

SWITCHING  
N-CHANNEL POWER MOS FET  
INDUSTRIAL USE

DESCRIPTION

The 2SK3431 is N-channel MOS Field Effect Transistor designed for high current switching applications.

FEATURES

- Super low on-state resistance:  
 $R_{DS(on)1} = 5.6 \text{ m}\Omega \text{ MAX. (} V_{GS} = 10 \text{ V, } I_D = 42 \text{ A)}$
- ★  $R_{DS(on)2} = 8.9 \text{ m}\Omega \text{ MAX. (} V_{GS} = 4 \text{ V, } I_D = 42 \text{ A)}$
- ★ • Low  $C_{iss}$ :  $C_{iss} = 6100 \text{ pF TYP.}$
- Built-in gate protection diode

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

Drain to Source Voltage	$V_{DSS}$	40	V
Gate to Source Voltage	$V_{GSS}$	$\pm 20$	V
Drain Current (DC)	$I_{D(DC)}$	$\pm 83$	A
Drain Current (pulse)	$I_{D(pulse)}$	$\pm 332$	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	$I_{AS}$	65	A
★ Single Avalanche Energy	$E_{AS}$	423	mJ

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

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

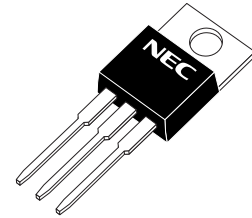
THERMAL RESISTANCE

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

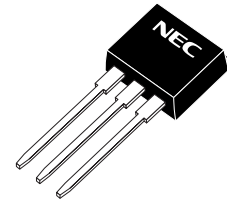
ORDERING INFORMATION

PART NUMBER	PACKAGE
2SK3431	TO-220AB
2SK3431-S	TO-262
2SK3431-Z	TO-220SMD

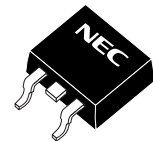
(TO-220AB)



(TO-262)



(TO-220SMD)

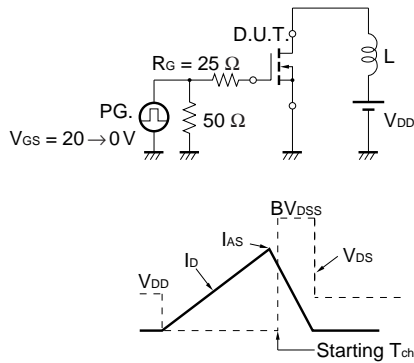


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Not all devices/types available in every country. Please check with local NEC representative for availability and additional information.

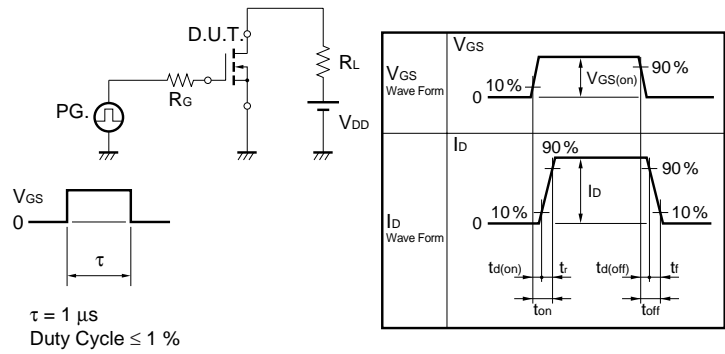
**ELECTRICAL CHARACTERISTICS (T<sub>A</sub> = 25 °C)**

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> = 42 A		4.5	5.6	mΩ
	R <sub>DS(on)2</sub>	V <sub>GS</sub> = 4 V, I <sub>D</sub> = 42 A		6.2	8.9	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> = 42 A	30	60		S
★ Drain Leakage Current	I <sub>DSS</sub>	V <sub>DS</sub> = 40 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		6100		pF
★ Output Capacitance	C <sub>oss</sub>			1400		pF
★ Reverse Transfer Capacitance	C <sub>rss</sub>			700		pF
★ Turn-on Delay Time	t <sub>d(on)</sub>	I <sub>D</sub> = 42 A, V <sub>GS(on)</sub> = 10 V, V <sub>DD</sub> = 20 V, R <sub>G</sub> = 10 Ω		120		ns
★ Rise Time	t <sub>r</sub>			1800		ns
★ Turn-off Delay Time	t <sub>d(off)</sub>			350		ns
★ Fall Time	t <sub>f</sub>			440		ns
★ Total Gate Charge	Q <sub>G</sub>	I <sub>D</sub> = 83 A, V <sub>DD</sub> = 32 V, V <sub>GS</sub> = 10 V		110		nC
★ Gate to Source Charge	Q <sub>GS</sub>			18		nC
★ Gate to Drain Charge	Q <sub>GD</sub>			31		nC
★ Body Diode Forward Voltage	V <sub>F(S-D)</sub>	I <sub>F</sub> = 83 A, V <sub>GS</sub> = 0 V		1.0		V
★ Reverse Recovery Time	t <sub>rr</sub>	I <sub>F</sub> = 83 A, V <sub>GS</sub> = 0 V, di/dt = 100 A/μs		65		ns
★ Reverse Recovery Charge	Q <sub>rr</sub>			110		nC

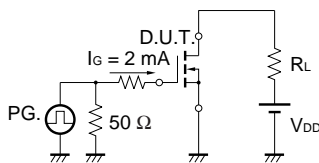
**TEST CIRCUIT 1 AVALANCHE CAPABILITY**



**TEST CIRCUIT 2 SWITCHING TIME**

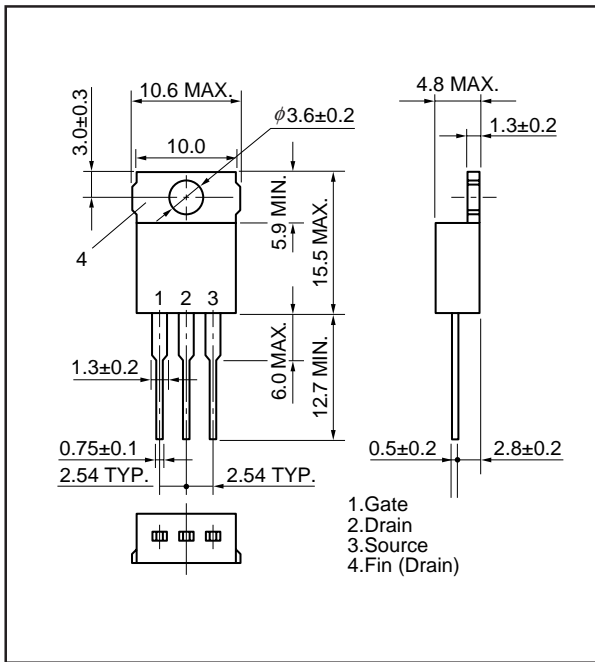


**TEST CIRCUIT 3 GATE CHARGE**

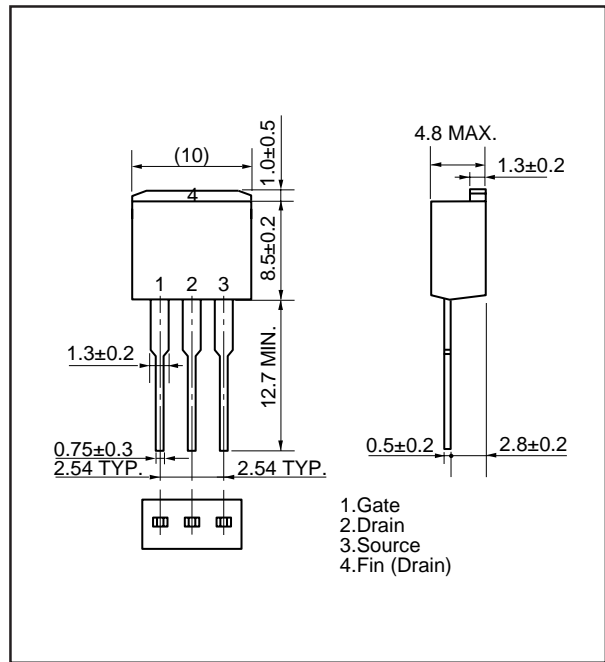


PACKAGE DRAWINGS (Unit: mm)

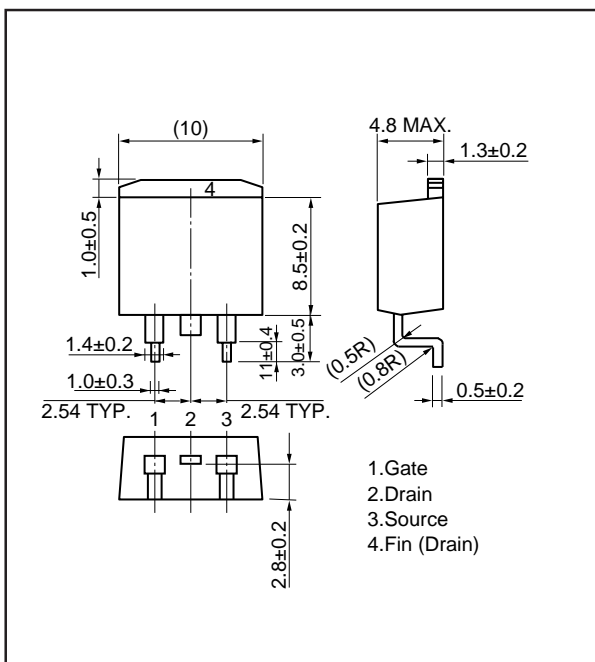
1) TO-220AB (MP-25)



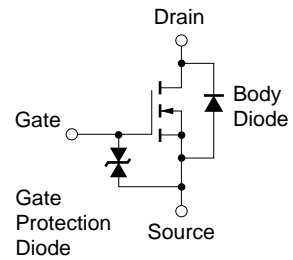
2) TO-262 (MP-25 Fin Cut)



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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