°C)

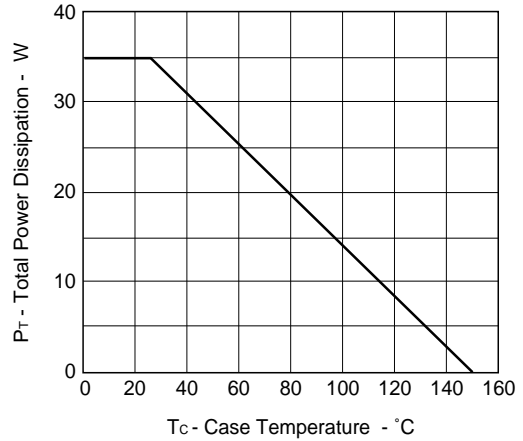




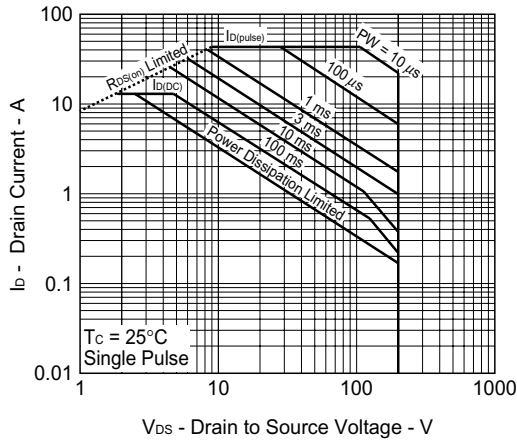
DERATING FACTOR OF FORWARD BIAS SAFE OPERATING AREA



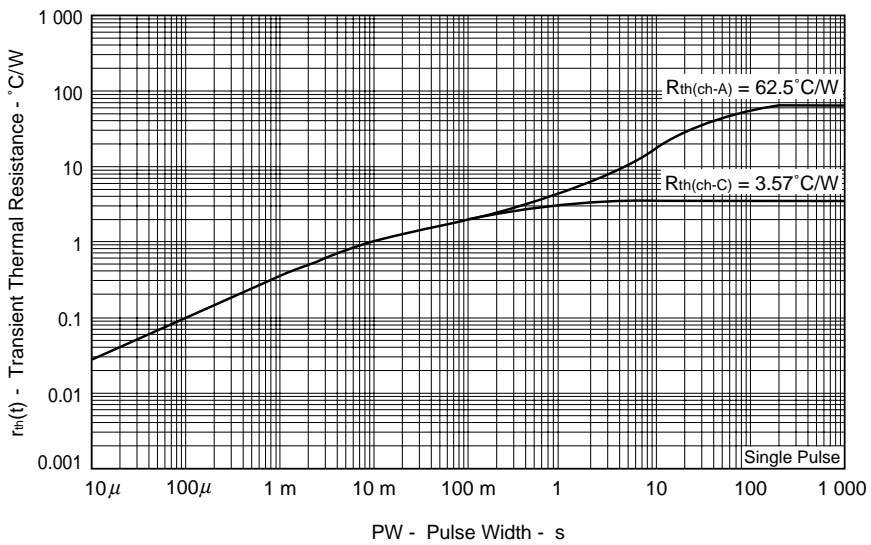
TOTAL POWER DISSIPATION vs. CASE TEMPERATURE

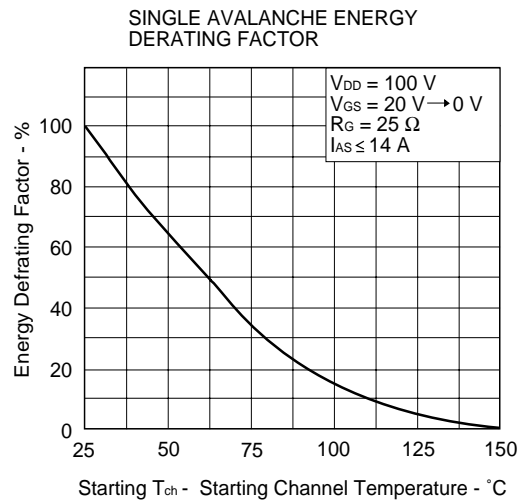
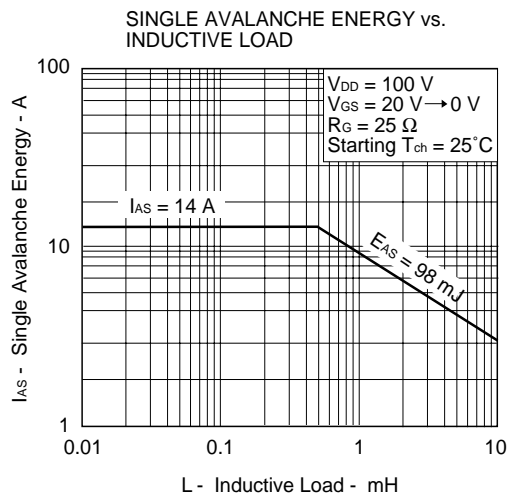


★ FORWARD BIAS SAFE OPERATING AREA



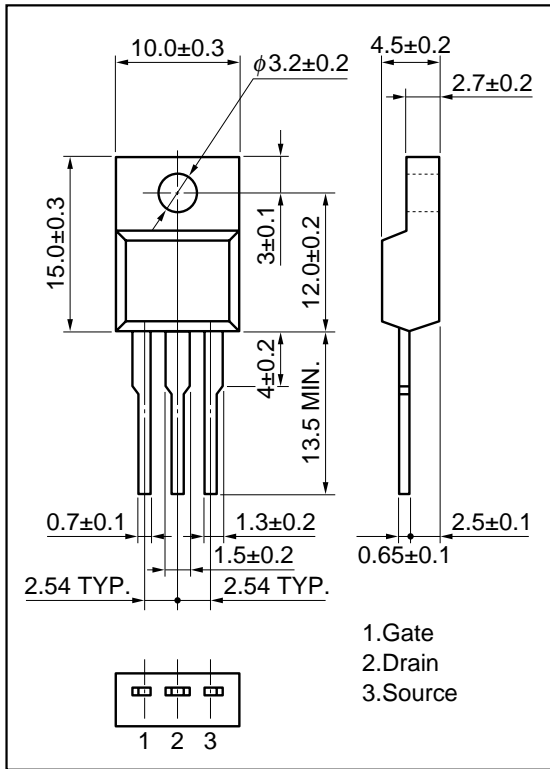
TRANSIENT THERMAL RESISTANCE vs. PULSE WIDTH



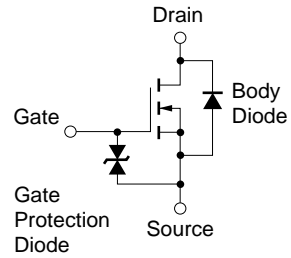


PACKAGE DRAWING(Unit : mm)

Isolated TO-220 (MP-45F)



EQUIVALENT CIRCUIT



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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