NEC

MOS FIELD EFFECT TRANSISTOR
2SK3507

SWITCHING
N-CHANNEL POWER MOS FET

DESCRIPTION

The 2SK3507 is N-channel MOS FET device that features a low on-state resistance and excellent switching characteristics, designed for low voltage high current applications such as DC/DC converter with synchronous rectifier.

ORDERING INFORMATION

PART NUMBER	PACKAGE
2SK3507-ZK	TO-252 (MP-3ZK)

FEATURES

- 4.5 V drive available
- Low on-state resistance

  $R_{DS(on)1}$ = 45 mΩ MAX. (V_{GS} = 10 V, I_D = 11 A)
- Low gate charge

  Q_G = 8.5 nC TYP. (V_{DD} = 24 V, V_{GS} = 10 V, I_D = 22 A)
- Built-in G-S protection diode
- Surface mount package available

ABSOLUTE MAXIMUM RATINGS (T_A = 25°C)

Drain to Source Voltage (V_{GS} = 0 V)	V_{DSS}	30	V
Gate to Source Voltage (V_{DS} = 0 V)	V_{GSS}	±16	V
Drain Current (DC) (T_C = 25°C)	$I_{D(DC)}$	±22	A
Drain Current (pulse) Note1	$I_{D(pulse)}$	±45	A
Total Power Dissipation (T_C = 25°C)	P_{T1}	20	W
Total Power Dissipation Note2	P_{T2}	1.5	W
Channel Temperature	T_{ch}	150	°C
Storage Temperature	T_{stg}	–55 to +150	°C
Single Avalanche Current Note3	I_{AS}	10	A
Single Avalanche Energy Note3	E_{AS}	10	mJ

Notes 1. PW ≤ 10 μs, Duty Cycle ≤ 1%

2. Mounted on glass epoxy board of 1 inch x 1 inch x 1.6 mm

3. Starting T_{ch} = 25°C, V_{DD} = 15 V, R_G = 25 Ω, V_{GS} = 20 → 0 V

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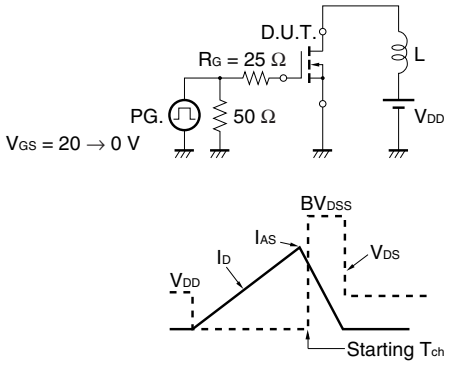
ELECTRICAL CHARACTERISTICS (T_A = 25°C)

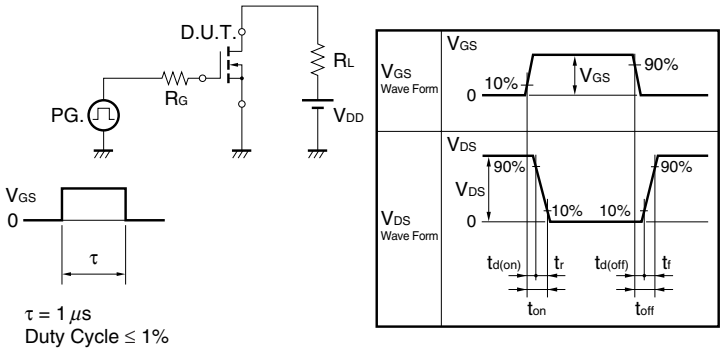
CHARACTERISTICS	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNIT
Zero Gate Voltage Drain Current	I_{DSS}	V_{DS} = 30 V, V_{GS} = 0 V			10	μA
Gate Leakage Current	I_{GSS}	V_{GS} = ±16 V, V_{DS} = 0 V			±10	μA
Gate Cut-off Voltage	$V_{GS(off)}$	V_{DS} = 10 V, I_D = 1 mA	1.5		2.5	V
Forward Transfer Admittance **Note**	$\|y_{fs}\|$	V_{DS} = 4.0 V, I_D = 11 A	6			S
Drain to Source On-state Resistance **Note**	$R_{DS(on)1}$	V_{GS} = 10 V, I_D = 11 A		28	45	mΩ
	$R_{DS(on)2}$	V_{GS} = 4.5 V, I_D = 11 A		46	76	mΩ
Input Capacitance	C_{iss}	V_{DS} = 10 V		360		pF
Output Capacitance	C_{oss}	V_{GS} = 0 V		125		pF
Reverse Transfer Capacitance	C_{rss}	f = 1 MHz		65		pF
Turn-on Delay Time	$t_{d(on)}$	V_{DD} = 15 V, I_D = 11 A		6.6		ns
Rise Time	t_r	V_{GS} = 10 V		3.6		ns
Turn-off Delay Time	$t_{d(off)}$	R_G = 10 Ω		16		ns
Fall Time	t_f			5.3		ns
Total Gate Charge	Q_G	V_{DD} = 24 V		8.5		nC
Gate to Source Charge	Q_{GS}	V_{GS} = 10 V		2		nC
Gate to Drain Charge	Q_{GD}	I_D = 22 A		2.1		nC
Body Diode Forward Voltage **Note**	$V_{F(S-D)}$	I_F = 22 A, V_{GS} = 0 V		1.0		V
Reverse Recovery Time	t_{rr}	I_F = 22 A, V_{GS} = 0 V		31		ns
Reverse Recovery Charge	Q_{rr}	di/dt = 100 A/μs		26		nC

Note Pulsed

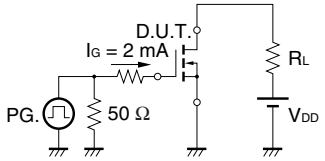
TEST CIRCUIT 1 AVALANCHE CAPABILITY



TEST CIRCUIT 2 SWITCHING TIME

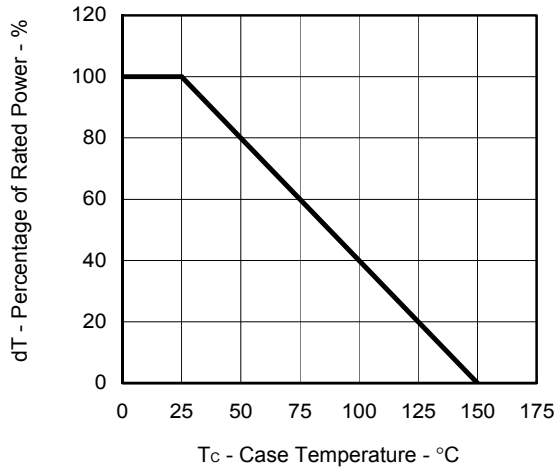


TEST CIRCUIT 3 GATE CHARGE

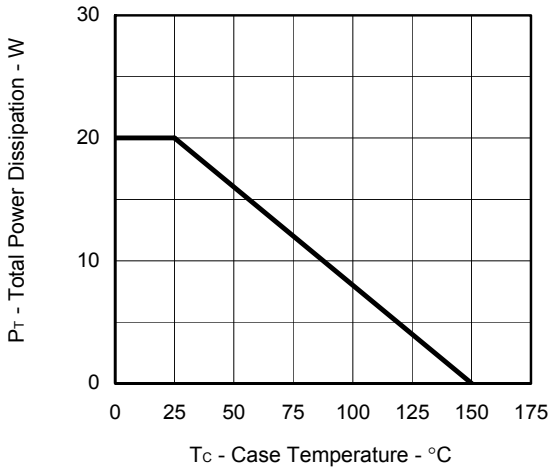


TYPICAL CHARACTERISTICS (T_A = 25°C)

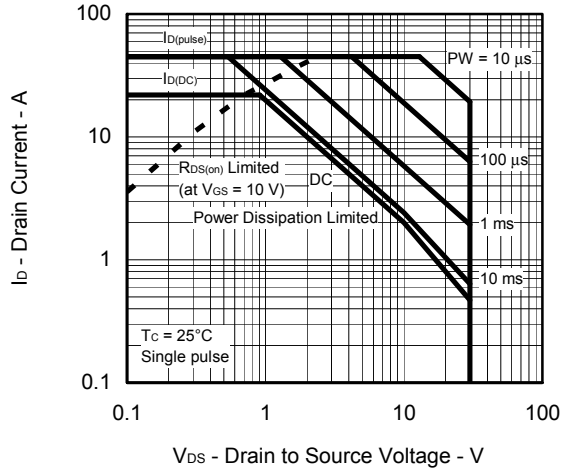
DERATING FACTOR OF FORWARD BIAS SAFE OPERATING AREA



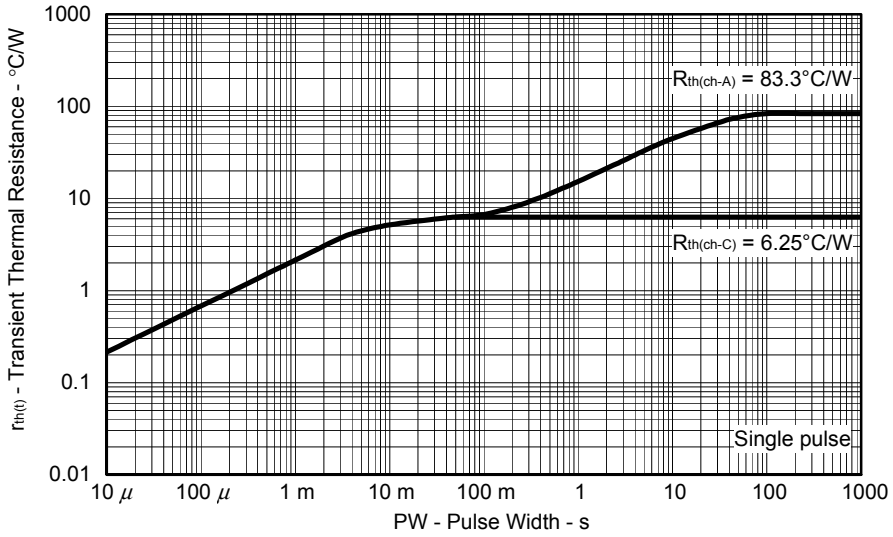
TOTAL POWER DISSIPATION vs. CASE TEMPERATURE



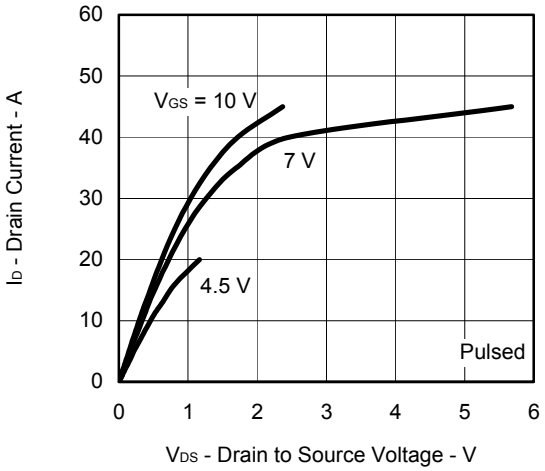
FORWARD BIAS SAFE OPERATING AREA



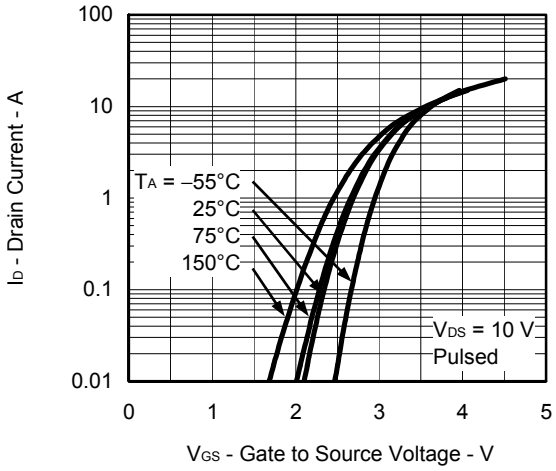
TRANSIENT THERMAL RESISTANCE vs. PULSE WIDTH



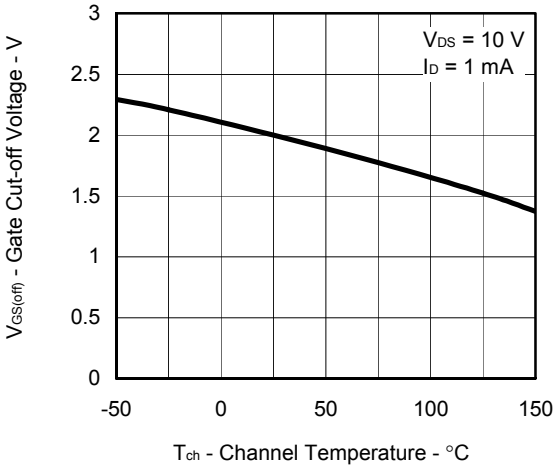
DRAIN CURRENT vs.
DRAIN TO SOURCE VOLTAGE



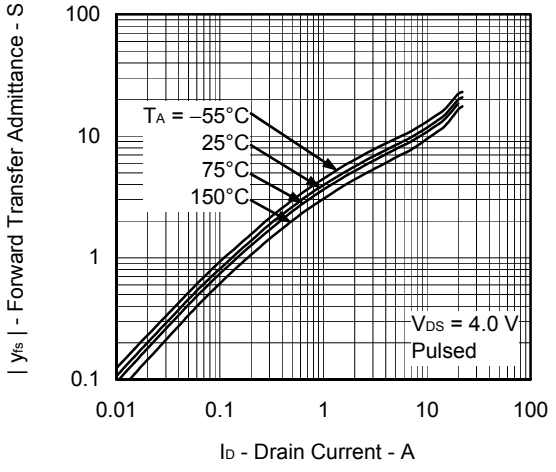
FORWARD TRANSFER CHARACTERISTICS



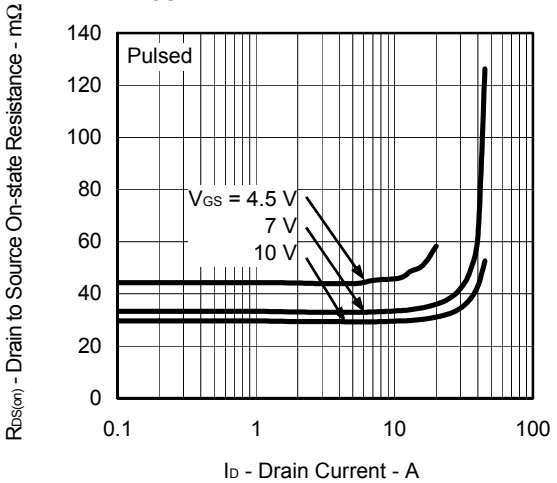
GATE CUT-OFF VOLTAGE vs.
CHANNEL TEMPERATURE



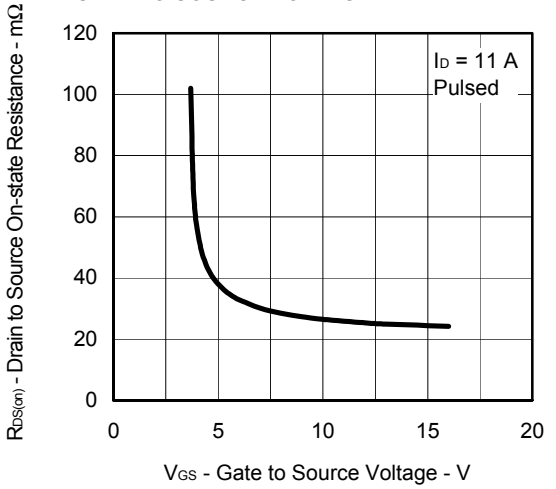
FORWARD TRANSFER ADMITTANCE vs.
DRAIN CURRENT



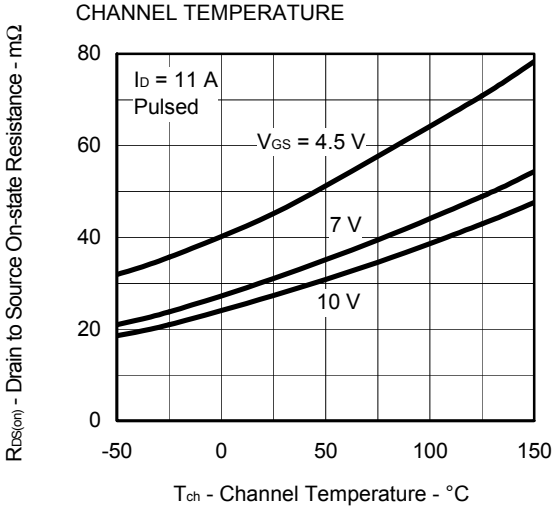
DRAIN TO SOURCE ON-STATE RESISTANCE vs.
DRAIN CURRENT



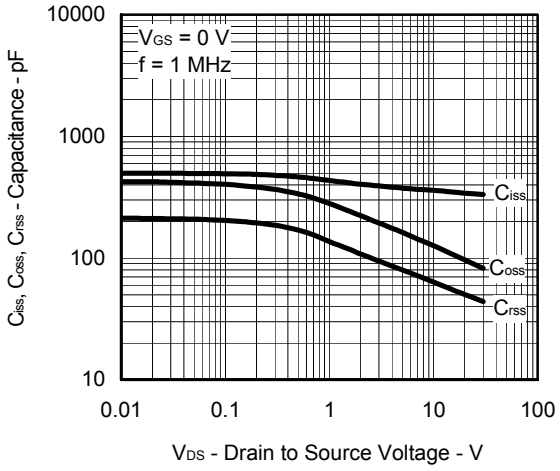
DRAIN TO SOURCE ON-STATE RESISTANCE vs.
GATE TO SOURCE VOLTAGE



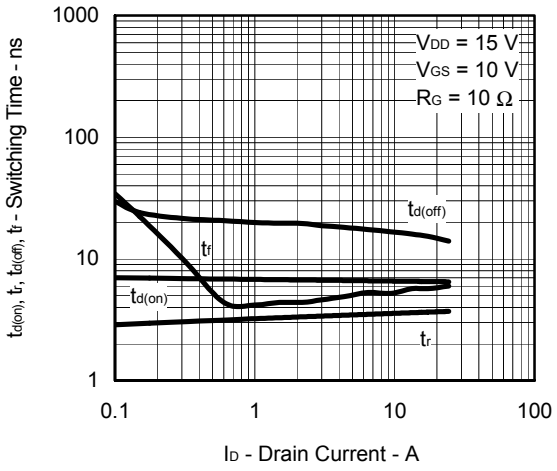
DRAIN TO SOURCE ON-STATE RESISTANCE vs. CHANNEL TEMPERATURE



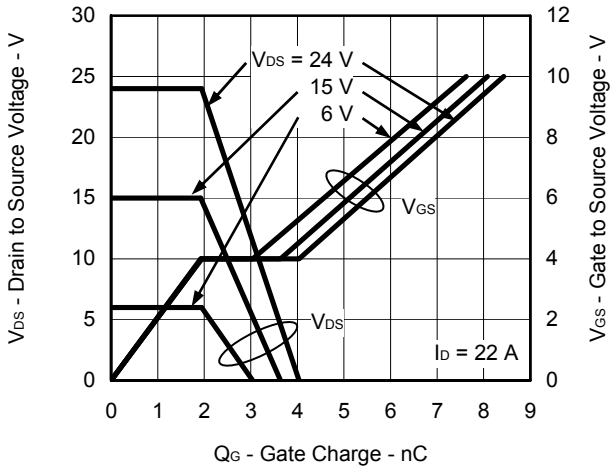
CAPACITANCE vs. DRAIN TO SOURCE VOLTAGE



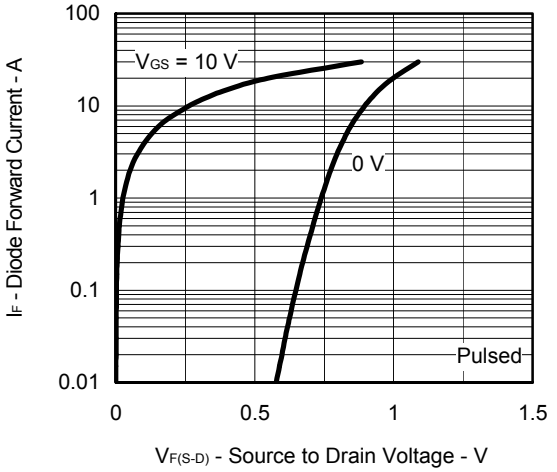
SWITCHING CHARACTERISTICS



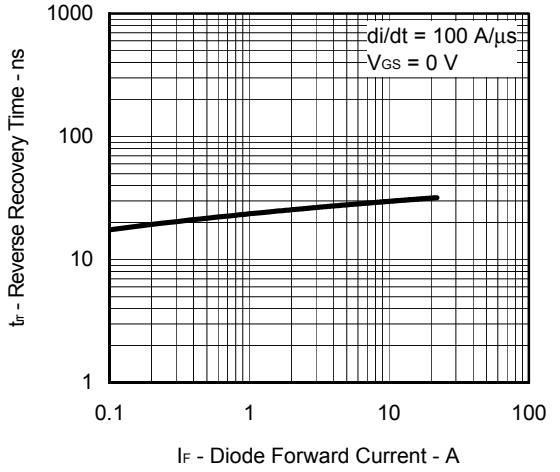
DYNAMIC INPUT/OUTPUT CHARACTERISTICS



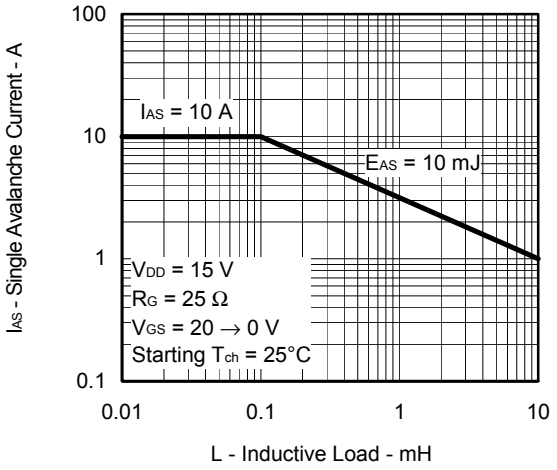
SOURCE TO DRAIN DIODE FORWARD VOLTAGE



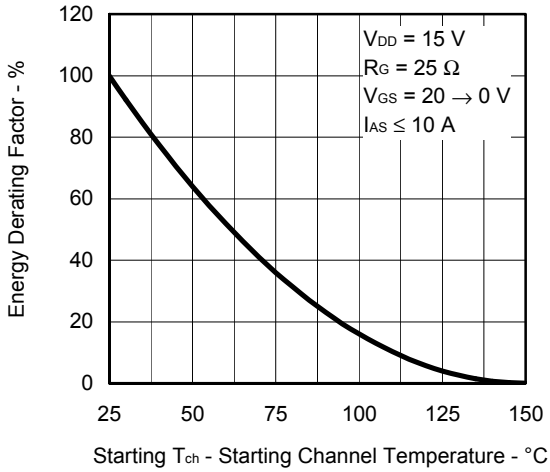
REVERSE RECOVERY TIME vs. DIODE FORWARD CURRENT



SINGLE AVALANCHE CURRENT vs.
INDUCTIVE LOAD

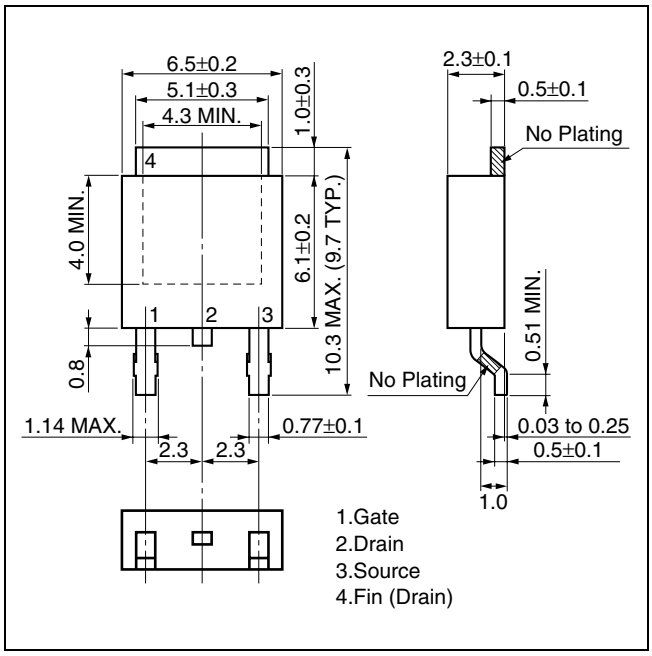


SINGLE AVALANCHE ENERGY
DERATING FACTOR

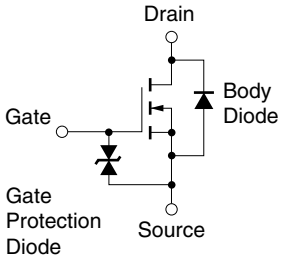


PACKAGE DRAWING (Unit: mm)

TO-252 (MP-3ZK)



EQUIVALENT CIRCUIT



Caution Strong electric field, when exposed to this device, can cause destruction of the gate oxide and ultimately degrade the device operation. Steps must be taken to stop generation of static electricity as much as possible, and quickly dissipate it once, when it has occurred.

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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