



# MOS FIELD EFFECT TRANSISTOR 2SK3385

# SWITCHING N-CHANNEL POWER MOS FET INDUSTRIAL USE

## DESCRIPTION

The 2SK3385 is N-Channel MOS Field Effect Transistor designed for high current switching applications.

#### FEATURES

- Low On-state Resistance
- ★ RDS(on)1 = 28 mΩ MAX. (VGS = 10 V, ID = 15 A) RDS(on)2 = 45 mΩ MAX. (VGS = 4.0 V, ID = 15 A)
  - Low  $C_{iss}$  :  $C_{iss} = 1500 \text{ pF TYP}$ .
  - Built-in Gate Protection Diode
  - TO-251/TO-252 package

#### ABSOLUTE MAXIMUM RATINGS (TA = 25 °C)

Drain to Source Voltage	Vdss	60	V
Gate to Source Voltage	Vgss	±20	V
Drain Current (DC)	D(DC)	±30	А
Drain Current (Pulse) Note1	D(pulse)	±100	А
Total Power Dissipation (Tc = 25°C)	Рт	36	W
Total Power Dissipation (TA = 25°C)	Рт	1.0	W
Channel Temperature	Tch	150	°C
Storage Temperature	Tstg	-55 to +150	°C
Single Avalanche Current Note2	las	22	А
Single Avalanche Energy Note2	Eas	48	mJ
	Gate to Source Voltage Drain Current (DC) Drain Current (Pulse) <sup>Note1</sup> Total Power Dissipation (Tc = 25°C) Total Power Dissipation (TA = 25°C) Channel Temperature Storage Temperature Single Avalanche Current <sup>Note2</sup>	Gate to Source VoltageVGSSDrain Current (DC)ID(DC)Drain Current (Pulse)Note1ID(pulse)ID(pulse)Total Power Dissipation (Tc = 25°C)PTTotal Power Dissipation (TA = 25°C)PTChannel TemperatureTchStorage TemperatureTstgSingle Avalanche Current Note2IAS	Gate to Source VoltageVGSS $\pm 20$ Drain Current (DC)ID(DC) $\pm 30$ Drain Current (Pulse)Note1ID(pulse)Total Power Dissipation (Tc = 25°C)PT36Total Power Dissipation (TA = 25°C)PT1.0Channel TemperatureTch150Storage TemperatureTstg-55 to +150Single Avalanche CurrentNote2IAS22

### **ORDERING INFORMATION**

PART NUMBER	PACKAGE	
2SK3385	3385 TO-251	
2SK3385-Z	TO-252	



(TO-251)

(TO-252)



**Notes 1.** PW  $\leq$  10  $\mu$ s, Duty cycle  $\leq$  1 %

2. Starting T<sub>ch</sub> = 25 °C, R<sub>G</sub> = 25  $\Omega$ , V<sub>GS</sub> = 20 V  $\rightarrow$  0 V

#### THERMAL RESISTANCE

$\star$	Channel to Case	Rth(ch-C)	3.47	°C/W
	Channel to Ambient	Rth(ch-A)	125	°C/W

The information in this document is subject to change without notice. Before using this document, please confirm that this is the latest version. Not all devices/types available in every country. Please check with local NEC representative for availability and additional information.

Document No. D14472EJ1V0DS00 (1st edition) Date Published January 2000 NS CP(K) Printed in Japan

90 %

90 %

tſ

toff

10 %

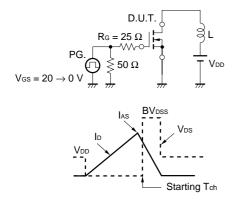
# \* ELECTRICAL CHARACTERISTICS (TA = 25 °C)

NEC

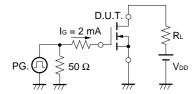
CHARACTERISTICS	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNIT
Drain to Source On-state Resistance	RDS(on)1	Vgs = 10 V, Id = 15 A		22	28	mΩ
	RDS(on)2	Vgs = 4.0 V, Id = 15 A		31	45	mΩ
Gate to Source Cut-off Voltage	V <sub>GS(off)</sub>	V <sub>DS</sub> = 10 V, I <sub>D</sub> = 1 mA	1.5	2.0	2.5	V
Forward Transfer Admittance	yfs	Vds = 10 V, Id = 15 A	8	16		S
Drain Leakage Current	loss	Vds = 60 V, Vgs = 0 V			10	μA
Gate to Source Leakage Current	lgss	$V_{GS} = \pm 20 \text{ V}, \text{ V}_{DS} = 0 \text{ V}$			±10	μA
Input Capacitance	Ciss	V <sub>DS</sub> = 10 V		1500		pF
Output Capacitance	Coss	V <sub>GS</sub> = 0 V		250		pF
Reverse Transfer Capacitance	Crss	f = 1 MHz		130		pF
Turn-on Delay Time	<b>t</b> d(on)	ID = 15 A		22		ns
Rise Time	tr	VGS(on) = 10 V		250		ns
Turn-off Delay Time	td(off)	Vdd = 30 V		77		ns
Fall Time	tr	Rg = 10 Ω		77		ns
Total Gate Charge	Q <sub>G</sub>	ID = 30 A		30		nC
Gate to Source Charge	QGS	V <sub>DD</sub> = 48 V		4.8		nC
Gate to Drain Charge	Qgd	VGS(on) = 10 V		8.6		nC
Body Diode Forward Voltage	VF(S-D)	IF = 30 A, VGS = 0 V		1.0		V
Reverse Recovery Time	trr	IF = 30 A, VGS = 0 V		44		ns
Reverse Recovery Charge	Qrr	di/dt = 100 A/ <i>µ</i> s		79		nC

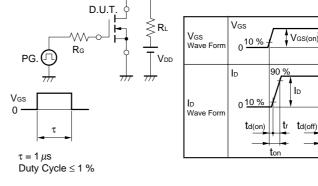
#### TEST CIRCUIT 1 AVALANCHE CAPABILITY

#### **TEST CIRCUIT 2 SWITCHING TIME**



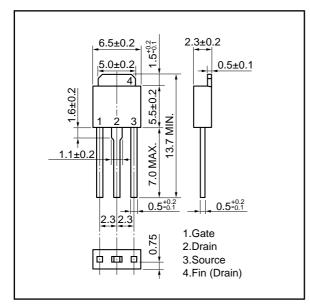
#### TEST CIRCUIT 3 GATE CHARGE



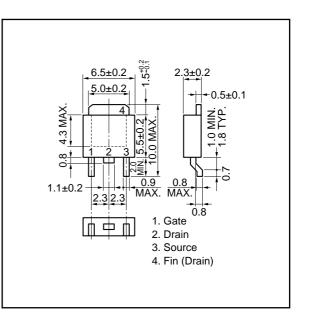


## PACKAGE DRAWINGS (Unit : mm)

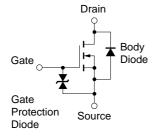
#### 1) TO-251 (MP-3)



#### 2) TO-252 (MP-3Z)



#### **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.

- The information in this document is subject to change without notice. Before using this document, please confirm that this is the latest version.
- No part of this document may be copied or reproduced in any form or by any means without the prior written consent of NEC Corporation. NEC Corporation assumes no responsibility for any errors which may appear in this document.
- NEC Corporation does not assume any liability for infringement of patents, copyrights or other intellectual property
  rights of third parties by or arising from use of a device described herein or any other liability arising from use
  of such device. No license, either express, implied or otherwise, is granted under any patents, copyrights or other
  intellectual property rights of NEC Corporation or others.
- Descriptions of circuits, software, and other related information in this document are provided for illustrative purposes in semiconductor product operation and application examples. The incorporation of these circuits, software, and information in the design of the customer's equipment shall be done under the full responsibility of the customer. NEC Corporation assumes no responsibility for any losses incurred by the customer or third parties arising from the use of these circuits, software, and information.
- While NEC Corporation has been making continuous effort to enhance the reliability of its semiconductor devices, the possibility of defects cannot be eliminated entirely. To minimize risks of damage or injury to persons or property arising from a defect in an NEC semiconductor device, customers must incorporate sufficient safety measures in its design, such as redundancy, fire-containment, and anti-failure features.
- NEC devices are classified into the following three quality grades:
   "Standard", "Special", and "Specific". The Specific quality grade applies only to devices developed based on a
   customer designated "quality assurance program" for a specific application. The recommended applications of
   a device depend on its quality grade, as indicated below. Customers must check the quality grade of each device
   before using it in a particular application.
  - Standard: Computers, office equipment, communications equipment, test and measurement equipment, audio and visual equipment, home electronic appliances, machine tools, personal electronic equipment and industrial robots
  - 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)
  - Specific: Aircraft, aerospace equipment, submersible repeaters, nuclear reactor control systems, life support systems or medical equipment for life support, etc.

The quality grade of NEC devices is "Standard" unless otherwise specified in NEC's Data Sheets or Data Books. If customers intend to use NEC devices for applications other than those specified for Standard quality grade, they should contact an NEC sales representative in advance.