

# MOS FIELD EFFECT TRANSISTOR

## 2SK3454

### SWITCHING

### N-CHANNEL POWER MOS FET

### INDUSTRIAL USE

#### DESCRIPTION

The 2SK3454 is N-channel MOS FET device that features a low on-state resistance and excellent switching characteristics, and designed for high voltage applications such as DC/DC converter.

#### ORDERING INFORMATION

PART NUMBER	PACKAGE
2SK3454	Isolated TO-220

#### FEATURES

- Gate voltage rating  $\pm 30$  V
- Low on-state resistance  
 $R_{DS(on)} = 0.63 \Omega$  MAX. ( $V_{GS} = 10$  V,  $I_D = 4.0$  A)
- Low input capacitance  
 $C_{iss} = 400$  pF TYP. ( $V_{DS} = 10$  V,  $V_{GS} = 0$  V)
- Built-in gate protection diode
- Isolated TO-220 package

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

Drain to Source Voltage ( $V_{GS} = 0$ V)	$V_{DSS}$	250	V
Gate to Source Voltage ( $V_{DS} = 0$ V)	$V_{GSS}$	$\pm 30$	V
Drain Current(DC) ( $T_C = 25^\circ\text{C}$ )	$I_{D(DC)}$	$\pm 7.0$	A
Drain Current(pulse) <sup>Note1</sup>	$I_{D(pulse)}$	$\pm 21$	A
Total Power Dissipation ( $T_A = 25^\circ\text{C}$ )	$P_{T1}$	2.0	W
Total Power Dissipation ( $T_C = 25^\circ\text{C}$ )	$P_{T2}$	30	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>	$I_{AS}$	7.0	A
Single Avalanche Energy <sup>Note2</sup>	$E_{AS}$	49	mJ

**Notes1.**  $PW \leq 10 \mu\text{s}$ , Duty Cycle  $\leq 1\%$

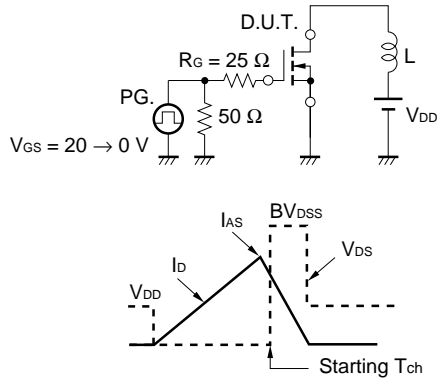
**2.** Starting  $T_{ch} = 25^\circ\text{C}$ ,  $V_{DD} = 125$  V,  $R_G = 25 \Omega$ ,  $V_{GS} = 20$  V  $\rightarrow 0$  V

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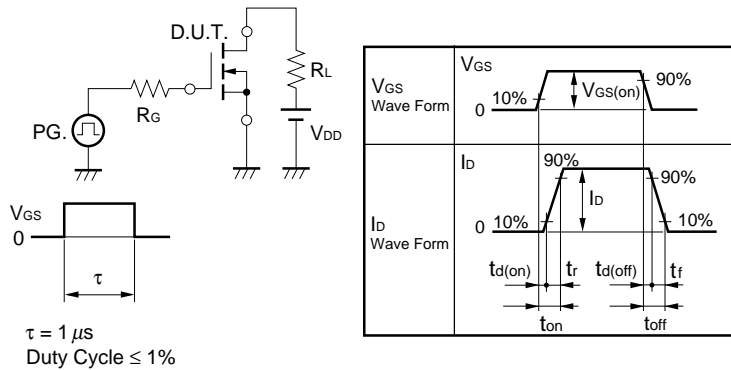
**ELECTRICAL CHARACTERISTICS (T<sub>A</sub> = 25°C)**

Characteristics	Symbol	Test Conditions	MIN.	TYP.	MAX.	Unit
Drain Leakage Current	I <sub>DSS</sub>	V <sub>DS</sub> = 250 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 to Source Cut-off Voltage	V <sub>GS(off)</sub>	V <sub>DS</sub> = 10 V, I <sub>D</sub> = 1 mA	2.5		4.5	V
Forward Transfer Admittance	y <sub>fs</sub>	V <sub>DS</sub> = 10 V, I <sub>D</sub> = 4.0 A	1.0			S
Drain to Source On-state Resistance	R <sub>DS(on)</sub>	V <sub>GS</sub> = 10 V, I <sub>D</sub> = 4.0 A		0.5	0.63	Ω
Input Capacitance	C <sub>iss</sub>	V <sub>DS</sub> = 10 V		400		pF
Output Capacitance	C <sub>oss</sub>	V <sub>GS</sub> = 0 V		110		pF
Reverse Transfer Capacitance	C <sub>rss</sub>	f = 1 MHz		55		pF
Turn-on Delay Time	T <sub>d(on)</sub>	V <sub>DD</sub> = 125 V, I <sub>D</sub> = 4.0 A		11		ns
Rise Time	T <sub>r</sub>	V <sub>GS(on)</sub> = 10 V		18		ns
Turn-off Delay Time	T <sub>d(off)</sub>	R <sub>G</sub> = 10 Ω		32		ns
Fall Time	T <sub>f</sub>			15		ns
Total Gate Charge	Q <sub>G</sub>	V <sub>DD</sub> = 200 V		18		nC
Gate to Source Charge	Q <sub>GS</sub>	V <sub>GS</sub> = 10 V		3.5		nC
Gate to Drain Charge	Q <sub>GD</sub>	I <sub>D</sub> = 7.0 A		10		nC
Diode Forward Voltage	V <sub>F(S-D)</sub>	I <sub>F</sub> = 7.0 A, V <sub>GS</sub> = 0 V		1.0		V
Reverse Recovery Time	T <sub>rr</sub>	I <sub>F</sub> = 7.0 A, V <sub>GS</sub> = 0 V		250		ns
Reverse Recovery Charge	Q <sub>rr</sub>	di/dt = 50 A/μs		1.0		μC

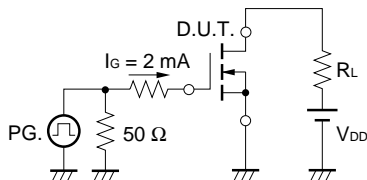
**TEST CIRCUIT 1 AVALANCHE CAPABILITY**



**TEST CIRCUIT 2 SWITCHING TIME**

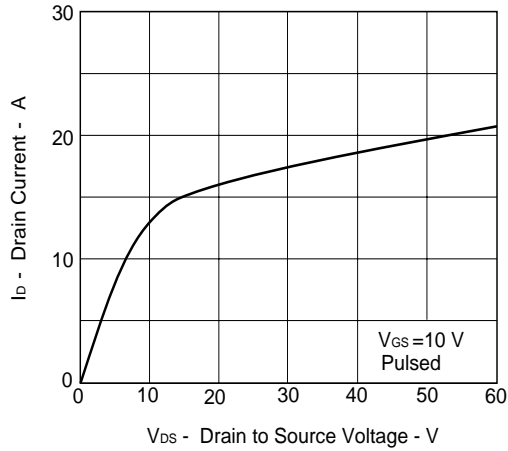


**TEST CIRCUIT 3 GATE CHARGE**

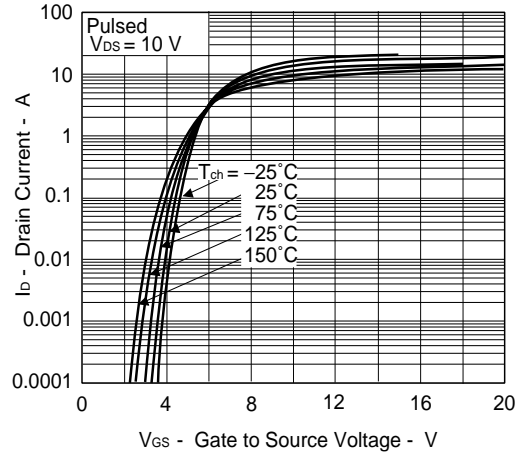


TYPICAL CHARACTERISTICS

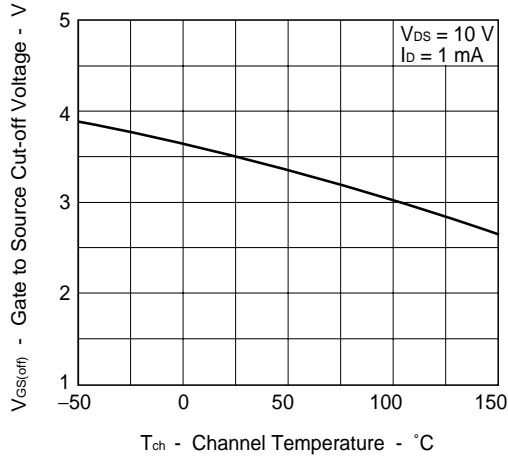
DRAIN CURRENT vs. DRAIN TO SOURCE VOLTAGE



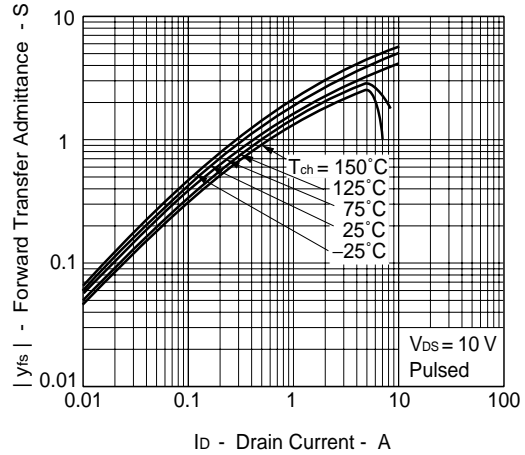
FORWARD TRANSFER CHARACTERISTICS



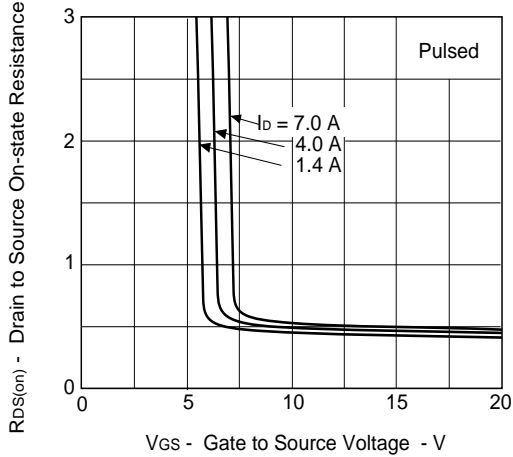
GATE TO SOURCE CUT-OFF VOLTAGE vs. CHANNEL TEMPERATURE



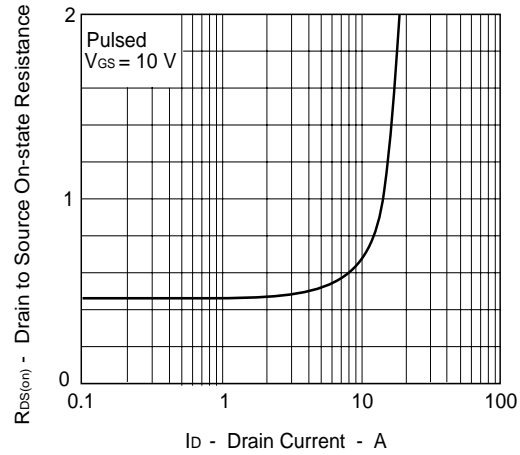
FORWARD TRANSFER ADMITTANCE vs. DRAIN CURRENT

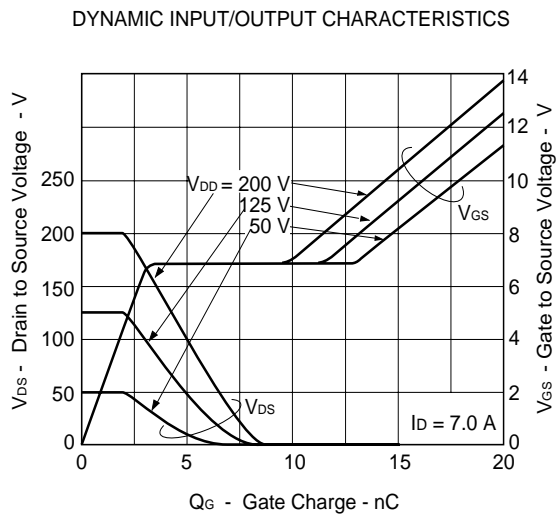
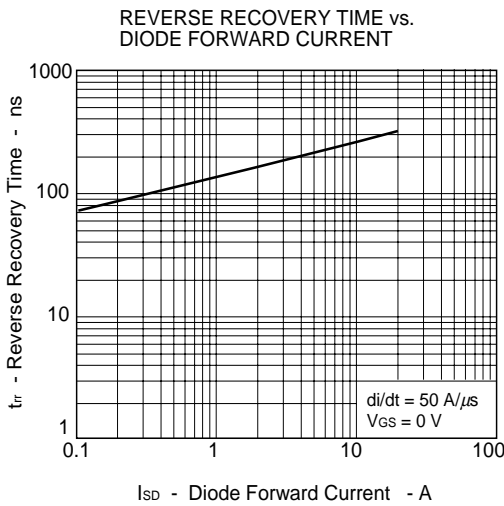
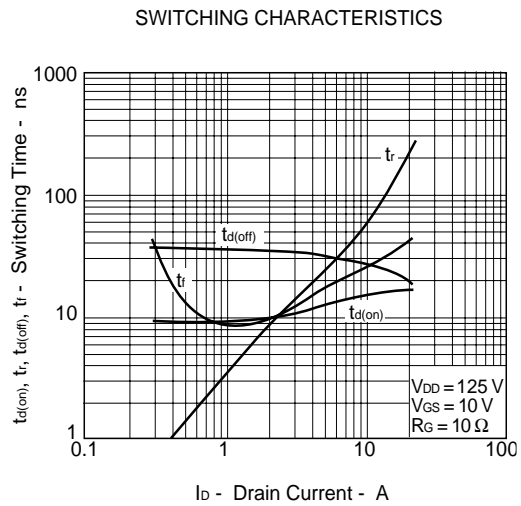
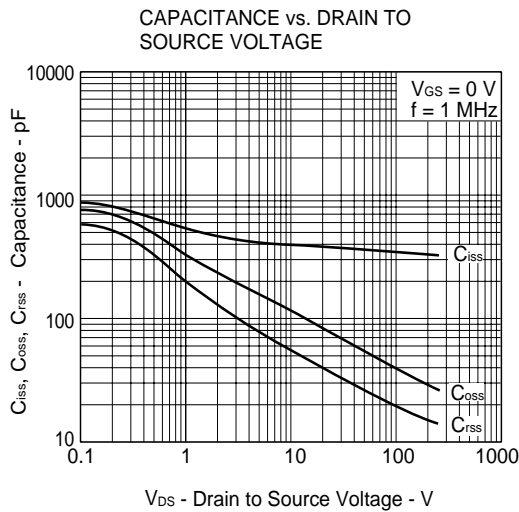
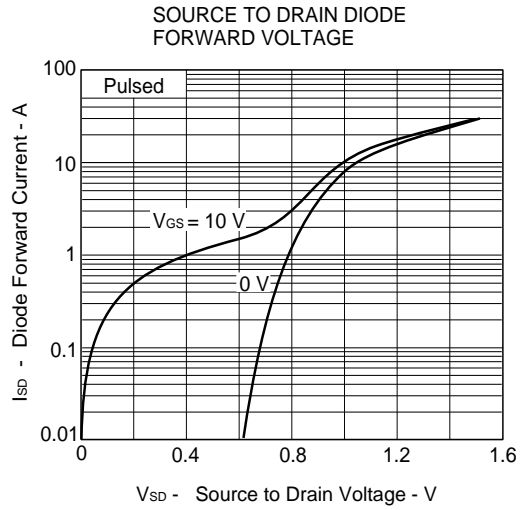
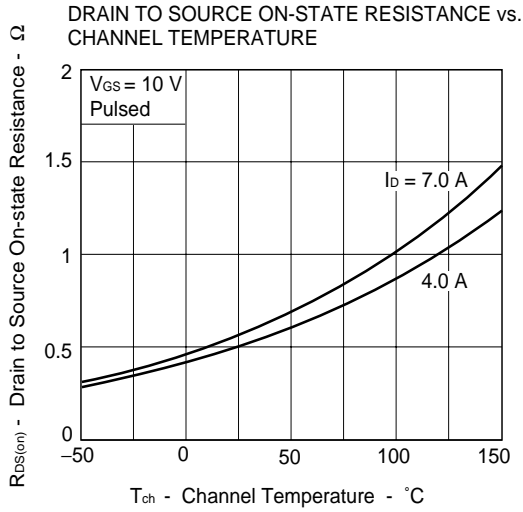


DRAIN TO SOURCE ON-STATE RESISTANCE vs. GATE TO SOURCE VOLTAGE

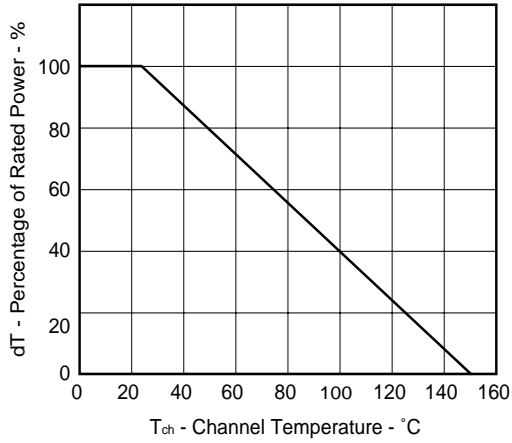


DRAIN TO SOURCE ON-STATE RESISTANCE vs. DRAIN CURRENT

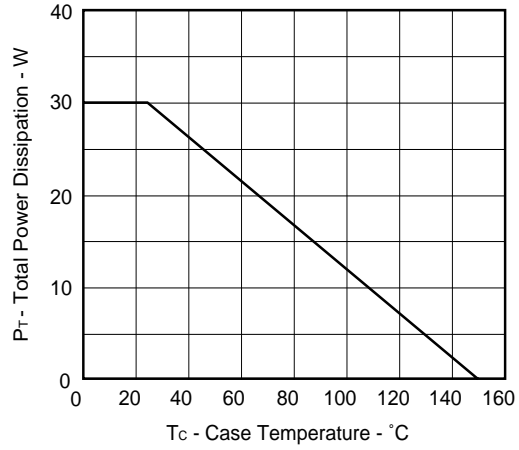




DERATING FACTOR OF FORWARD BIAS SAFE OPERATING AREA

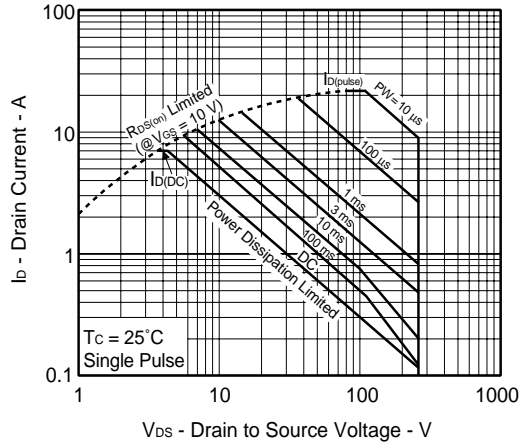


TOTAL POWER DISSIPATION vs. CASE TEMPERATURE



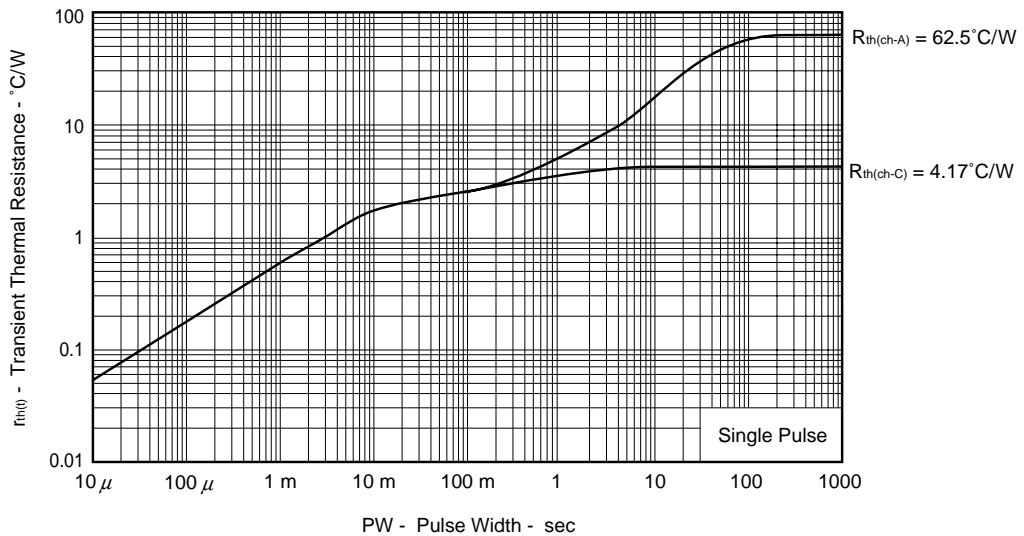
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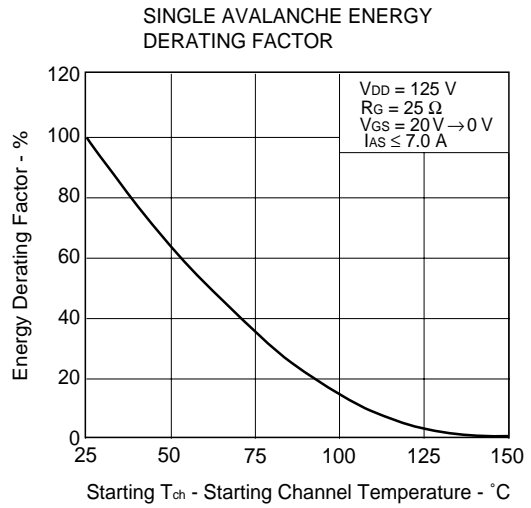
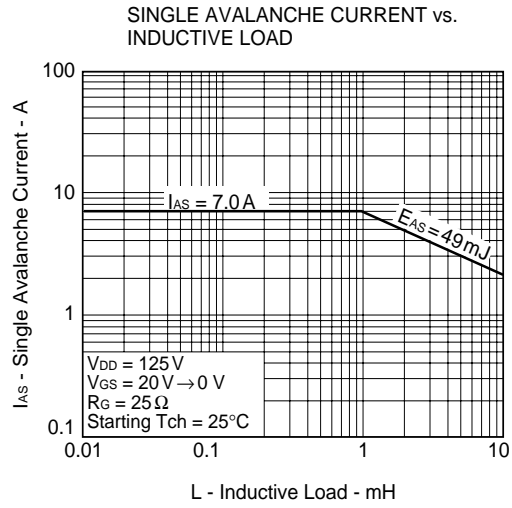
FORWARD BIAS SAFE OPERATING AREA



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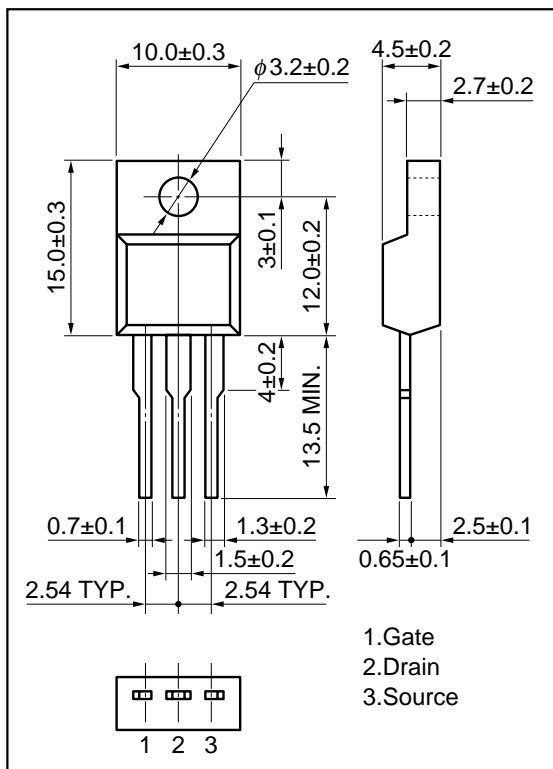
TRANSIENT THERMAL RESISTANCE vs. PULSE WIDTH



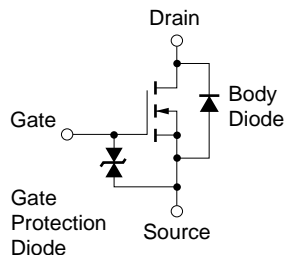


PACKAGE DRAWING (Unit: mm)

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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