

# MOS FIELD EFFECT TRANSISTOR

## 2SK3115

### SWITCHING

### N-CHANNEL POWER MOS FET

### INDUSTRIAL USE

#### Description

The 2SK3115 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.

#### Features

- Low gate charge  
 $Q_G = 26 \text{ nC TYP. (} V_{DD} = 450 \text{ V, } V_{GS} = 10 \text{ V, } I_D = 6.0 \text{ A)}$
- Gate voltage rating  $\pm 30 \text{ V}$
- Low on-state resistance  
 $R_{DS(on)} = 1.2 \Omega \text{ MAX. (} V_{GS} = 10 \text{ V, } I_D = 3.0 \text{ A)}$
- Avalanche capability ratings

#### Ordering Information

Part number	Package
2SK3115	Isolated TO-220

#### Absolute Maximum Ratings ( $T_A = 25 \text{ }^\circ\text{C}$ )

Drain to source voltage ( $V_{GS} = 0$ )	$V_{DSS}$	600	V
Gate to source voltage ( $V_{DS} = 0$ )	$V_{GSS}$	$\pm 30$	V
Drain current (DC) ( $T_C = 25 \text{ }^\circ\text{C}$ )	$I_{D(DC)}$	$\pm 6.0$	A
Drain current (pulse) <sup>Note1</sup>	$I_{D(pulse)}$	$\pm 24$	A
Total power dissipation ( $T_A = 25 \text{ }^\circ\text{C}$ )	$P_{T1}$	2.0	W
Total power dissipation ( $T_C = 25 \text{ }^\circ\text{C}$ )	$P_{T2}$	35	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>	$I_{AS}$	6.0	A
Single avalanche energy <sup>Note2</sup>	$E_{AS}$	24	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  $T_{ch} = 25 \text{ }^\circ\text{C}$ ,  $V_{DD} = 150 \text{ V}$ ,  $R_G = 25 \Omega$ ,  $V_{GS} = 20 \text{ V} \rightarrow 0$

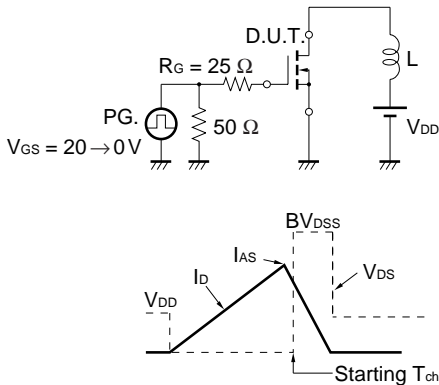
**3.**  $I_F \leq 3.0 \text{ A}$ ,  $V_{clamp} = 600 \text{ V}$ ,  $di/dt \leq 100 \text{ A}/\mu\text{s}$ ,  $T_A = 25 \text{ }^\circ\text{C}$

The information in this document is subject to change without notice.

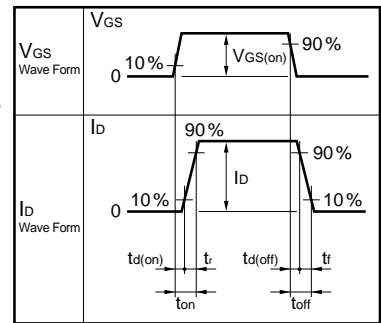
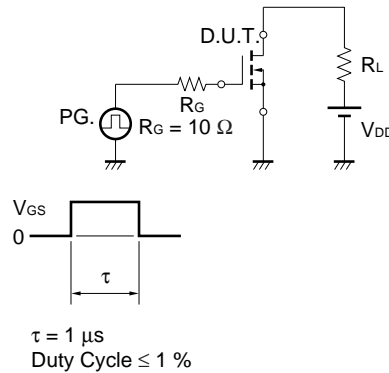
Electrical Characteristics (T<sub>A</sub> = 25 °C)

Characteristics	Symbol	MIN.	TYP.	MAX.	Unit	Test Conditions
Drain leakage current	I <sub>DSS</sub>			100	μA	V <sub>DS</sub> = 600 V, V <sub>GS</sub> = 0
Gate to source leakage current	I <sub>GSS</sub>			±100	nA	V <sub>GS</sub> = ±30 V, V <sub>DS</sub> = 0
Gate to source cutoff voltage	V <sub>GS(off)</sub>	2.5		3.5	V	V <sub>DS</sub> = 10 V, I <sub>D</sub> = 1 mA
Forward transfer admittance	y <sub>fs</sub>	2.0			S	V <sub>DS</sub> = 10 V, I <sub>D</sub> = 3.0 A
Drain to source on-resistance	R <sub>DS(on)</sub>		0.9	1.2	Ω	V <sub>GS</sub> = 10 V, I <sub>D</sub> = 3.0 A
Input capacitance	C <sub>iss</sub>		1100		pF	V <sub>DS</sub> = 10 V, V <sub>GS</sub> = 0, f = 1 MHz
Output capacitance	C <sub>oss</sub>		200		pF	
Reverse transfer capacitance	C <sub>rss</sub>		20		pF	
Turn-on delay time	t <sub>d(on)</sub>		18		ns	V <sub>DD</sub> = 150 V, I <sub>D</sub> = 3.0 A, V <sub>GS(on)</sub> = 10 V, R <sub>G</sub> = 10 Ω, R <sub>L</sub> = 50 Ω
Rise time	t <sub>r</sub>		12		ns	
Turn-off delay time	t <sub>d(off)</sub>		50		ns	
Fall time	t <sub>f</sub>		15		ns	
Total gate charge	Q <sub>G</sub>		26		nC	V <sub>DD</sub> = 450 V, V <sub>GS</sub> = 10 V, I <sub>D</sub> = 6.0 A
Gate to source charge	Q <sub>GS</sub>		6		nC	
Gate to drain charge	Q <sub>GD</sub>		10		nC	
Body diode forward voltage	V <sub>F(S-D)</sub>		1.0		V	I <sub>F</sub> = 6.0 A, V <sub>GS</sub> = 0
Reverse recovery time	t <sub>rr</sub>		1.4		μs	I <sub>F</sub> = 6.0 A, V <sub>GS</sub> = 0,
Reverse recovery charge	Q <sub>rr</sub>		6.5		μC	di/dt = 50 A/μs

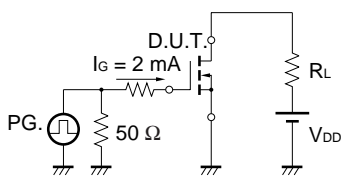
Test Circuit 1 Avalanche Capability



Test Circuit 2 Switching Time

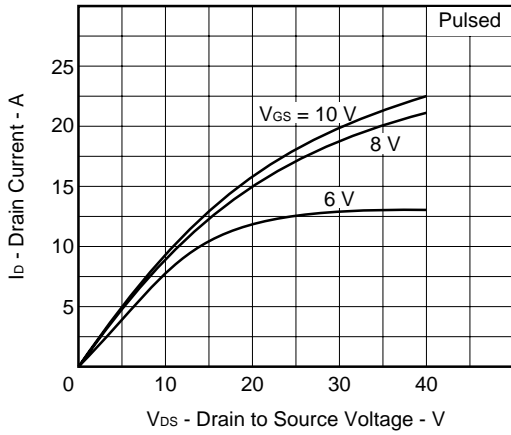


Test Circuit 3 Gate Charge

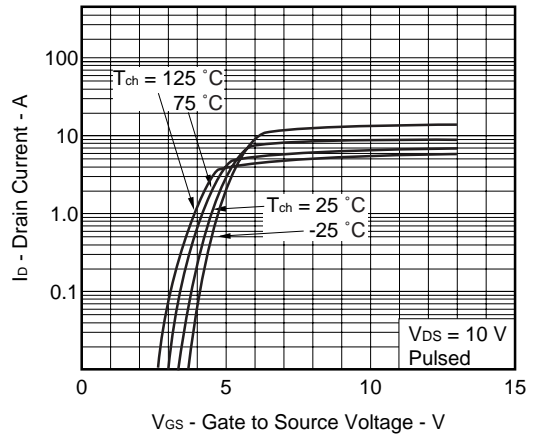


Typical Characteristics (T<sub>A</sub> = 25 °C)

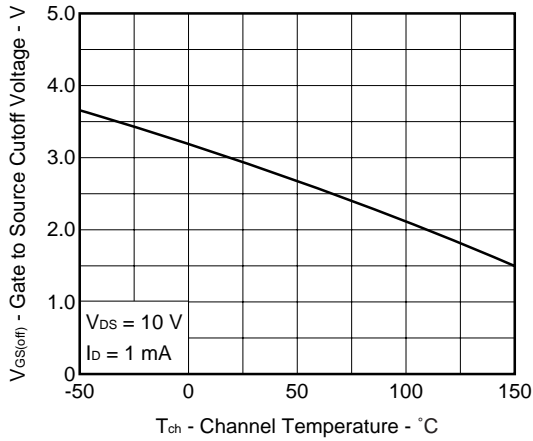
DRAIN CURRENT vs. DRAIN TO SOURCE VOLTAGE



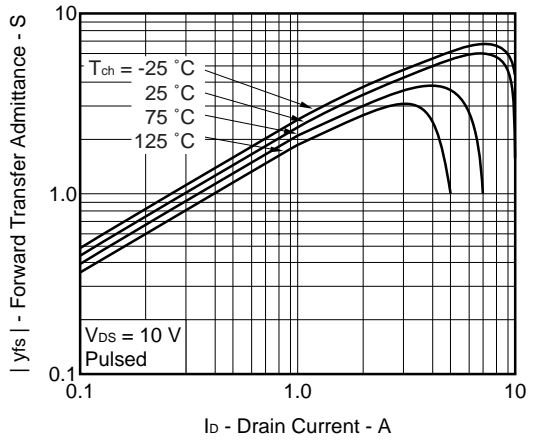
FORWARD TRANSFER CHARACTERISTICS



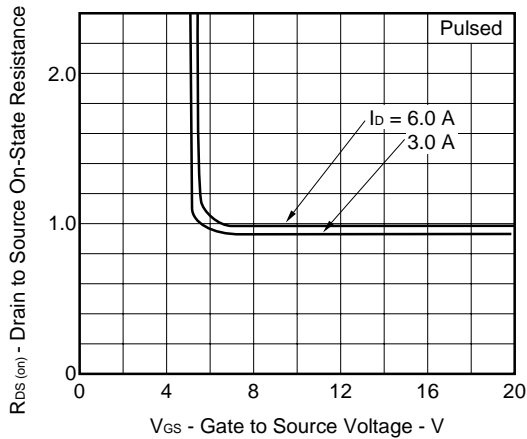
GATE TO SOURCE CUTOFF VOLTAGE vs. CHANNEL TEMPERATURE



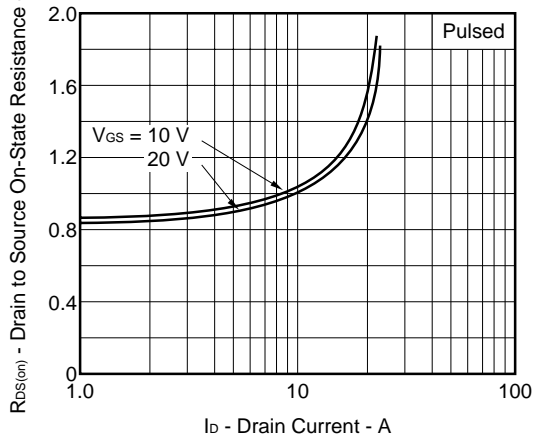
FORWARD TRANSFER ADMITTANCE vs. DRAIN CURRENT

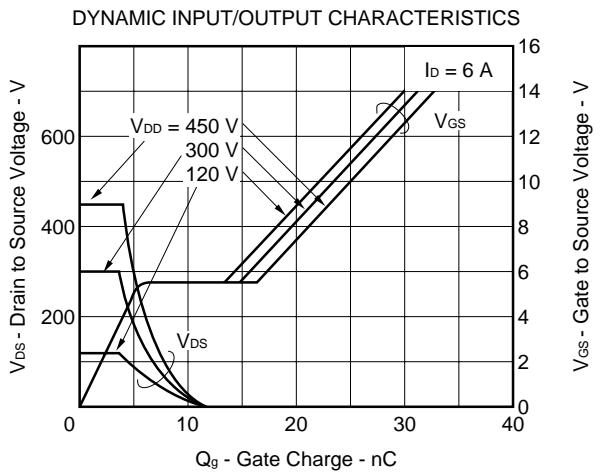
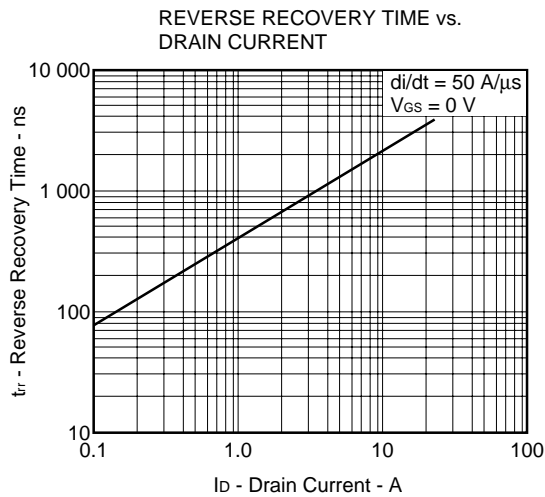
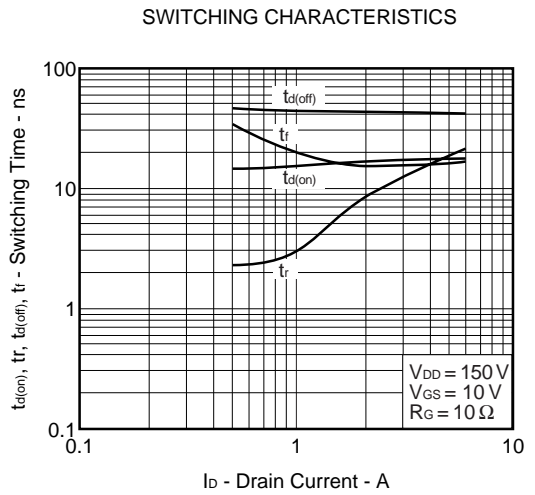
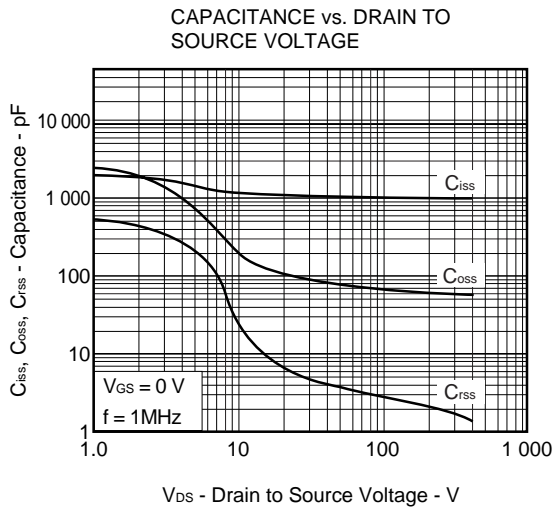
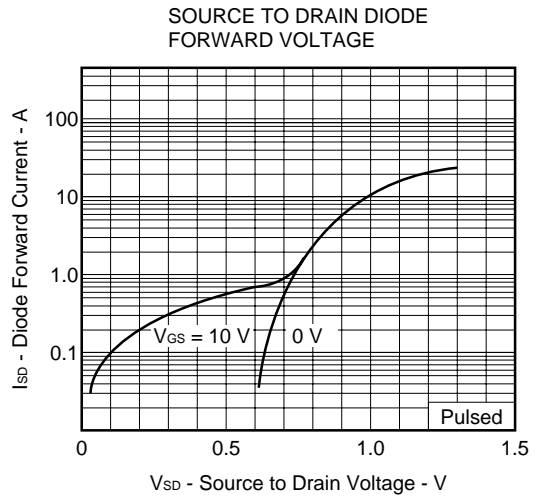
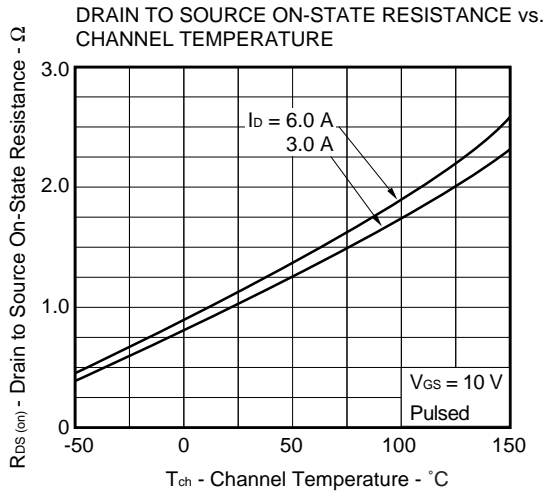


DRAIN TO SOURCE ON-STATE RESISTANCE vs. GATE TO SOURCE VOLTAGE

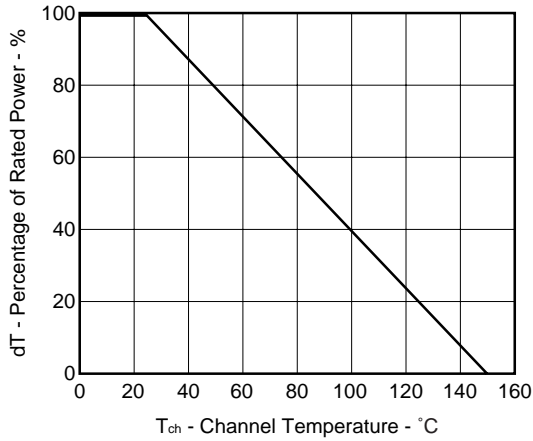


DRAIN TO SOURCE ON-STATE RESISTANCE vs. DRAIN CURRENT

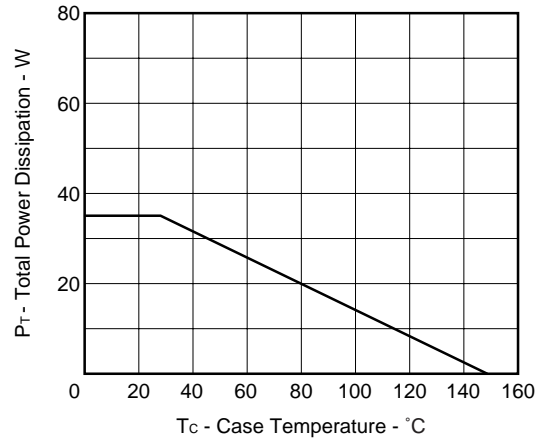




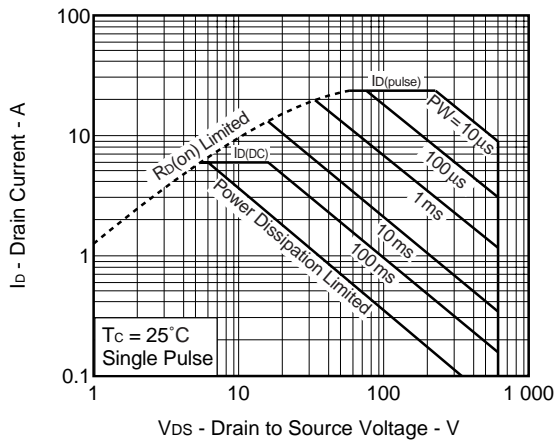
DERATING FACTOR OF FORWARD BIAS SAFE OPERATING AREA



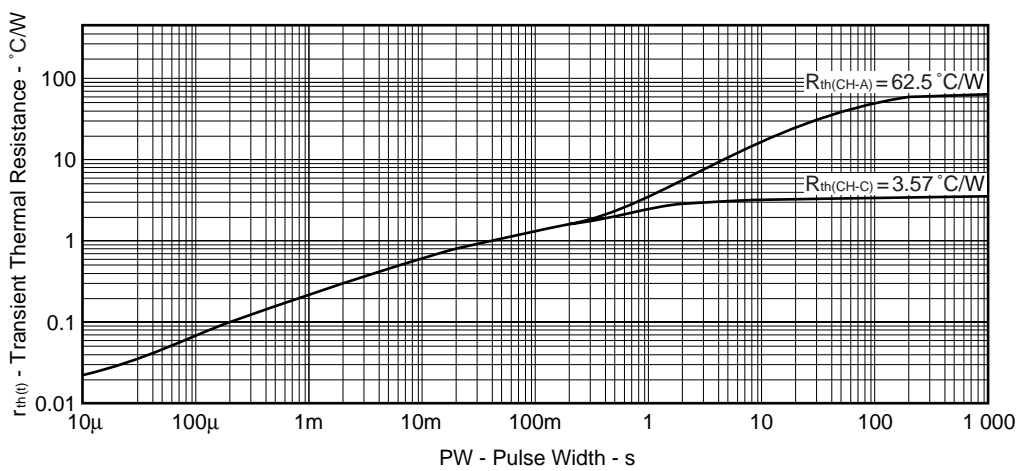
TOTAL POWER DISSIPATION vs. CASE TEMPERATURE

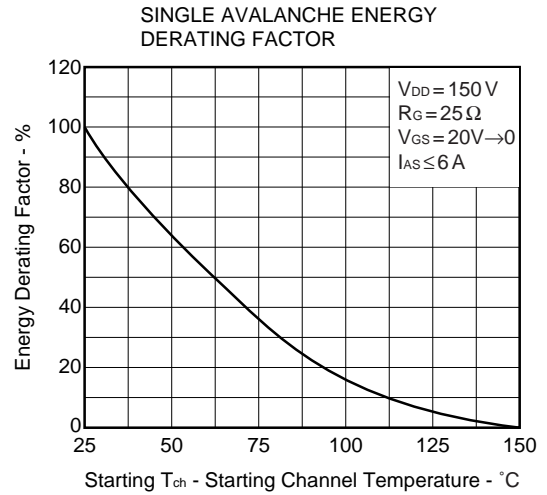
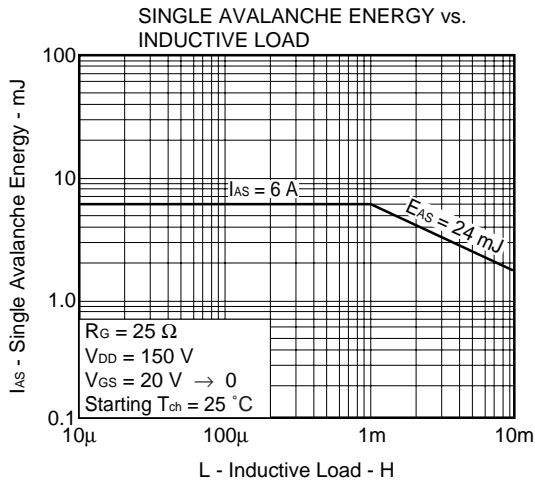


FORWARD BIAS SAFE OPERATING AREA



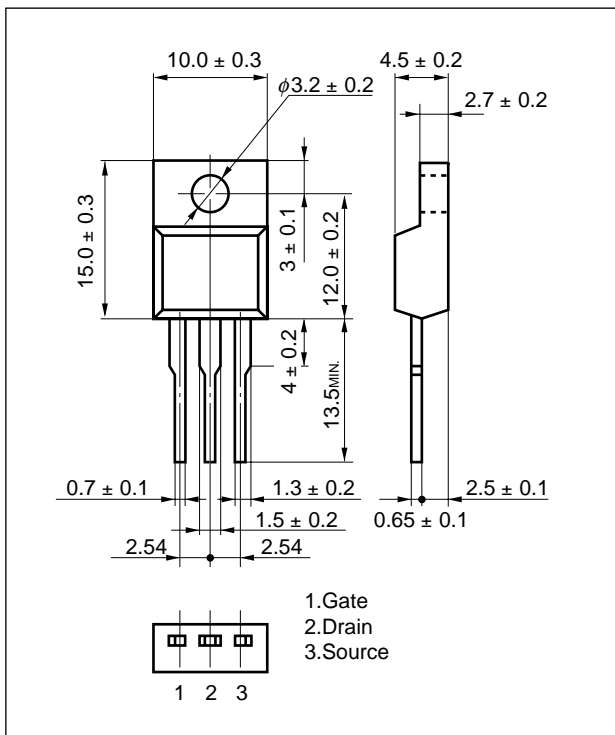
TRANSIENT THERMAL RESISTANCE vs. PULSE WIDTH



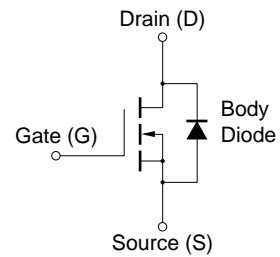


**Package Drawing (Unit : mm)**

Isolated TO-220(MP-45F)



**Equivalent Circuit**



**Remark** 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.

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Anti-radioactive design is not implemented in this product.