

To our customers,

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## Old Company Name in Catalogs and Other Documents

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On April 1<sup>st</sup>, 2010, NEC Electronics Corporation merged with Renesas Technology Corporation, and Renesas Electronics Corporation took over all the business of both companies. Therefore, although the old company name remains in this document, it is a valid Renesas Electronics document. We appreciate your understanding.

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

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

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

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MOS FIELD EFFECT TRANSISTOR  
2SK2109

N-CHANNEL MOS FET  
FOR HIGH-SPEED SWITCHING

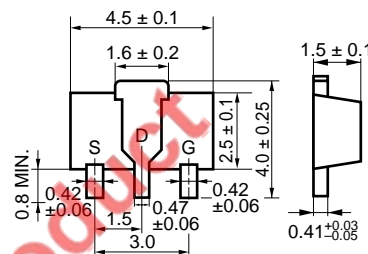
The 2SK2109 is a N-channel MOS FET of a vertical type and is a switching element that can be directly driven by the output of an IC operating at 5 V.

This product has a low ON resistance and superb switching characteristics and is ideal for driving the actuator, such as motors and DC/DC converters.

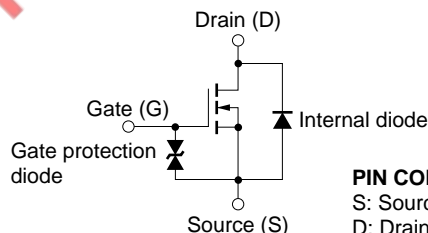
FEATURES

- Low ON resistance  
 $R_{DS(on)} = 1.0 \Omega$  MAX. @  $V_{GS} = 4.0 V$ ,  $I_D = 0.3 A$
- High switching speed  
 $t_{on} + t_{off} < 100 ns$
- Low parasitic capacitance

PACKAGE DIMENSIONS (in mm)



EQUIVALENT CIRCUIT



PIN CONNECTIONS

S: Source  
D: Drain  
G: Gate

Marking: NS

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

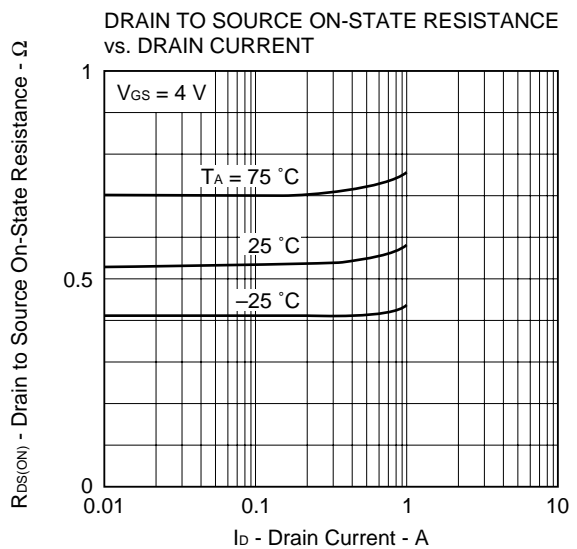
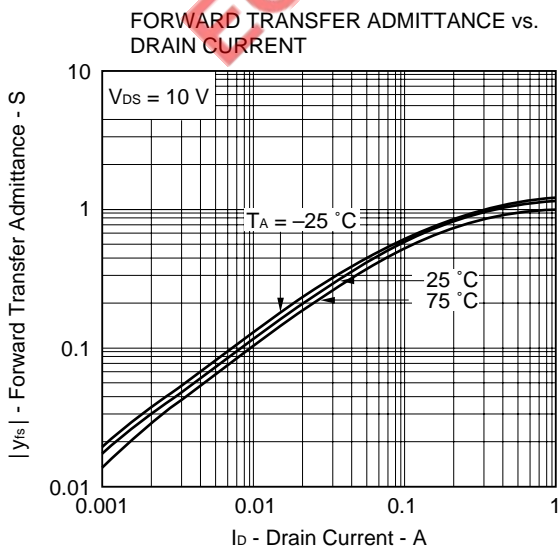
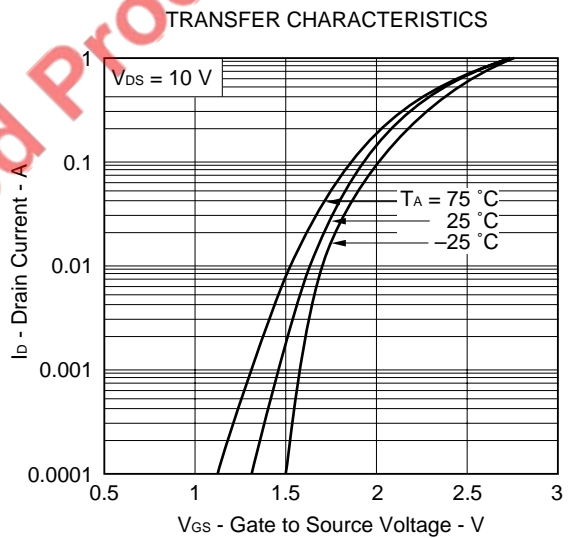
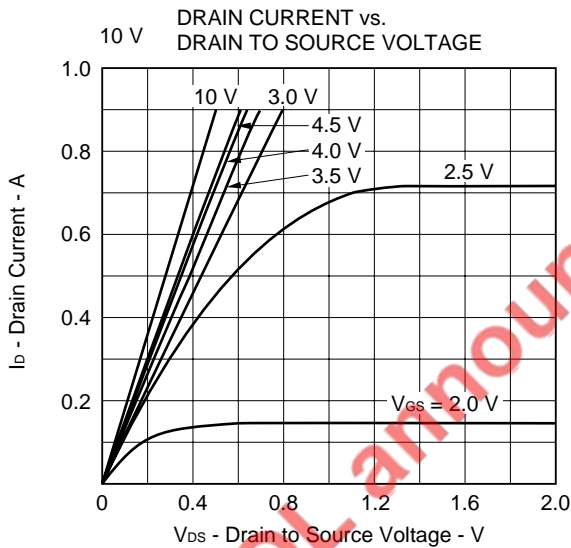
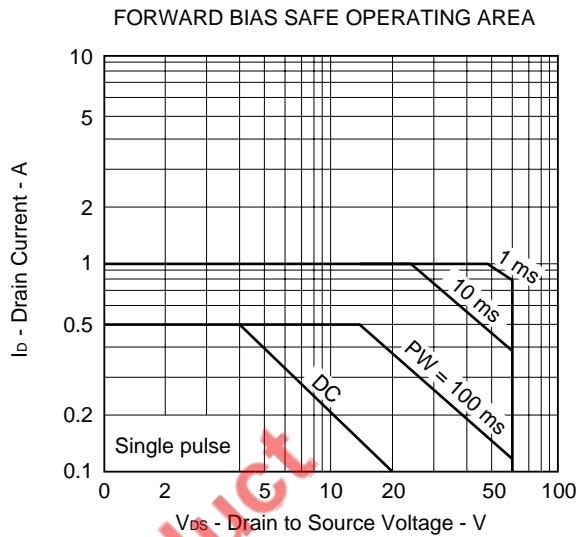
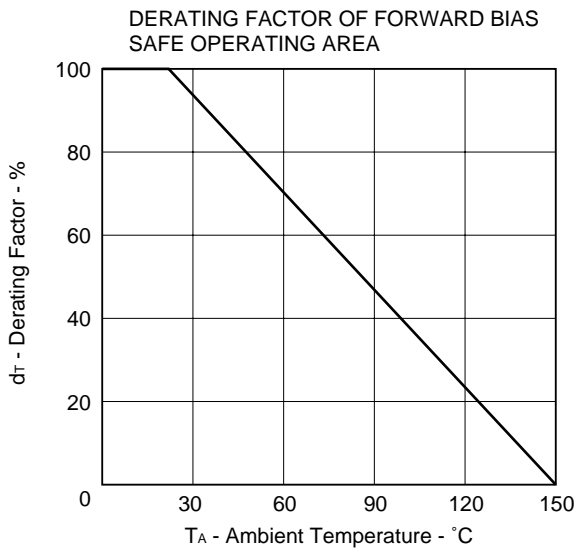
PARAMETER	SYMBOL	TEST CONDITIONS	RATING	UNIT
Drain to Source Voltage	$V_{DSS}$	$V_{GS} = 0$	60	V
Gate to Source Voltage	$V_{GSS}$	$V_{DS} = 0$	$\pm 20$	V
Drain Current (DC)	$I_{D(DC)}$		$\pm 0.5$	A
Drain Current (Pulse)	$I_{D(pulse)}$	$PW \leq 10 ms$ , Duty cycle $\leq 50 \%$	$\pm 1.0$	A
Total Power Dissipation	$P_T$	$16 cm^2 \times 0.7 mm$ , ceramic substrate used	2.0	W
Channel Temperature	$T_{ch}$		150	$^\circ C$
Storage Temperature	$T_{stg}$		-55 to +150	$^\circ C$

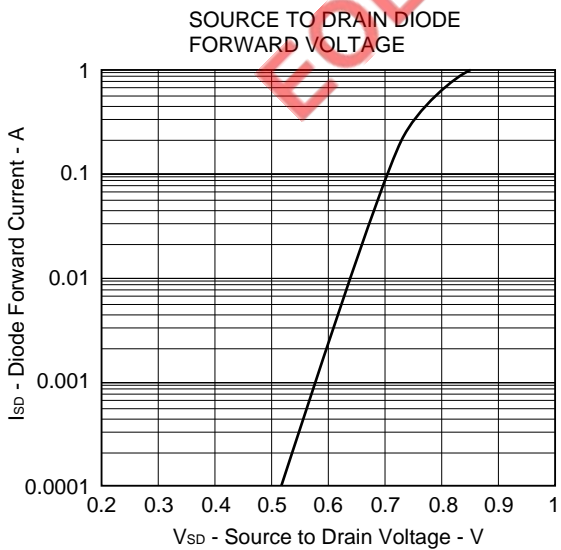
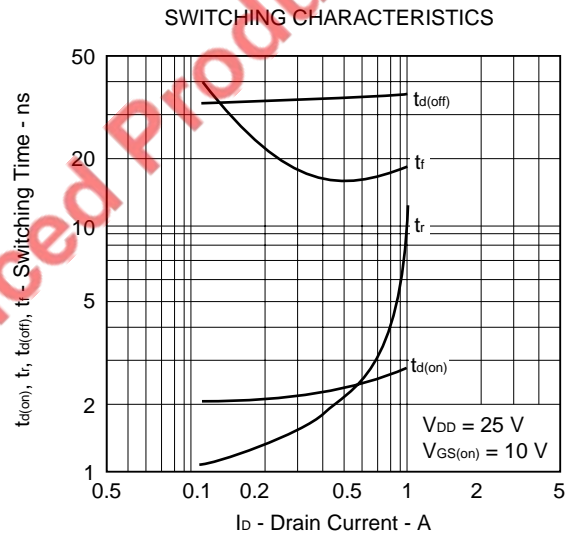
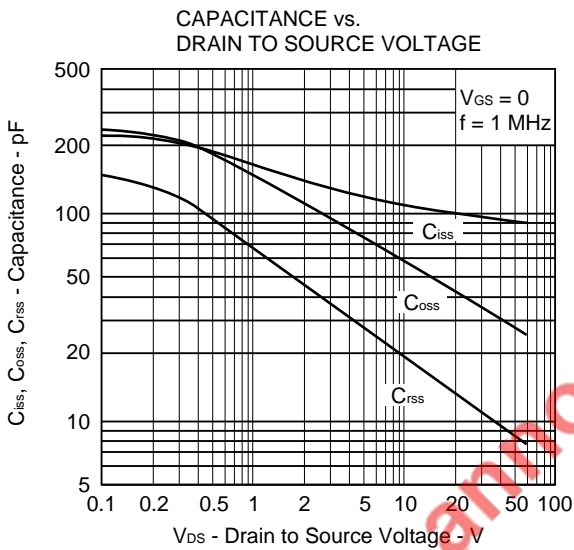
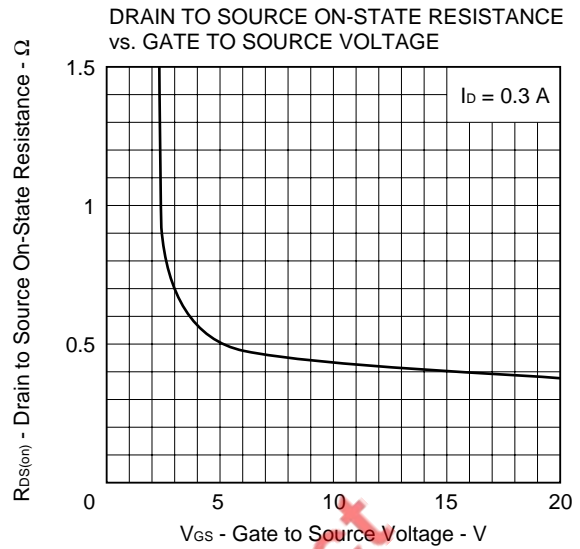
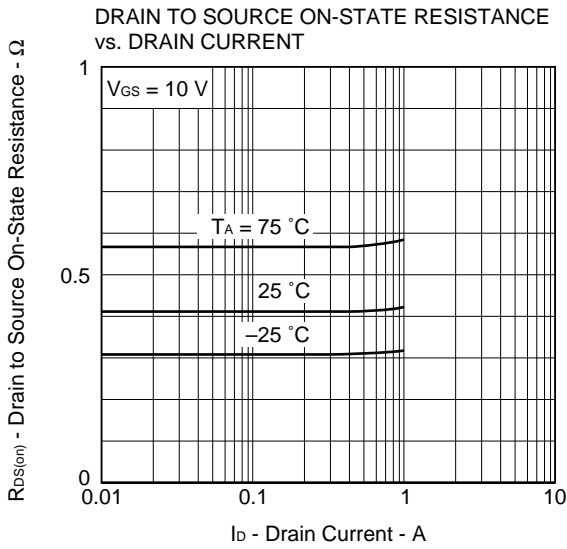
ELECTRICAL CHARACTERISTICS (T<sub>A</sub> = 25 °C)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNIT
Drain Cut-Off Current	I <sub>DSS</sub>	V <sub>DS</sub> = 60 V, V <sub>GS</sub> = 0			1.0	μA
Gate Leakage Current	I <sub>GSS</sub>	V <sub>GS</sub> = ±20 V, V <sub>DS</sub> = 0			±10	μA
Gate Cut-Off Voltage	V <sub>GS(off)</sub>	V <sub>DS</sub> = 10 V, I <sub>D</sub> = 1 mA	0.8	1.5	2.0	V
Forward Transfer Admittance	y <sub>ts</sub>	V <sub>DS</sub> = 10 V, I <sub>D</sub> = 0.3 A	0.4			S
Drain to Source On-State Resistance	R <sub>DS(on)1</sub>	V <sub>GS</sub> = 4.0 V, I <sub>D</sub> = 0.3 A		0.55	1.0	Ω
Drain to Source On-State Resistance	R <sub>DS(on)2</sub>	V <sub>GS</sub> = 10 V, I <sub>D</sub> = 0.3 A		0.41	0.8	Ω
Input Capacitance	C <sub>iss</sub>	V <sub>DS</sub> = 10 V, V <sub>GS</sub> = 0, f = 1.0 MHz		111		pF
Output Capacitance	C <sub>oss</sub>			55		pF
Reverse Transfer Capacitance	C <sub>rss</sub>			19		pF
Turn-On Delay Time	t <sub>d(on)</sub>	V <sub>DD</sub> = 25 V, I <sub>D</sub> = 0.3 A		2.2		ns
Rise Time	t <sub>r</sub>	V <sub>GS(on)</sub> = 10 V, R <sub>G</sub> = 10 Ω		1.5		ns
Turn-Off Delay Time	t <sub>d(off)</sub>	R <sub>L</sub> = 83 Ω		35		ns
Fall Time	t <sub>f</sub>			19		ns

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





**REFERENCE**

Document Name	Document No.
NEC semiconductor device reliability/quality control system	TEI-1202
Quality grade on NEC semiconductor devices	IEI-1209
Semiconductor device mounting technology manual	C10535E
Guide to quality assurance for semiconductor devices	MEI-1202
Semiconductor selection guide	X10679E

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Special: Transportation equipment (automobiles, trains, ships, etc.), traffic control systems, anti-disaster systems, anti-crime systems, safety equipment and medical equipment (not specifically designed for life support)

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