

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°C)

Drain to Source Voltage	V_{DSS}	40	V
Gate to Source Voltage	V_{GSS}	±20	V
Drain Current (DC)	$I_{D(DC)}$	±83	A
Drain Current (pulse) ^{Note1}	$I_{D(pulse)}$	±332	A
Total Power Dissipation (T _C = 25°C)	P_T	100	W
Total Power Dissipation (T _A = 25°C)	P_T	1.5	W
Channel Temperature	T_{ch}	150	°C
Storage Temperature	T_{stg}	-55 to +150	°C
★ Single Avalanche Current ^{Note2}	I_{AS}	65	A
★ Single Avalanche Energy ^{Note2}	E_{AS}	423	mJ

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

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

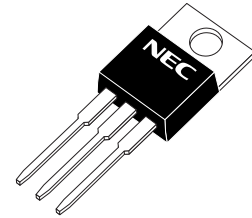
THERMAL RESISTANCE

Channel to Case	$R_{th(ch-C)}$	1.25	°C/W
Channel to Ambient	$R_{th(ch-A)}$	83.3	°C/W

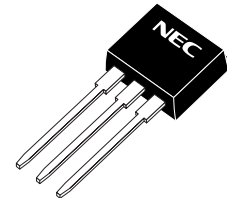
ORDERING INFORMATION

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

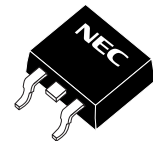
(TO-220AB)



(TO-262)



(TO-220SMD)

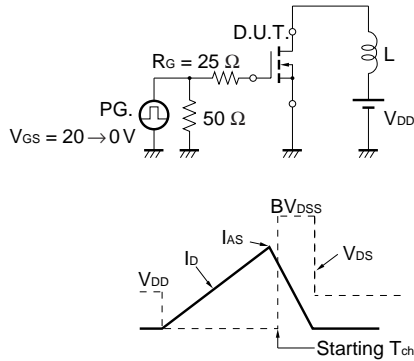


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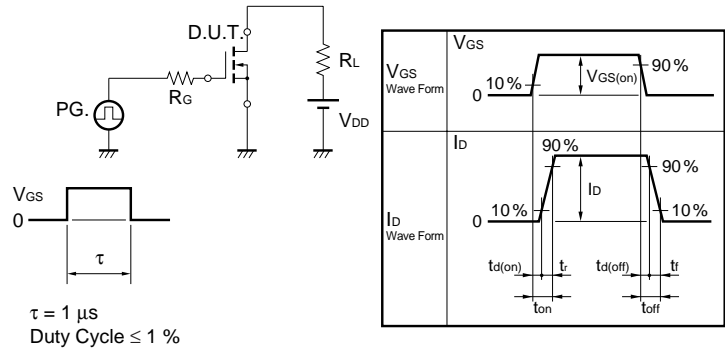
ELECTRICAL CHARACTERISTICS (T_A = 25 °C)

CHARACTERISTICS	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNIT
★ Drain to Source On-state Resistance	R _{DS(on)1}	V _{GS} = 10 V, I _D = 42 A		4.5	5.6	mΩ
	R _{DS(on)2}	V _{GS} = 4 V, I _D = 42 A		6.2	8.9	mΩ
★ Gate to Source Cut-off Voltage	V _{GS(off)}	V _{DS} = 10 V, I _D = 1 mA	1.5	2.0	2.5	V
★ Forward Transfer Admittance	y _{fs}	V _{DS} = 10 V, I _D = 42 A	30	60		S
★ Drain Leakage Current	I _{DSS}	V _{DS} = 40 V, V _{GS} = 0 V			10	μA
★ Gate to Source Leakage Current	I _{GSS}	V _{GS} = ±20 V, V _{DS} = 0 V			±10	μA
★ Input Capacitance	C _{iss}	V _{DS} = 10 V, V _{GS} = 0 V, f = 1 MHz		6100		pF
★ Output Capacitance	C _{oss}			1400		pF
★ Reverse Transfer Capacitance	C _{rss}			700		pF
★ Turn-on Delay Time	t _{d(on)}	I _D = 42 A, V _{GS(on)} = 10 V, V _{DD} = 20 V, R _G = 10 Ω		120		ns
★ Rise Time	t _r			1800		ns
★ Turn-off Delay Time	t _{d(off)}			350		ns
★ Fall Time	t _f			440		ns
★ Total Gate Charge	Q _G	I _D = 83 A, V _{DD} = 32 V, V _{GS} = 10 V		110		nC
★ Gate to Source Charge	Q _{GS}			18		nC
★ Gate to Drain Charge	Q _{GD}			31		nC
★ Body Diode Forward Voltage	V _{F(S-D)}	I _F = 83 A, V _{GS} = 0 V		1.0		V
★ Reverse Recovery Time	t _{rr}	I _F = 83 A, V _{GS} = 0 V, di/dt = 100 A/μs		65		ns
★ Reverse Recovery Charge	Q _{rr}			110		nC

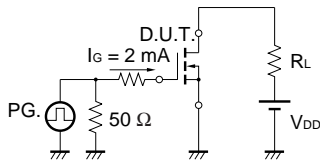
TEST CIRCUIT 1 AVALANCHE CAPABILITY



TEST CIRCUIT 2 SWITCHING TIME

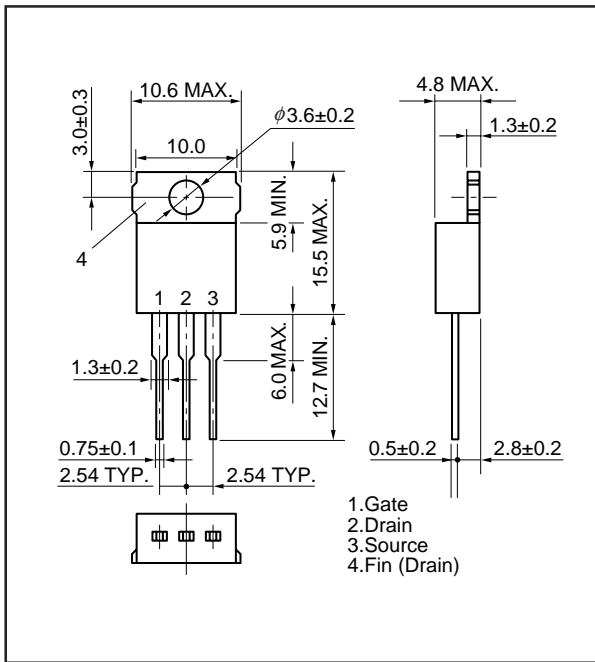


TEST CIRCUIT 3 GATE CHARGE

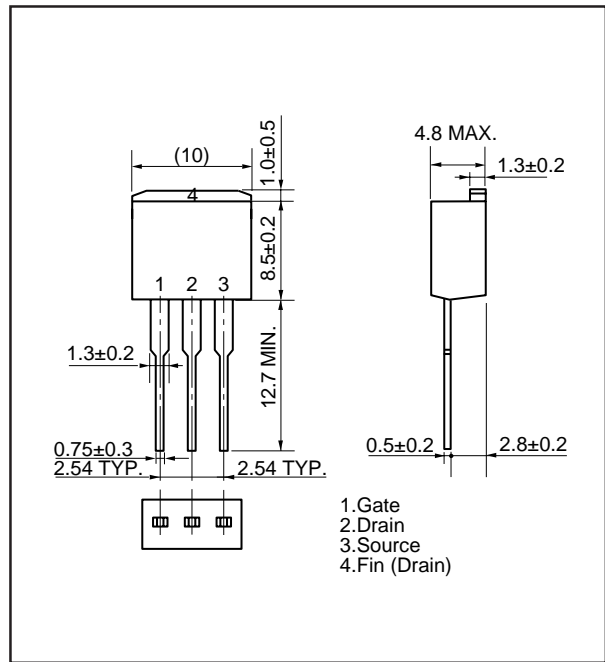


PACKAGE DRAWINGS (Unit: mm)

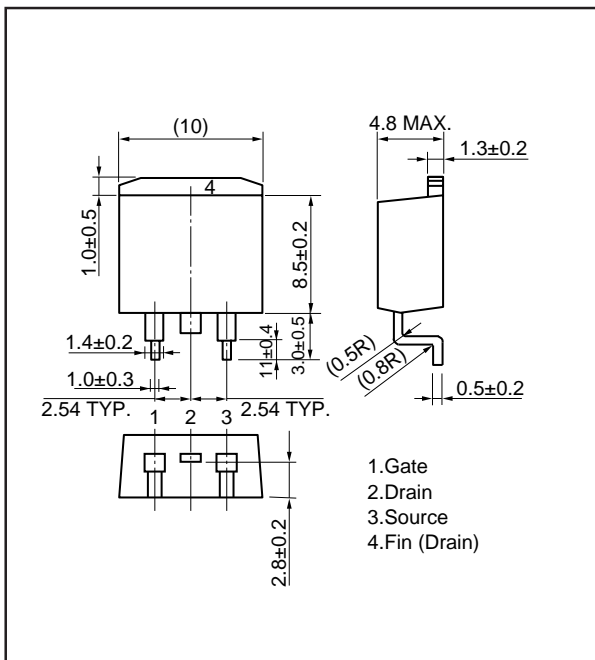
1) TO-220AB (MP-25)



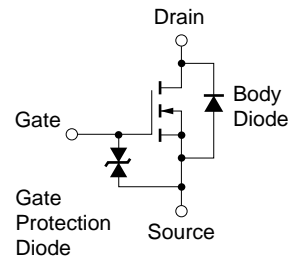
2) TO-262 (MP-25 Fin Cut)



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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