

## SWITCHING N-CHANNEL POWER MOS FET INDUSTRIAL USE

### DESCRIPTION

The 2SK3433 is N-channel MOS Field Effect Transistor designed for high current switching applications.

### FEATURES

- Super low on-state resistance:  
 $R_{DS(on)1} = 26 \text{ m}\Omega \text{ MAX. (} V_{GS} = 10 \text{ V, } I_D = 20 \text{ A)}$   
 ★  $R_{DS(on)2} = 41 \text{ m}\Omega \text{ MAX. (} V_{GS} = 4.0 \text{ V, } I_D = 20 \text{ A)}$
- Low  $C_{iss}$ :  $C_{iss} = 1500 \text{ pF TYP.}$
- Built-in gate protection diode

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

Drain to Source Voltage	$V_{DS}$	60	V
Gate to Source Voltage	$V_{GS}$	$\pm 20$	V
Drain Current (DC)	$I_{D(DC)}$	$\pm 40$	A
Drain Current (pulse) <sup>Note1</sup>	$I_{D(pulse)}$	$\pm 160$	A
★ Total Power Dissipation ( $T_C = 25^\circ\text{C}$ )	$P_T$	47	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	$T_{stg}$	$-55 \text{ to } +150$	$^\circ\text{C}$
★ Single Avalanche Current <sup>Note2</sup>	$I_{AS}$	21	A
★ Single Avalanche Energy <sup>Note2</sup>	$E_{AS}$	44	mJ

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

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

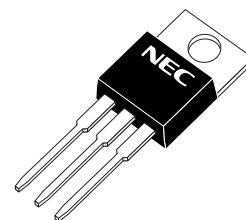
### THERMAL RESISTANCE

★ Channel to Case	$R_{th(ch-C)}$	2.66	$^\circ\text{C/W}$
Channel to Ambient	$R_{th(ch-A)}$	83.3	$^\circ\text{C/W}$

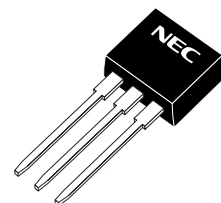
### ORDERING INFORMATION

PART NUMBER	PACKAGE
2SK3433	TO-220AB
2SK3433-S	TO-262
2SK3433-Z	TO-220SMD

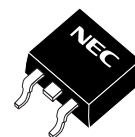
(TO-220AB)



(TO-262)



(TO-220SMD)

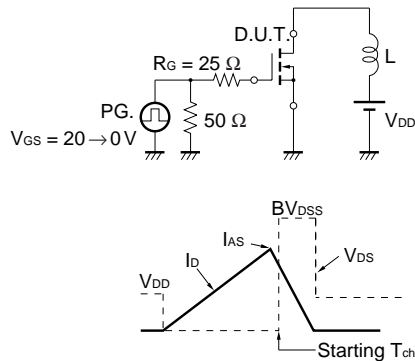


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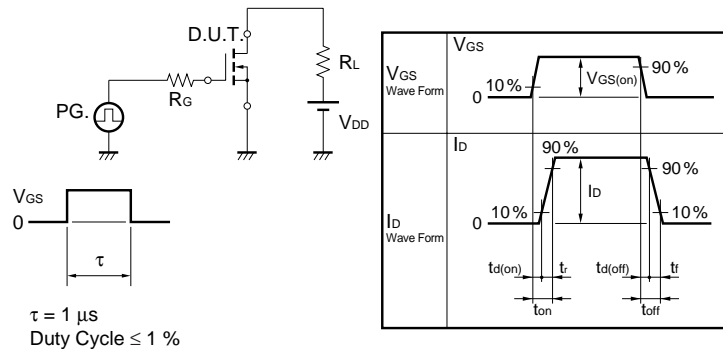
**ELECTRICAL CHARACTERISTICS (T<sub>A</sub> = 25 °C)**

	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> = 20 A		22	26	mΩ
		R <sub>DS(on)2</sub>	V <sub>GS</sub> = 4.0 V, I <sub>D</sub> = 20 A		29	41	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	y <sub>fs</sub>	V <sub>DS</sub> = 10 V, I <sub>D</sub> = 20 A	11	22		S
	Drain Leakage Current	I <sub>DSS</sub>	V <sub>DS</sub> = 60 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, V <sub>GS</sub> = 0 V, f = 1 MHz		1500		pF
	Output Capacitance	C <sub>oss</sub>			250		pF
	Reverse Transfer Capacitance	C <sub>rss</sub>			120		pF
★	Turn-on Delay Time	t <sub>d(on)</sub>	I <sub>D</sub> = 20 A, V <sub>GS(on)</sub> = 10 V, V <sub>DD</sub> = 30 V, R <sub>G</sub> = 10 Ω		35		ns
★	Rise Time	t <sub>r</sub>			320		ns
★	Turn-off Delay Time	t <sub>d(off)</sub>			89		ns
★	Fall Time	t <sub>f</sub>			120		ns
	Total Gate Charge	Q <sub>G</sub>	I <sub>D</sub> = 40 A, V <sub>DD</sub> = 48 V, V <sub>GS</sub> = 10 V		30		nC
	Gate to Source Charge	Q <sub>GS</sub>			5		nC
	Gate to Drain Charge	Q <sub>GD</sub>			8		nC
	Body Diode Forward Voltage	V <sub>F(S-D)</sub>	I <sub>F</sub> = 40 A, V <sub>GS</sub> = 0 V		1.0		V
★	Reverse Recovery Time	t <sub>rr</sub>	I <sub>F</sub> = 40 A, V <sub>GS</sub> = 0 V,		44		ns
★	Reverse Recovery Charge	Q <sub>rr</sub>	di/dt = 100 A/μs		60		nC

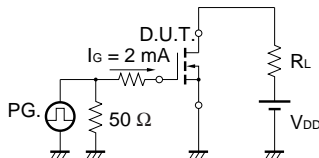
**TEST CIRCUIT 1 AVALANCHE CAPABILITY**



**TEST CIRCUIT 2 SWITCHING TIME**

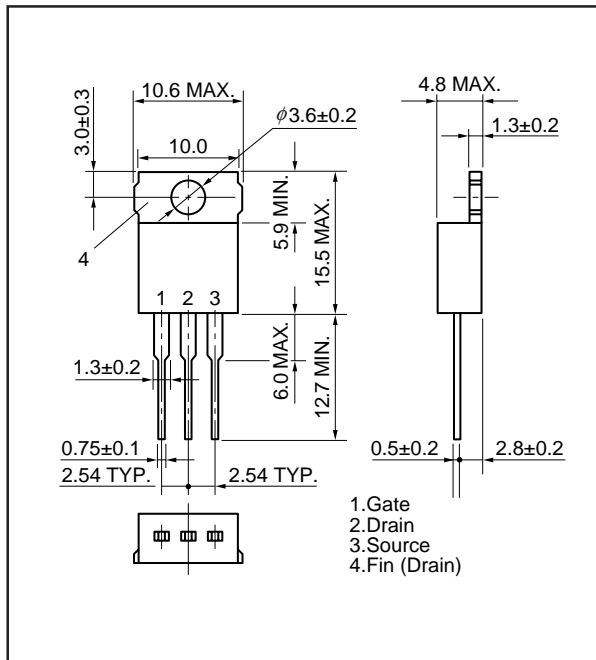


**TEST CIRCUIT 3 GATE CHARGE**

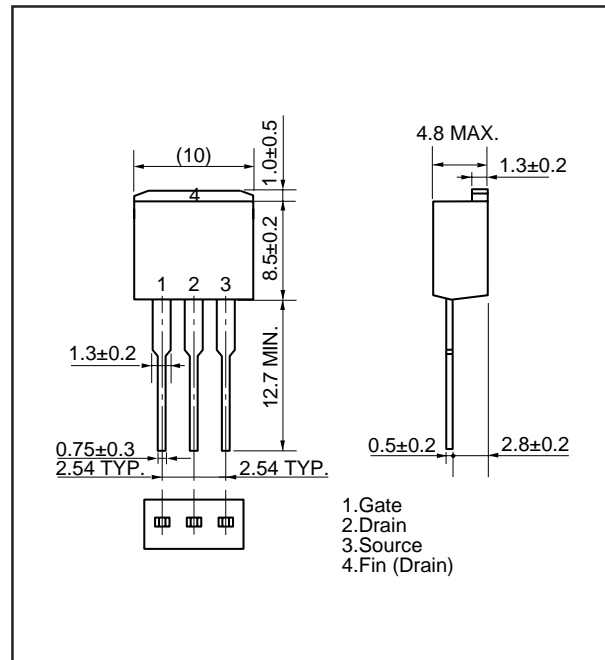


### PACKAGE DRAWINGS (Unit: mm)

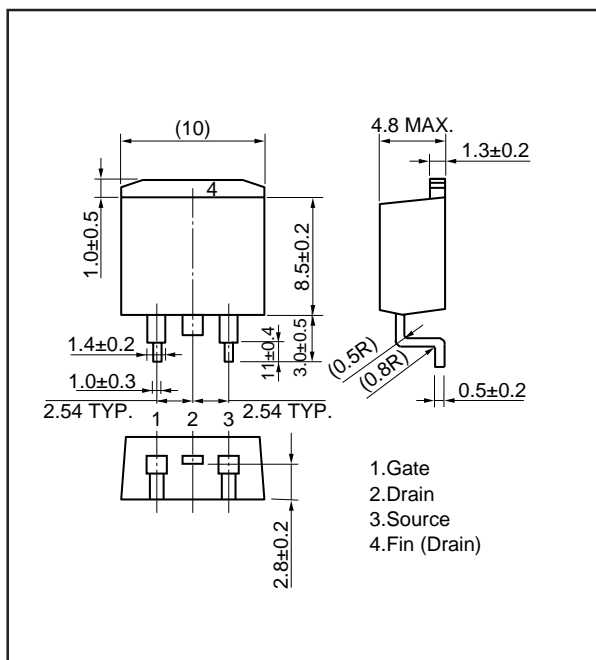
1) TO-220AB (MP-25)



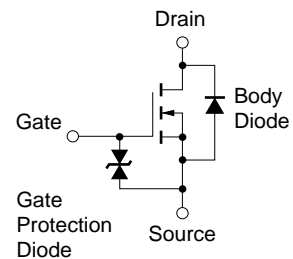
## 2) TO-262 (MP-25 Fin Cut)



### 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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