

# MOS FIELD EFFECT TRANSISTOR

# 2SK3359

## SWITCHING

### N-CHANNEL POWER MOS FET

### INDUSTRIAL USE

#### DESCRIPTION

The 2SK3359 is N-Channel MOS Field Effect Transistor designed for high current switching applications.

#### FEATURES

- Low on-state resistance  
 $R_{DS(on)1} = 20 \text{ m}\Omega \text{ MAX. (} V_{GS} = 10 \text{ V, } I_D = 35 \text{ A)}$
- ★  $R_{DS(on)2} = 28 \text{ m}\Omega \text{ MAX. (} V_{GS} = 4.5 \text{ V, } I_D = 30 \text{ A)}$
- ★ • Low  $C_{iss}$ :  $C_{iss} = 4900 \text{ pF TYP.}$
- Built-in gate protection diode

#### ORDERING INFORMATION

PART NUMBER	PACKAGE
2SK3359	TO-220AB
2SK3359-S	TO-262
2SK3359-Z	TO-220SMD

#### ABSOLUTE MAXIMUM RATINGS ( $T_A = 25^\circ\text{C}$ )

Drain to Source Voltage ( $V_{GS} = 0 \text{ V}$ )	$V_{DSS}$	100	V
Gate to Source Voltage ( $V_{DS} = 0 \text{ V}$ )	$V_{GSS(AC)}$	$\pm 20$	V
Gate to Source Voltage ( $V_{DS} = 0 \text{ V}$ )	$V_{GSS(DC)}$	+20, -10	V
Drain Current (DC)	$I_{D(DC)}$	$\pm 70$	A
Drain Current (Pulse) <sup>Note1</sup>	$I_{D(pulse)}$	$\pm 280$	A
Total Power Dissipation ( $T_c = 25^\circ\text{C}$ )	$P_T$	100	W
Total Power Dissipation ( $T_A = 25^\circ\text{C}$ )	$P_T$	1.5	W
Channel Temperature	$T_{ch}$	150	$^\circ\text{C}$
Storage Temperature	$T_{stg}$	-55 to +150	$^\circ\text{C}$
Single Avalanche Current <sup>Note2</sup>	$I_{AS}$	50	A
Single Avalanche Energy <sup>Note2</sup>	$E_{AS}$	250	mJ

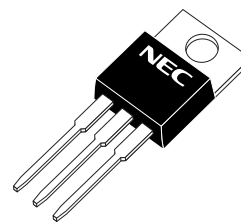
**Notes 1.**  $PW \leq 10 \mu\text{s}$ , Duty cycle  $\leq 1 \%$

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

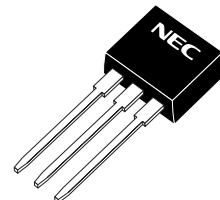
#### THERMAL RESISTANCE

Channel to Case	$R_{th(ch-C)}$	1.25	$^\circ\text{C/W}$
Channel to Ambient	$R_{th(ch-A)}$	83.3	$^\circ\text{C/W}$

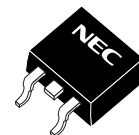
(TO-220AB)



(TO-262)



(TO-220SMD)



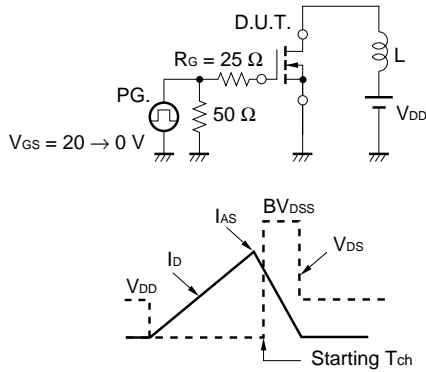
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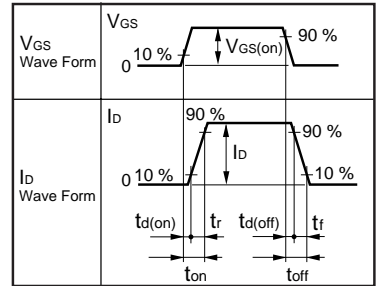
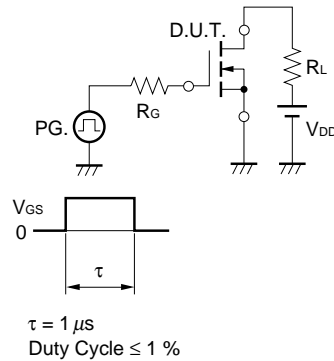
ELECTRICAL CHARACTERISTICS (T<sub>A</sub> = 25 °C)

	CHARACTERISTICS	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNIT
★	Drain to Source On-state Resistance	R <sub>DS(on)1</sub>	V <sub>GS</sub> = 10 V, I <sub>D</sub> = 35 A		14	20	mΩ
		R <sub>DS(on)2</sub>	V <sub>GS</sub> = 4.5 V, I <sub>D</sub> = 30 A		19	28	mΩ
★	Gate to Source Cut-off Voltage	V <sub>GS(off)</sub>	V <sub>DS</sub> = 10 V, I <sub>D</sub> = 250 μA	1.5	2.0	2.5	V
	Forward Transfer Admittance	y <sub>fs</sub>	V <sub>DS</sub> = 10 V, I <sub>D</sub> = 35 A	23	47		S
	Drain Leakage Current	I <sub>DSS</sub>	V <sub>DS</sub> = 100 V, V <sub>GS</sub> = 0 V			10	μA
	Gate to Source Leakage Current	I <sub>GSS</sub>	V <sub>GS</sub> = ±20 V, V <sub>DS</sub> = 0 V			±10	μA
★	Input Capacitance	C <sub>iss</sub>	V <sub>DS</sub> = 10 V		4900		pF
	Output Capacitance	C <sub>oss</sub>	V <sub>GS</sub> = 0 V		990		pF
	Reverse Transfer Capacitance	C <sub>rss</sub>	f = 1 MHz		580		pF
	Turn-on Delay Time	t <sub>d(on)</sub>	I <sub>D</sub> = 35 A		58		ns
	Rise Time	t <sub>r</sub>	V <sub>GS(on)</sub> = 10 V		400		ns
	Turn-off Delay Time	t <sub>d(off)</sub>	V <sub>DD</sub> = 50 V		340		ns
	Fall Time	t <sub>f</sub>	R <sub>G</sub> = 10 Ω		340		ns
	Total Gate Charge	Q <sub>G</sub>	I <sub>D</sub> = 70 A		130		nC
★	Gate to Source Charge	Q <sub>GS</sub>	V <sub>DD</sub> = 80 V		14		nC
★	Gate to Drain Charge	Q <sub>GD</sub>	V <sub>GS(on)</sub> = 10 V		50		nC
	Body Diode Forward Voltage	V <sub>F(S-D)</sub>	I <sub>F</sub> = 70 A, V <sub>GS</sub> = 0 V		1.0		V
	Reverse Recovery Time	t <sub>rr</sub>	I <sub>F</sub> = 70 A, V <sub>GS</sub> = 0 V		170		ns
	Reverse Recovery Charge	Q <sub>rr</sub>	di/dt = 100 A/μs		920		nC

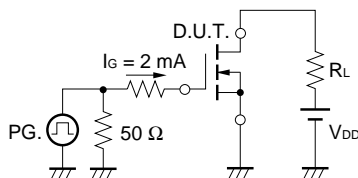
TEST CIRCUIT 1 AVALANCHE CAPABILITY



TEST CIRCUIT 2 SWITCHING TIME

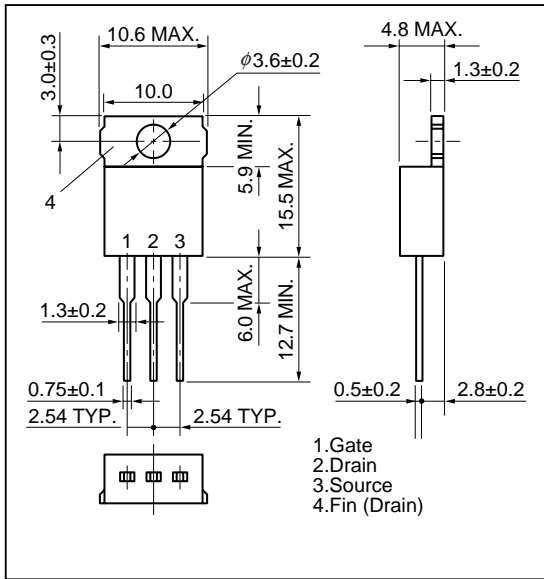


TEST CIRCUIT 3 GATE CHARGE

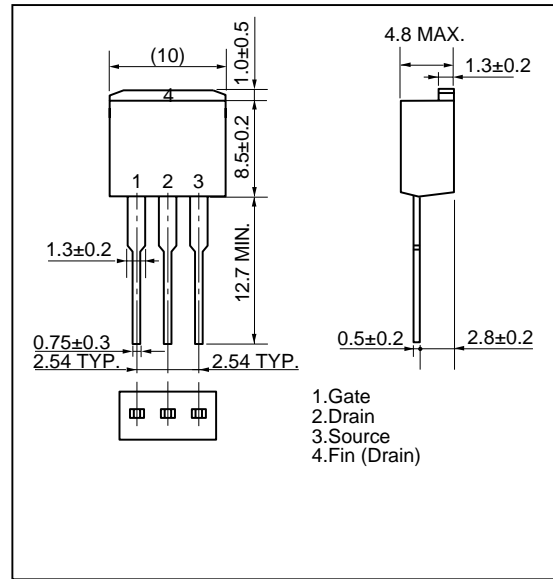


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PACKAGE DRAWINGS (Unit : mm)

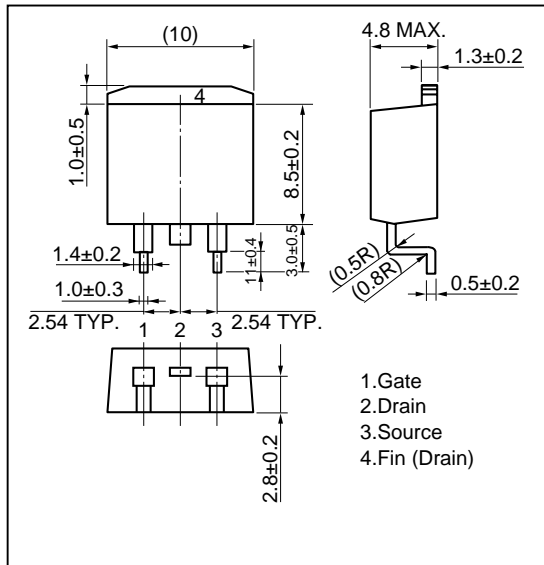
1) TO-220AB (MP-25)



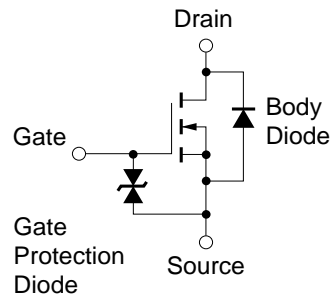
2) TO-262 (MP-25 Fin Cut)



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.

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