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DATA SHEET

NEC

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.

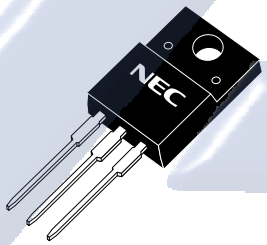
ORDERING INFORMATION

PART NUMBER	PACKAGE
2SK3114	Isolated TO-220

FEATURES

- Low on-state resistance:
  $R_{DS(on)}$ = 2.2 Ω MAX. (V_{GS} = 10 V, I_D = 2.0 A)
- Low gate charge:
  Q_G = 15 nC TYP. (V_{DD} = 450 V, V_{GS} = 10 V, I_D = 4.0 A)
- Gate voltage rating: ±30 V
- Avalanche capability ratings
- Isolated TO-220 package

★ (Isolated TO-220)



ABSOLUTE MAXIMUM RATINGS (T_A = 25°C)

Drain to Source Voltage (V_{GS} = 0 V)	V_{DSS}	600	V
Gate to Source Voltage (V_{DS} = 0 V)	V_{GSS}	±30	V
Drain Current (DC) (T_C = 25°C)	$I_{D(DC)}$	±4.0	A
Drain Current (pulse) Note1	$I_{D(pulse)}$	±16	A
Total Power Dissipation (T_C = 25°C)	P_{T1}	30	W
Total Power Dissipation (T_A = 25°C)	P_{T2}	2.0	W
Channel Temperature	T_{ch}	150	°C
Storage Temperature	T_{stg}	–55 to +150	°C
Single Avalanche Current Note2	I_{AS}	4.0	A
Single Avalanche Energy Note2	E_{AS}	10.7	mJ

Notes 1. PW ≤ 10 μs, Duty cycle ≤ 1%

2. Starting T_{ch} = 25°C, V_{DD} = 150 V, R_G = 25 Ω, V_{GS} = 20 → 0 V

Document No. D13337EJ2V0DS00 (2nd edition)
Date Published January 2001 NS CP(K)
Printed in Japan

The mark ★ shows major revised points.

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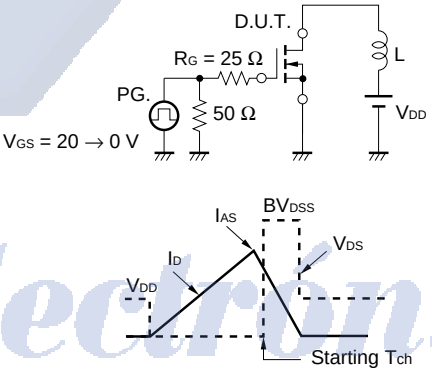
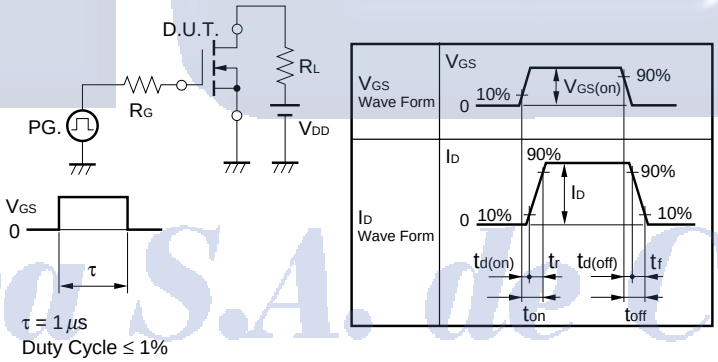
ELECTRICAL CHARACTERISTICS (T_A = 25°C)

Characteristics	Symbol	Test Conditions	MIN.	TYP.	MAX.	Unit
Zero Gate Voltage Drain Current	I_{DSS}	V_{DS} = 600 V, V_{GS} = 0 V			100	μA
Gate Leakage Current	I_{GSS}	V_{GS} = ±30 V, V_{DS} = 0 V			±10	μA
Gate Cut-off Voltage	$V_{GS(off)}$	V_{DS} = 10 V, I_D = 1 mA	2.5		3.5	V
Forward Transfer Admittance	$\|y_{fs}\|$	V_{DS} = 10 V, I_D = 2.0 A	1.0	50		S
Drain to Source On-state Resistance	$R_{DS(on)}$	V_{GS} = 10 V, I_D = 2.0 A		1.6	2.2	Ω
Input Capacitance	C_{iss}	V_{DS} = 10 V		550		pF
Output Capacitance	C_{oss}	V_{GS} = 0 V		115		pF
Reverse Transfer Capacitance	C_{rss}	f = 1 MHz		13		pF
Turn-on Delay Time	$t_{d(on)}$	V_{DD} = 150 V, I_D = 2.0 A		12		ns
Rise Time	t_r	$V_{GS(on)}$ = 10 V		6		ns
Turn-off Delay Time	$t_{d(off)}$	R_G = 10 Ω		35		ns
Fall Time	t_f	R_L = 10 Ω		12		ns
Total Gate Charge	Q_G	V_{DD} = 450 V		15		nC
Gate to Source Charge	Q_{GS}	V_{GS} = 10 V		4		nC
Gate to Drain Charge	Q_{GD}	I_D = 4.0 A		4.4		nC
Body Diode Forward Voltage	$V_{F(S-D)}$	I_F = 4.0 A, V_{GS} = 0 V		0.9		V
Reverse Recovery Time	t_{rr}	I_F = 4.0 A, V_{GS} = 0 V		1.3		μs
Reverse Recovery Charge	Q_{rr}	di/dt = 50 A/μs		4.3		μC

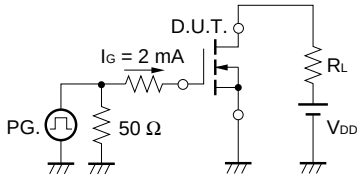
TEST CIRCUIT 1 AVALANCHE CAPABILITY



TEST CIRCUIT 2 SWITCHING TIME



TEST CIRCUIT 3 GATE CHARGE



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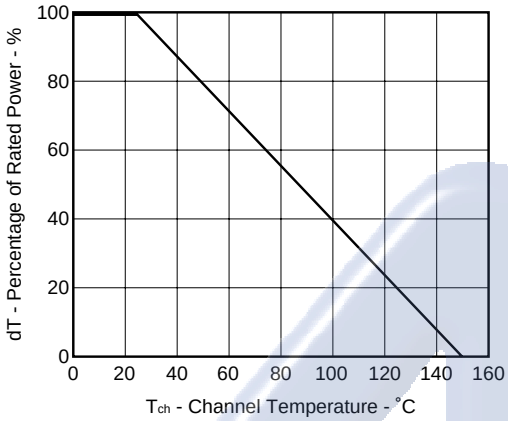
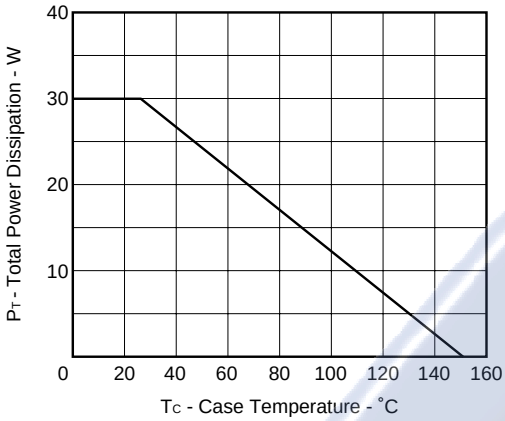
TYPICAL CHARACTERISTICS (T_A = 25°C)

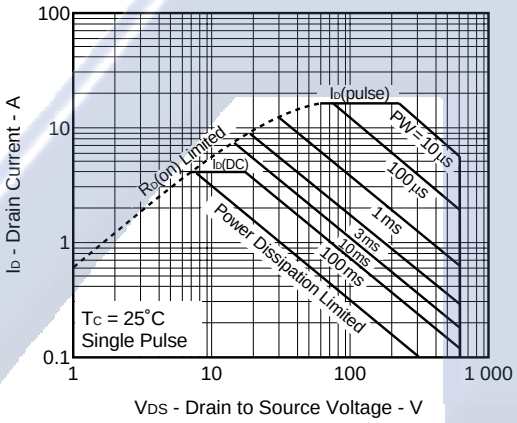
DERATING FACTOR OF FORWARD BIAS SAFE OPERATING AREA



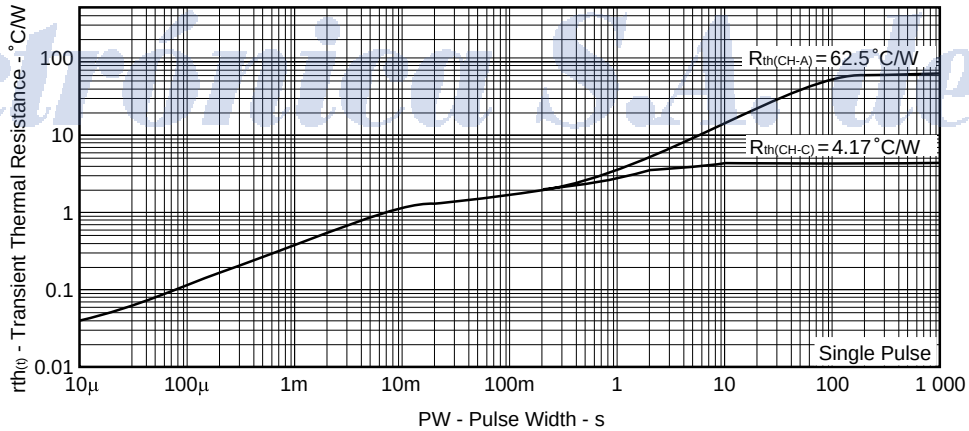
TOTAL POWER DISSIPATION vs. CASE TEMPERATURE



FORWARD BIAS SAFE OPERATING AREA



TRANSIENT THERMAL RESISTANCE vs. PULSE WIDTH



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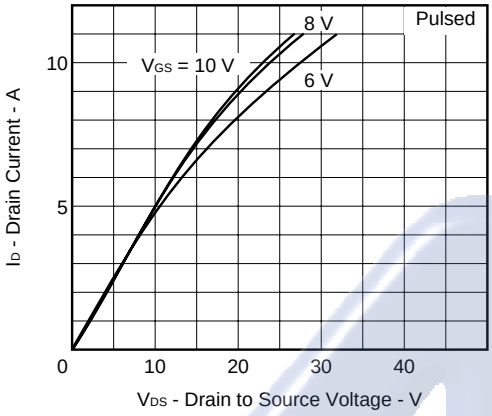
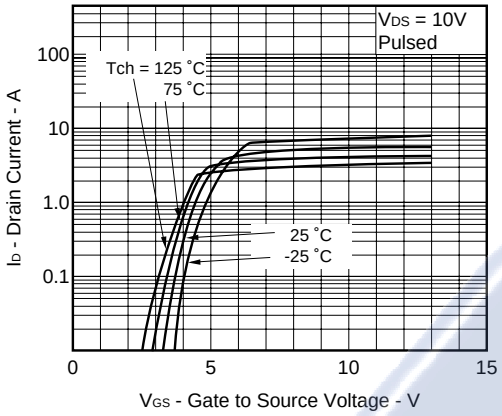
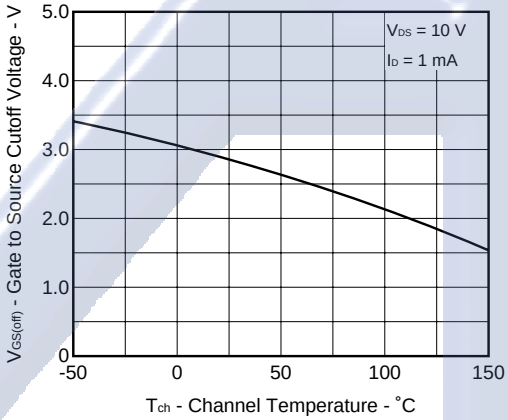
DRAIN CURRENT vs.
DRAIN TO SOURCE VOLTAGE



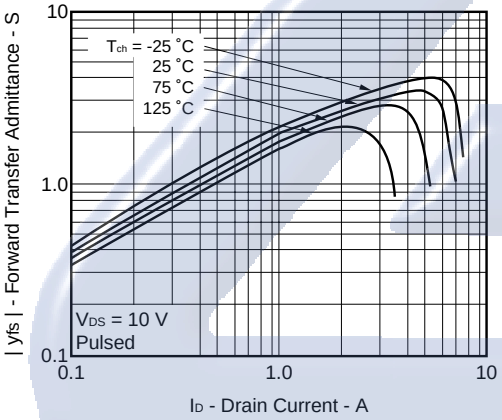
FORWARD TRANSFER CHARACTERISTICS



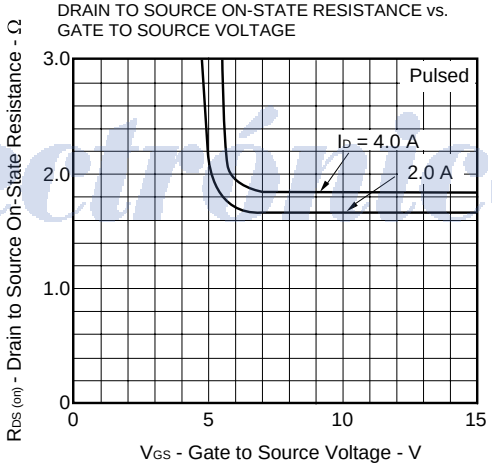
GATE TO SOURCE CUTOFF VOLTAGE
vs. CHANNEL TEMPERATURE



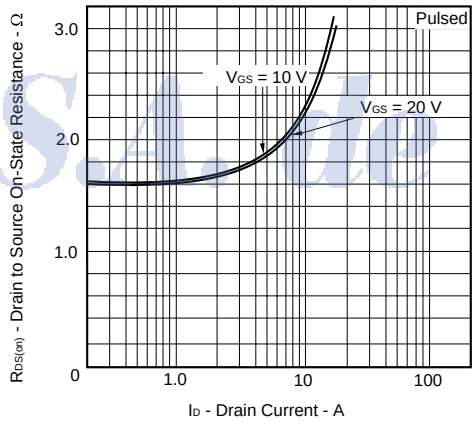
FORWARD TRANSFER ADMITTANCE vs.
DRAIN CURRENT



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



DRAIN TO SOURCE ON-STATE
RESISTANCE vs. DRAIN CURRENT



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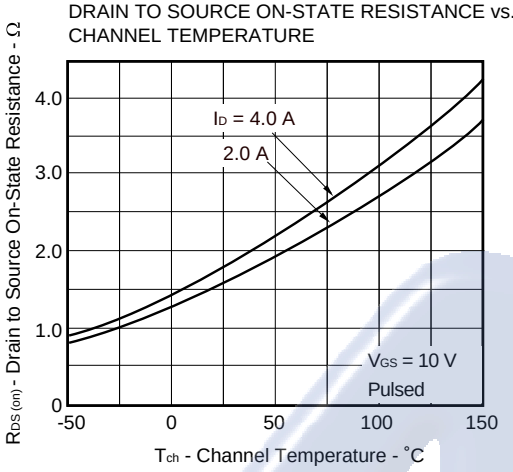
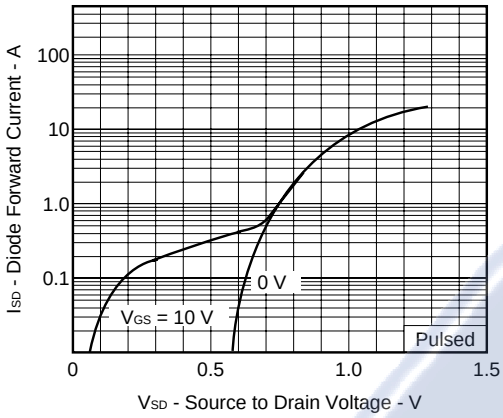
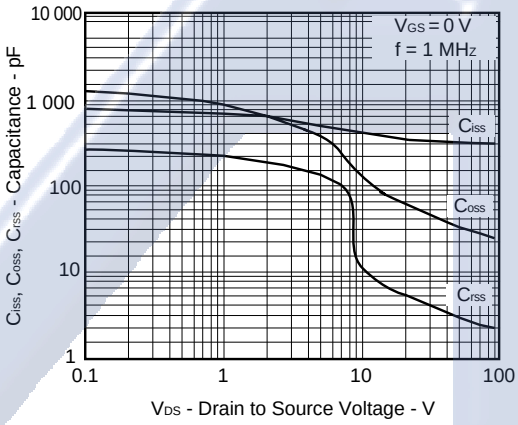
DRAIN TO SOURCE ON-STATE RESISTANCE vs. CHANNEL TEMPERATURE



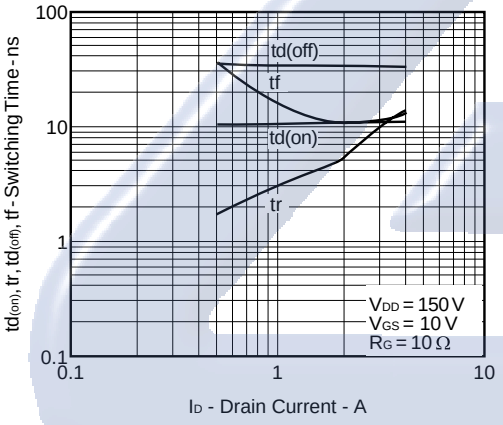
SOURCE TO DRAIN DIODE FORWARD VOLTAGE



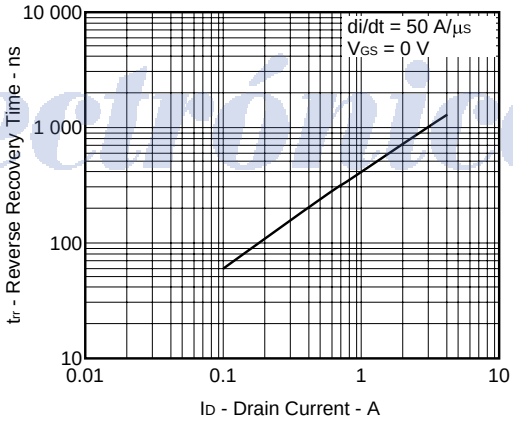
CAPACITANCE vs. DRAIN TO SOURCE VOLTAGE



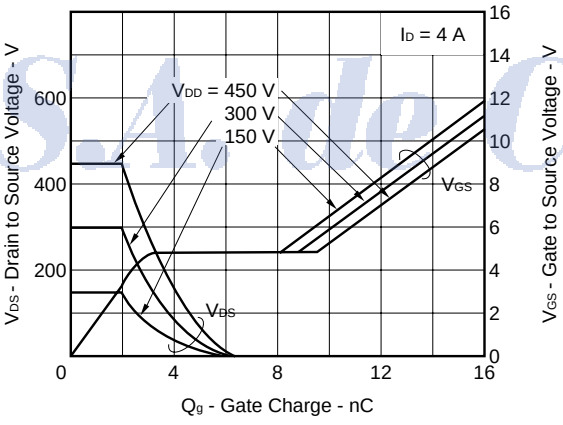
SWITCHING CHARACTERISTICS



REVERSE RECOVERY TIME vs. DRAIN CURRENT



DYNAMIC INPUT/OUTPUT CHARACTERISTICS



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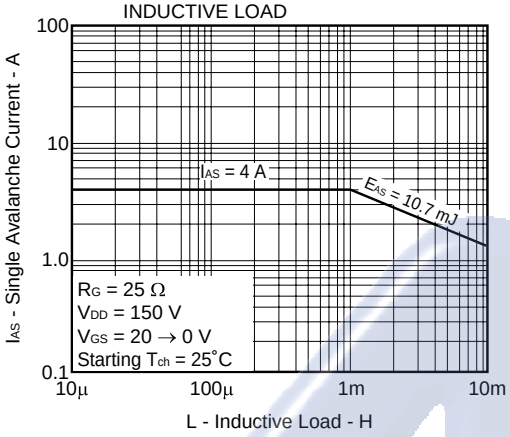
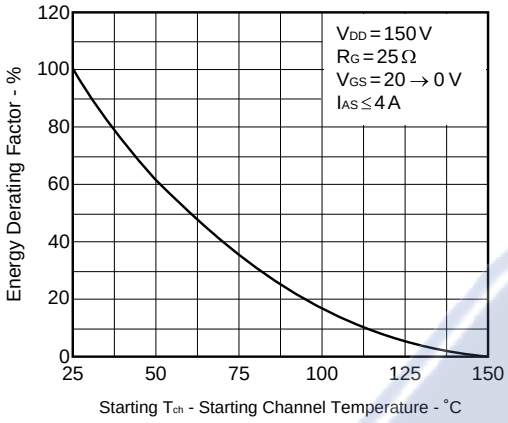
SINGLE AVALANCHE CURRENT vs. INDUCTIVE LOAD

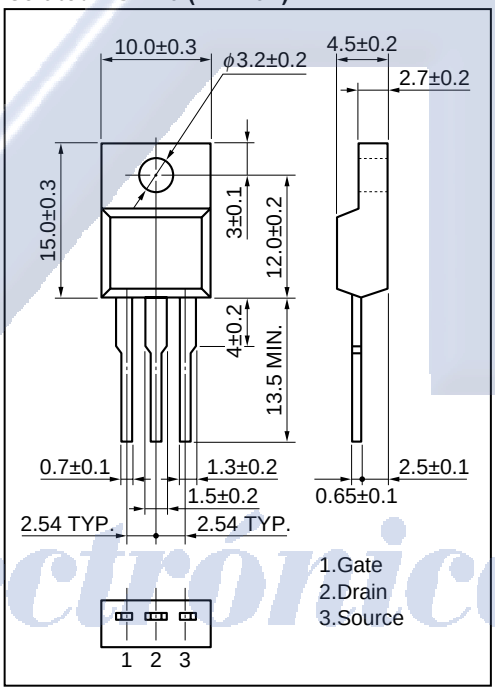


SINGLE AVALANCHE ENERGY DERATING FACTOR

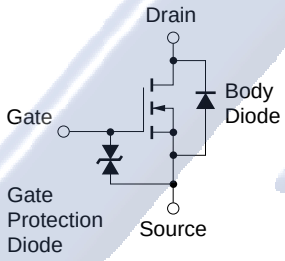


PACKAGE DRAWINGS (Unit: mm)

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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