

# MOS FIELD EFFECT TRANSISTOR

# 2SK3354

# SWITCHING N-CHANNEL POWER MOS FET INDUSTRIAL USE

# DESCRIPTION

The 2SK3354 is N-channel MOS Field Effect Transistor designed for high current switching applications.

# FEATURES

- Super low on-state resistance:
- ★  $R_{DS(on)1} = 8.0 \text{ m}\Omega \text{ MAX.} (V_{GS} = 10 \text{ V}, \text{ ID} = 42 \text{ A})$
- ★  $R_{DS(on)2} = 12 \text{ m}\Omega \text{ MAX.} (V_{GS} = 4 \text{ V}, \text{ ID} = 42 \text{ A})$
- ★ Low Ciss: Ciss = 6300 pF TYP.
  - Built-in gate protection diode

# ABSOLUTE MAXIMUM RATINGS (TA = 25°C)

	•	,	
Drain to Source Voltage	VDSS	60	V
Gate to Source Voltage	VGSS(AC)	±20	V
Drain Current (DC)	D(DC)	±83	А
Drain Current (pulse) Note1	D(pulse)	±332	А
Total Power Dissipation (Tc = 25°C)	P⊤	100	W
Total Power Dissipation ( $T_A = 25^{\circ}C$ )	P⊤	1.5	W
Channel Temperature	Tch	150	°C
Storage Temperature	Tstg	–55 to +150	°C
Single Avalanche Current Note2	las	55	А
Single Avalanche Energy <sup>Note2</sup>	Eas	302	mJ

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

★ 2. Starting Tch = 25 °C, RG = 25  $\Omega$ , VGS = 20 V  $\rightarrow$  0 V

THERMAL RESISTANCE			
Channel to Case	Rth(ch-C)	1.25	°C/W
Channel to Ambient	Rth(ch-A)	83.3	°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. D14131EJ1V0DS00 (1st edition) Date Published June 1999 NS CP(K) Printed in Japan

# **ORDERING INFORMATION**

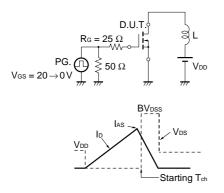
PART NUMBER	PACKAGE		
2SK3354	TO-220AB		
2SK3354-S	TO-262		
2SK3354-Z	TO-220SMD		

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

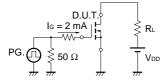
NEC

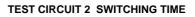
CHARACTERISTICS	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNIT
Drain to Source On-state Resistance	RDS(on)1	$V_{GS} = 10 V, I_D = 42 A$		6.3	8.0	mΩ
	RDS(on)2	$V_{GS} = 4 V, I_D = 42 A$		8.0	12	mΩ
Gate to Source Cut-off Voltage	VGS(off)	$V_{DS} = 10 V, I_{D} = 1 mA$	1.5	2.0	2.5	V
Forward Transfer Admittance	yfs	$V_{DS} = 10 V$ , $I_D = 42 A$	35	59		S
Drain Leakage Current	loss	$V_{DS} = 60 V, V_{GS} = 0 V$			10	μA
Gate to Source Leakage Current	lgss	$V_{GS} = \pm 20 V$ , $V_{DS} = 0 V$			±10	μA
Input Capacitance	Ciss	$V_{DS} = 10 V$ , $V_{GS} = 0 V$ , $f = 1 MHz$		6300		pF
Output Capacitance	Coss			1000		pF
Reverse Transfer Capacitance	Crss			490		pF
Turn-on Delay Time	td(on)	$I_{D} = 42 \text{ A}, \text{ V}_{\text{GS(on)}} = 10 \text{ V}, \text{ V}_{\text{DD}} = 30 \text{ V},$		100		ns
Rise Time	tr	R <sub>G</sub> = 10 Ω		1500		ns
Turn-off Delay Time	td(off)			300		ns
Fall Time	tr			440		ns
Total Gate Charge	QG	I D = 83  A , $V D D = 48  V,  V G S = 10  V$		106		nC
Gate to Source Charge	Q <sub>GS</sub>			20		nC
Gate to Drain Charge	Qgd			30		nC
Body Diode Forward Voltage	VF(S-D)	IF = 83 A, VGS = 0 V		1.0		V
Reverse Recovery Time	trr	IF = 83 A, VGS = 0 V,		55		ns
Reverse Recovery Charge	Qrr	di/dt = 100 A/µs		100		nC

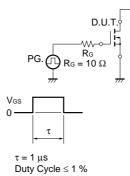
# TEST CIRCUIT 1 AVALANCHE CAPABILITY

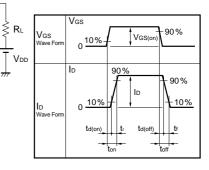


### TEST CIRCUIT 3 GATE CHARGE



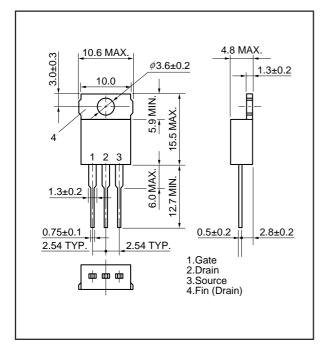




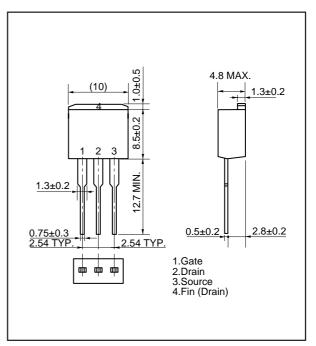


# PACKAGE DRAWING (Unit: mm)

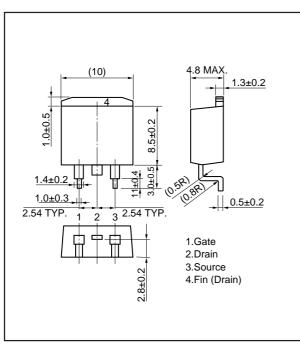
## 1) TO-220AB (MP-25)



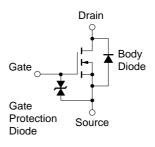
2) TO-262 (MP-25 Fin Cut)



#### 3) TO-220SMD (MP-25Z)



# **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.