

# MOS FIELD EFFECT TRANSISTOR

2SK3114

# SWITCHING N-CHANNEL POWER MOS FET INDUSTRIAL USE

#### **DESCRIPTION**

The 2SK3114 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
2SK3114	Isolated TO-220

#### **FEATURES**

• Low on-state resistance:

 $R_{DS(on)} = 2.2 \Omega MAX. (V_{GS} = 10 V, I_D = 2.0 A)$ 

• Low gate charge:

 $Q_G = 15 \text{ nC TYP.}$  ( $V_{DD} = 450 \text{ V}$ ,  $V_{GS} = 10 \text{ V}$ ,  $I_D = 4.0 \text{ A}$ )

• Gate voltage rating: ±30 V

- Avalanche capability ratings
- Isolated TO-220 package

#### ★ (Isolated TO-220)



#### ABSOLUTE MAXIMUM RATINGS (TA = 25°C)

Drain to Source Voltage (Vss = 0 V)	V <sub>DSS</sub>	600	V
Gate to Source Voltage (V <sub>DS</sub> = 0 V)	Vgss	±30	V
Drain Current (DC) (Tc = 25°C)	I <sub>D(DC)</sub>	±4.0	Α
Drain Current (pulse) Note1	I <sub>D(pulse)</sub>	±16	Α
Total Power Dissipation (Tc = 25°C)	P <sub>T1</sub>	30	W
Total Power Dissipation (T <sub>A</sub> = 25°C)	P <sub>T2</sub>	2.0	W
Channel Temperature	$T_ch$	150	°C
Storage Temperature	$T_{stg}$	-55 to +150	°C
Single Avalanche Current Note2	las	4.0	Α
Single Avalanche Energy Note2	Eas	10.7	mJ

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

**2.** Starting T<sub>ch</sub> = 25°C, V<sub>DD</sub> = 150 V, R<sub>G</sub> = 25  $\Omega$ , V<sub>GS</sub> = 20  $\rightarrow$  0 V

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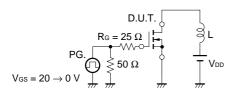
Not all devices/types available in every country. Please check with local NEC representative for availability and additional information.

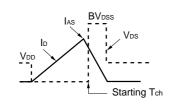


# **ELECTRICAL CHARACTERISTICS (TA = 25°C)**

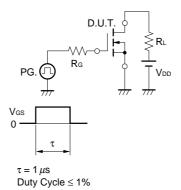
Characteristics	Symbol	Test Conditions	MIN.	TYP.	MAX.	Unit
Zero Gate Voltage Drain Current	Ipss	V <sub>DS</sub> = 600 V, V <sub>GS</sub> = 0 V			100	μΑ
Gate Leakage Current	Igss	V <sub>GS</sub> = ±30 V, V <sub>DS</sub> = 0 V			±10	μΑ
Gate Cut-off Voltage	V <sub>GS(off)</sub>	V <sub>DS</sub> = 10 V, I <sub>D</sub> = 1 mA	2.5		3.5	V
Forward Transfer Admittance	yfs	V <sub>DS</sub> = 10 V, I <sub>D</sub> = 2.0 A	1.0	50		S
Drain to Source On-state Resistance	RDS(on)	V <sub>GS</sub> = 10 V, I <sub>D</sub> = 2.0 A		1.6	2.2	Ω
Input Capacitance	Ciss	V <sub>DS</sub> = 10 V		550		pF
Output Capacitance	Coss	V <sub>GS</sub> = 0 V		115		pF
Reverse Transfer Capacitance	Crss	f = 1 MHz		13		pF
Turn-on Delay Time	t <sub>d(on)</sub>	V <sub>DD</sub> = 150 V, I <sub>D</sub> = 2.0 A		12		ns
Rise Time	tr	V <sub>GS(on)</sub> = 10 V		6		ns
Turn-off Delay Time	t <sub>d(off)</sub>	R <sub>G</sub> = 10 Ω		35		ns
Fall Time	tf	$R_L = 10 \Omega$		12		ns
Total Gate Charge	Q <sub>G</sub>	V <sub>DD</sub> = 450 V		15		nC
Gate to Source Charge	Qgs	V <sub>GS</sub> = 10 V		4		nC
Gate to Drain Charge	Q <sub>GD</sub>	I <sub>D</sub> = 4.0 A		4.4		nC
Body Diode Forward Voltage	V <sub>F(S-D)</sub>	I <sub>F</sub> = 4.0 A, V <sub>GS</sub> = 0 V		0.9		V
Reverse Recovery Time	trr	I <sub>F</sub> = 4.0 A, V <sub>GS</sub> = 0 V		1.3		μs
Reverse Recovery Charge	Qrr	di/dt = 50 A/μs		4.3		μC

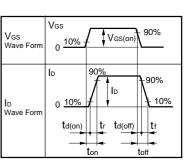
## **TEST CIRCUIT 1 AVALANCHE CAPABILITY**



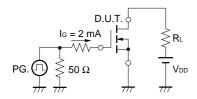


# TEST CIRCUIT 2 SWITCHING TIME



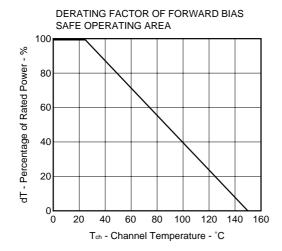


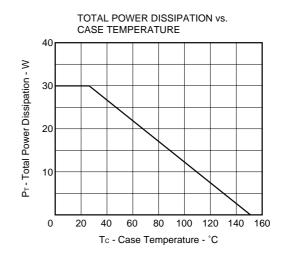
# **TEST CIRCUIT 3 GATE CHARGE**



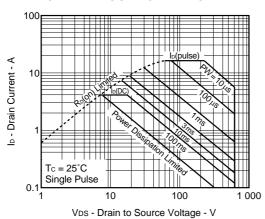


## TYPICAL CHARACTERISTICS (TA = 25°C)

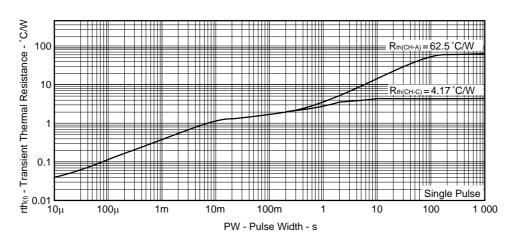




#### FORWARD BIAS SAFE OPERATING AREA



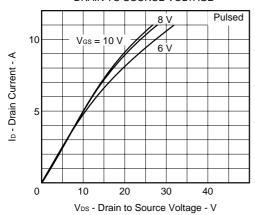
#### TRANSIENT THERMAL RESISTANCE vs. PULSE WIDTH



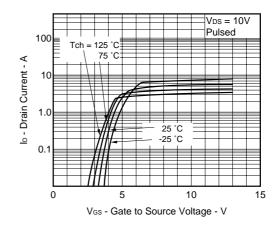
Data Sheet D13337EJ2V0DS 3



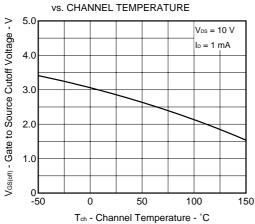
#### DRAIN CURRENT vs. DRAIN TO SOURCE VOLTAGE



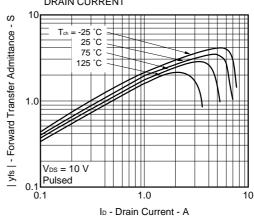
#### FORWARD TRANSFER CHARACTERISTICS



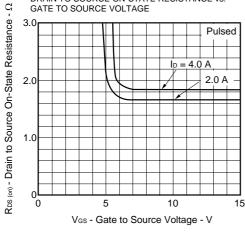
# GATE TO SOURCE CUTOFF VOLTAGE



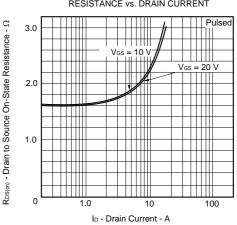
#### FORWARD TRANSFER ADMITTANCE vs. DRAIN CURRENT



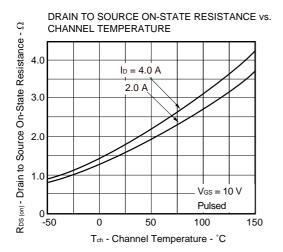
# DRAIN TO SOURCE ON-STATE RESISTANCE vs. GATE TO SOURCE VOLTAGE

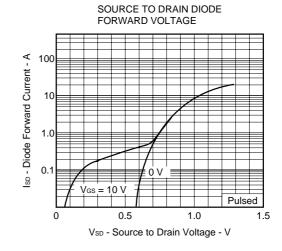


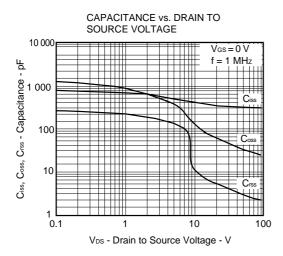
# DRAIN TO SOURCE ON-STATE RESISTANCE vs. DRAIN CURRENT

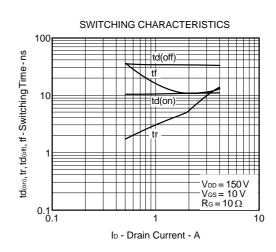


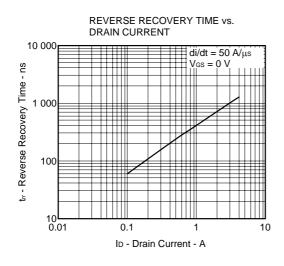


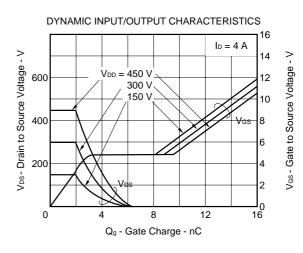




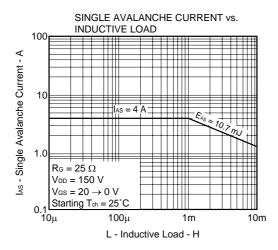


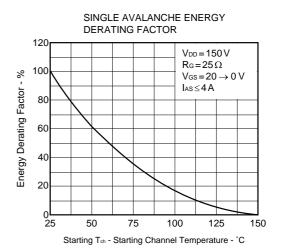






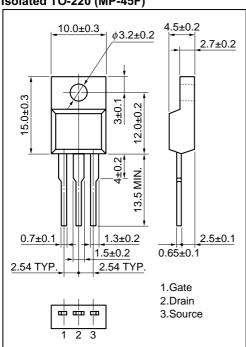
5



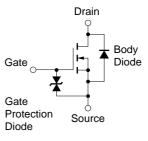


## PACKAGE DRAWINGS (Unit: mm)

## Isolated TO-220 (MP-45F)



## **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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[MEMO]

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