



# MOS FIELD EFFECT TRANSISTOR 2SK3221

## SWITCHING N-CHANNEL POWER MOS FET INDUSTRIAL USE

### DESCRIPTION

The 2SK3221 is N channel DMOS FET device that features a low gate charge and excellent switching characteristics, and designed for high voltage applications such as switching power supply, AC adapter.

### ORDERING INFORMATION

Part number	Package
2SK3221	Isolated TO-220

### FEATURES

- Low gate charge  
 $Q_G = 9 \text{ nC TYP. (} V_{DD} = 450 \text{ V, } V_{GS} = 10 \text{ V, } I_D = 2.0 \text{ A)}$
- Gate voltage rating  $\pm 30 \text{ V}$
- Low oN-state resistance  
 $R_{DS(on)} = 4.4 \ \Omega \text{ (MAX.) (} V_{GS} = 10 \text{ V, } I_D = 1.0 \text{ A)}$
- Avalanche capability ratings
- Isolated TO-220 package

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

Drain to source voltage ( $V_{GS} = 0 \text{ V}$ )	$V_{DSS}$	600	V
Gate to source voltage ( $V_{DS} = 0 \text{ V}$ )	$V_{GSS}$	$\pm 30$	V
Drain current(DC) ( $T_C = 25^\circ\text{C}$ )	$I_{D(DC)}$	$\pm 2.0$	A
Drain current(pulse) <sup>Note1</sup>	$I_{D(pulse)}$	$\pm 8.0$	A
Total power dissipation ( $T_A = 25^\circ\text{C}$ )	$P_{T1}$	2.0	W
Total power dissipation ( $T_C = 25^\circ\text{C}$ )	$P_{T2}$	25	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>	IAS	2.0	A
Single avalanche energy <sup>Note2</sup>	EAS	2.7	mJ
Diode recovery $dv/dt$ <sup>Note3</sup>	$dv/dt$	3.5	V/ns

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

**2.** Starting  $T_{ch} = 25^\circ\text{C}$ ,  $V_{DD} = 150 \text{ V}$ ,  $R_G = 25 \ \Omega$ ,  $V_{GS} = 20 \text{ V} \rightarrow 0 \text{ V}$

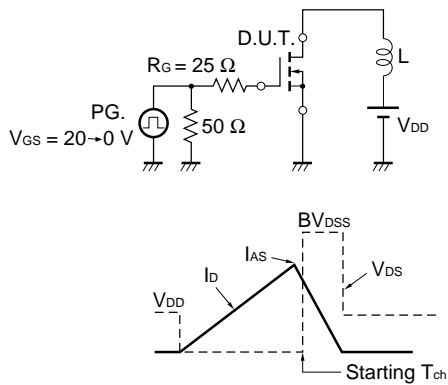
**3.**  $I_F \leq 1.0 \text{ A}$ ,  $V_{clamp} = 600 \text{ V}$ ,  $di/dt \leq 100 \text{ A}/\mu\text{s}$ ,  $T_A = 25^\circ\text{C}$

The information contained in this document is being issued in advance of the production cycle for the device. The parameters for the device may change before final production or NEC Corporation, at its own discretion, may withdraw the device prior to its production.

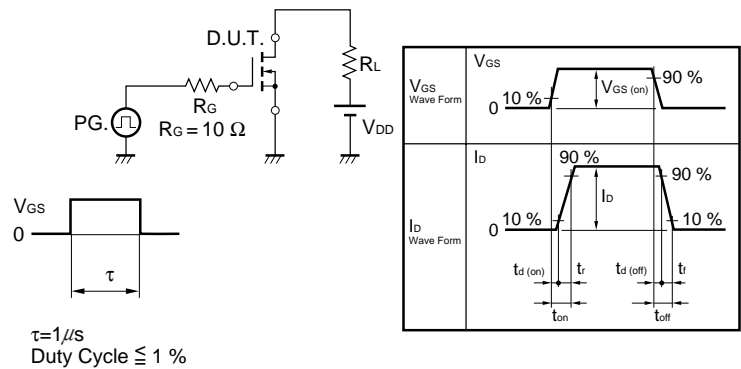
**ELECTRICAL CHARACTERISTICS(T<sub>A</sub> = 25°C)**

Characteristics	Symbol	Test Conditions	MIN.	TYP.	MAX.	Unit
Drain leakage current	I <sub>DSS</sub>	V <sub>DS</sub> = 600 V, V <sub>GS</sub> = 0 V			100	μA
Gate leakage current	I <sub>GSS</sub>	V <sub>GS</sub> = ±30 V, V <sub>DS</sub> = 0 V			±10	μA
Gate cut-off voltage	V <sub>GS(off)</sub>	V <sub>DS</sub> = 10 V, I <sub>D</sub> = 1 mA	2.5		3.5	V
Forward transfer admittance	y <sub>fs</sub>	V <sub>DS</sub> = 10 V, I <sub>D</sub> = 1.0 A	0.5			S
Drain to source on-state resistance	R <sub>DS(on)</sub>	V <sub>GS</sub> = 10 V, I <sub>D</sub> = 1.0 A		3.3	4.4	Ω
Input capacitance	C <sub>iss</sub>	V <sub>DS</sub> = 10 V		290		pF
Output capacitance	C <sub>oss</sub>	V <sub>GS</sub> = 0 V		60		pF
Reverse transfer capacitance	C <sub>rss</sub>	f = 1 MHz		5		pF
Turn-on delay time	t <sub>d(on)</sub>	V <sub>DD</sub> = 150 V, I <sub>D</sub> = 1.0 A		7		ns
Rise time	t <sub>r</sub>	V <sub>GS(on)</sub> = 10 V		2		ns
Turn-off delay time	t <sub>d(off)</sub>	R <sub>G</sub> = 10 Ω		20		ns
Fall time	t <sub>f</sub>			10		ns
Total gate charge	Q <sub>G</sub>	V <sub>DD</sub> = 450 V		9		nC
Gate to source charge	Q <sub>GS</sub>	V <sub>GS</sub> = 10 V		2.4		nC
Gate to drain charge	Q <sub>GD</sub>	I <sub>D</sub> = 2.0 A		2		nC
Diode forward voltage	V <sub>F(S-D)</sub>	I <sub>F</sub> = 2.0 A, V <sub>GS</sub> = 0 V		0.9		V
Reverse recovery time	T <sub>rr</sub>	I <sub>F</sub> = 2.0 A, V <sub>GS</sub> = 0 V		0.9		μs
Reverse recovery charge	Q <sub>rr</sub>	di/dt = 50 A/μs		2.0		μC

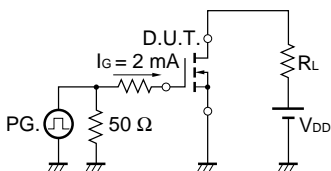
Test circuit 1 Avalanche capability



Test circuit 2 Switching time

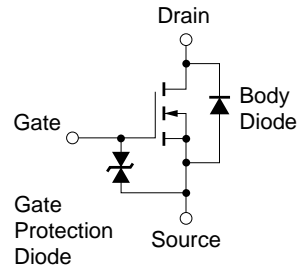
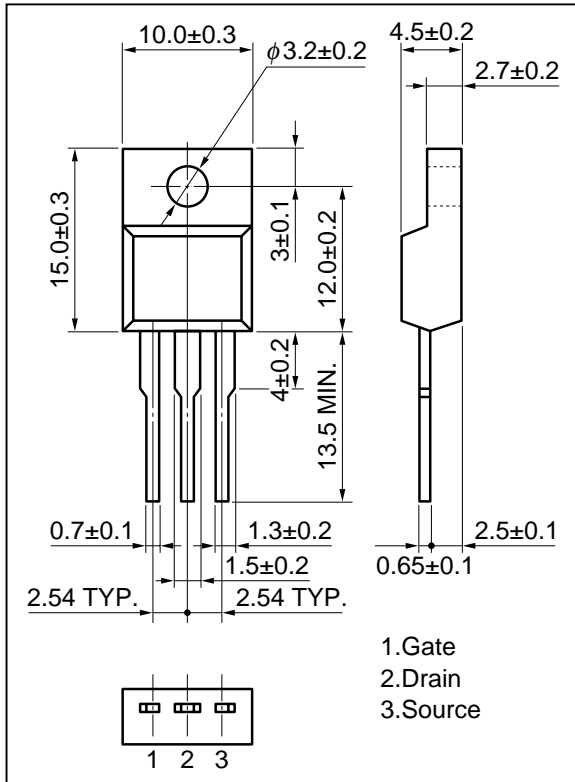


Test circuit 3 Gate charge



Package Drawing(Unit : mm)

Isolated TO-220 (MP-45F)



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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Anti-radioactive design is not implemented in this product.