

## SWITCHING

### N-CHANNEL POWER MOS FET

#### DESCRIPTION

The 2SK3115B is N-Channel MOS 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  
 $Q_G = 21 \text{ nC TYP. (} V_{DD} = 450 \text{ V, } V_{GS} = 10 \text{ V, } I_D = 6.0 \text{ A)}$
- 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

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

Drain to Source Voltage ( $V_{GS} = 0 \text{ V}$ )	$V_{DSS}$	600	V
Gate to Source Voltage ( $V_{DS} = 0 \text{ V}$ )	$V_{GSS}$	$\pm 30$	V
Drain Current (DC) ( $T_C = 25^\circ\text{C}$ )	$I_{D(DC)}$	$\pm 6.0$	A
Drain Current (pulse) <sup>Note1</sup>	$I_{D(pulse)}$	$\pm 24$	A
Total Power Dissipation ( $T_A = 25^\circ\text{C}$ )	$P_{T1}$	2.0	W
Total Power Dissipation ( $T_C = 25^\circ\text{C}$ )	$P_{T2}$	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

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

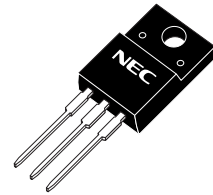
**2.** Starting  $T_{ch} = 25^\circ\text{C}$ ,  $V_{DD} = 150 \text{ V}$ ,  $R_G = 25 \Omega$ ,  $V_{GS} = 20 \rightarrow 0 \text{ V}$

#### ORDERING INFORMATION

PART NUMBER	PACKAGE
2SK3115B-S17-AY <sup>Note</sup>	Isolated TO-220

**Note** Pb-free (This product does not contain Pb in External electrode.)

(Isolated TO-220)



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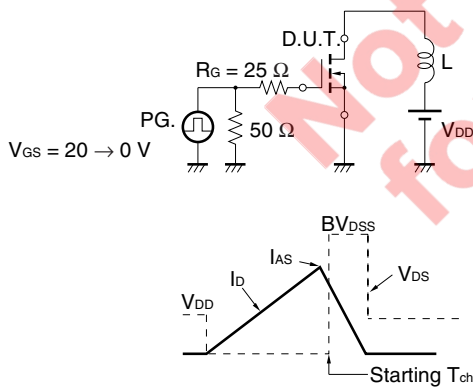
Not all products and/or types are available in every country. Please check with an NEC Electronics sales representative for availability and additional information.

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

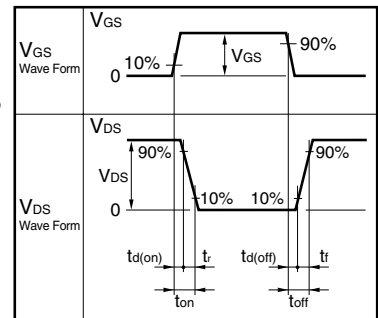
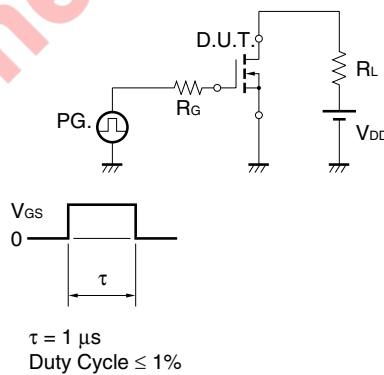
Characteristics	Symbol	Test Conditions	MIN.	TYP.	MAX.	Unit
Zero Gate Voltage Drain Current	I <sub>DSS</sub>	V <sub>DS</sub> = 600 V, V <sub>GS</sub> = 0 V			100	μA
Gate Leakage Current	I <sub>GSS</sub>	V <sub>GS</sub> = ±30 V, V <sub>DS</sub> = 0 V			±100	nA
Gate Cut-off Voltage	V <sub>GS(off)</sub>	V <sub>DS</sub> = 10 V, I <sub>D</sub> = 1 mA	2.5		3.5	V
Forward Transfer Admittance <sup>Note</sup>	y <sub>fs</sub>	V <sub>DS</sub> = 10 V, I <sub>D</sub> = 3.0 A	2.0	2.7		S
Drain to Source On-state Resistance <sup>Note</sup>	R <sub>DS(on)</sub>	V <sub>GS</sub> = 10 V, I <sub>D</sub> = 3.0 A		0.9	1.2	Ω
Input Capacitance	C <sub>iss</sub>	V <sub>DS</sub> = 10 V		1090		pF
Output Capacitance	C <sub>oss</sub>	V <sub>GS</sub> = 0 V		380		pF
Reverse Transfer Capacitance	C <sub>rss</sub>	f = 1 MHz		53		pF
Turn-on Delay Time	t <sub>d(on)</sub>	V <sub>DD</sub> = 150 V, I <sub>D</sub> = 3.0 A		16		ns
Rise Time	t <sub>r</sub>	V <sub>GS</sub> = 10 V		11		ns
Turn-off Delay Time	t <sub>d(off)</sub>	R <sub>G</sub> = 10 Ω		29		ns
Fall Time	t <sub>f</sub>	R <sub>L</sub> = 50 Ω		8		ns
Total Gate Charge	Q <sub>G</sub>	V <sub>DD</sub> = 450 V		21		nC
Gate to Source Charge	Q <sub>GS</sub>	V <sub>GS</sub> = 10 V		8		nC
Gate to Drain Charge	Q <sub>GD</sub>	I <sub>D</sub> = 6.0 A		8		nC
Body Diode Forward Voltage <sup>Note</sup>	V <sub>F(S-D)</sub>	I <sub>F</sub> = 6.0 A, V <sub>GS</sub> = 0 V		0.9		V
Reverse Recovery Time	t <sub>rr</sub>	I <sub>F</sub> = 6.0 A, V <sub>GS</sub> = 0 V		360		ns
Reverse Recovery Charge	Q <sub>rr</sub>	di/dt = 50 A/μs		1730		nC

**Note** Pulsed

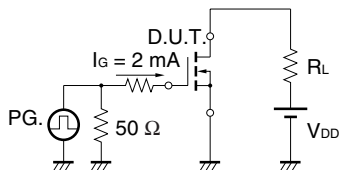
**TEST CIRCUIT 1 AVALANCHE CAPABILITY**



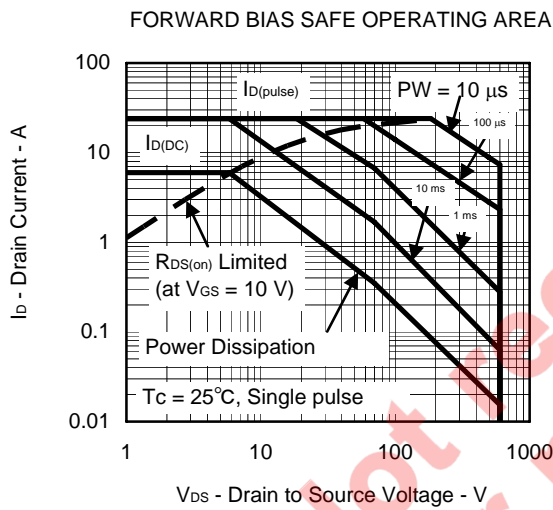
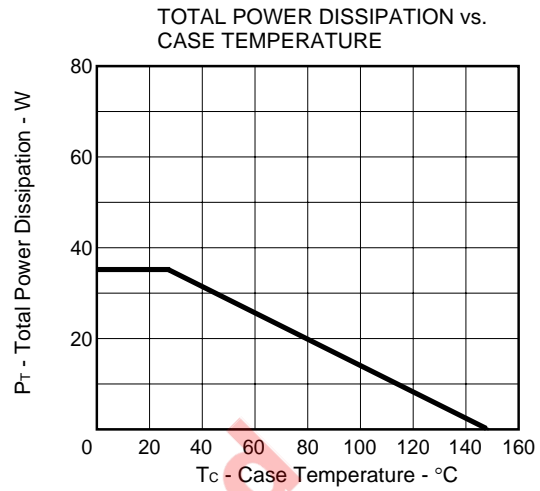
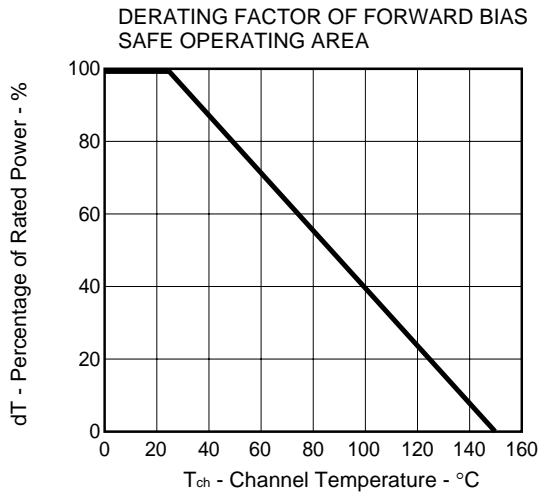
**TEST CIRCUIT 2 SWITCHING TIME**



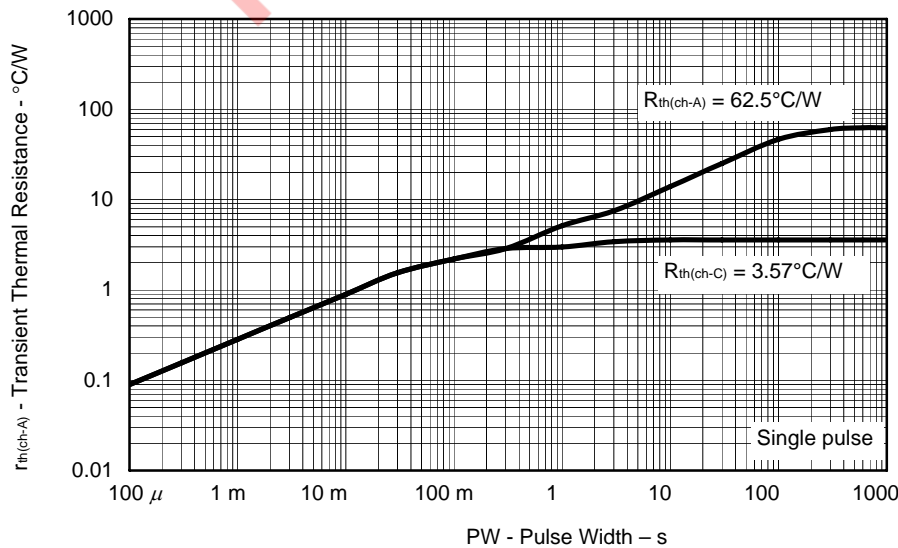
**TEST CIRCUIT 3 GATE CHARGE**



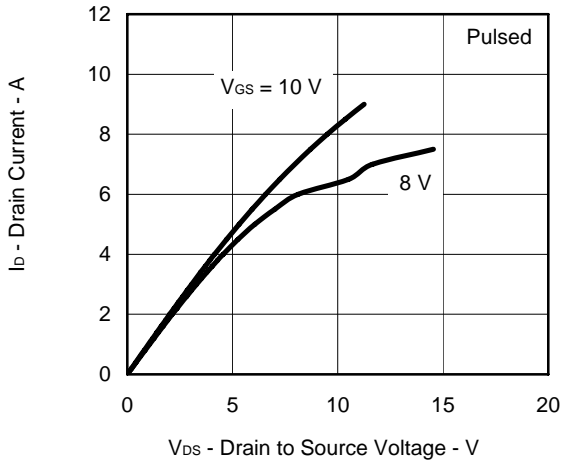
TYPICAL CHARACTERISTICS (TA = 25°C)



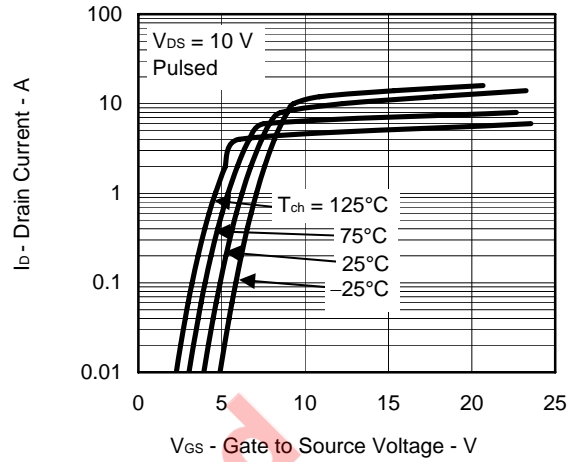
TRANSIENT THERMAL RESISTANCE vs. PULSE WIDTH



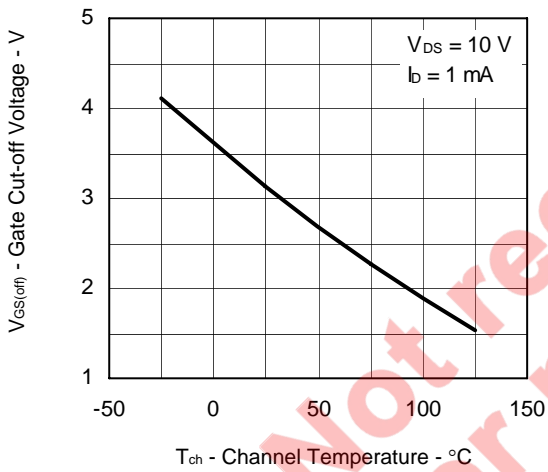
DRAIN CURRENT vs. DRAIN TO SOURCE VOLTAGE



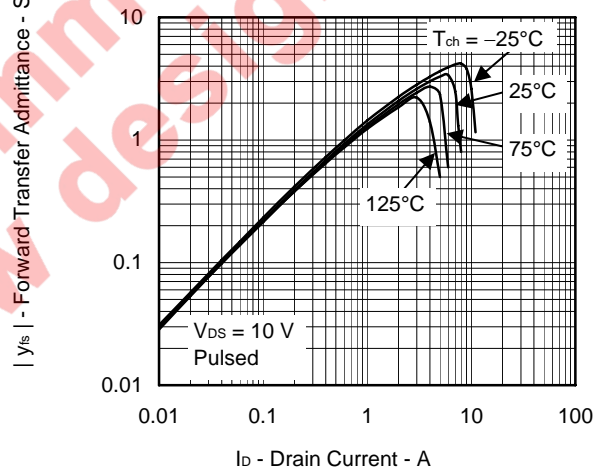
FORWARD TRANSFER CHARACTERISTICS



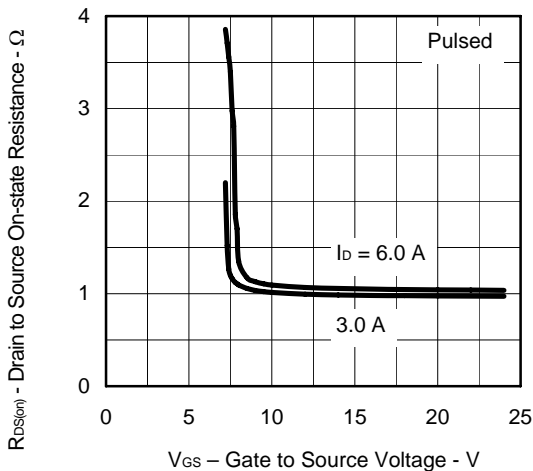
GATE CUT-OFF VOLTAGE vs. CHANNEL TEMPERATURE



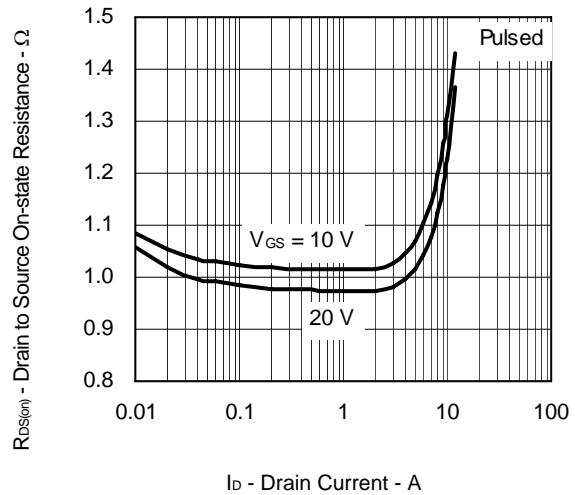
FORWARD TRANSFER ADMITTANCE vs. DRAIN CURRENT



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

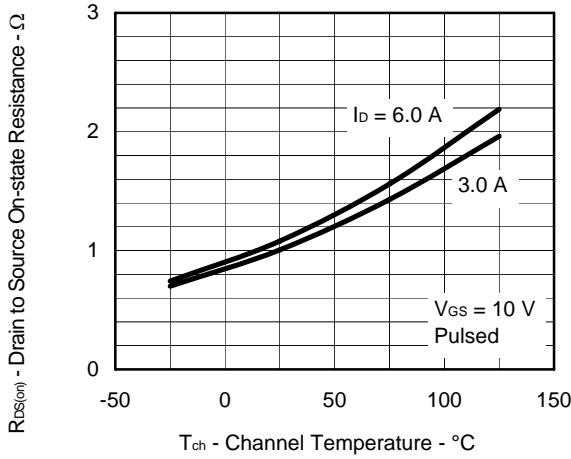


DRAIN TO SOURCE ON-STATE RESISTANCE vs. DRAIN CURRENT

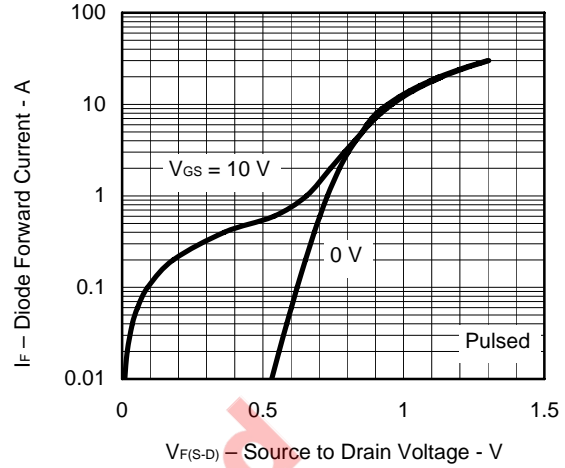


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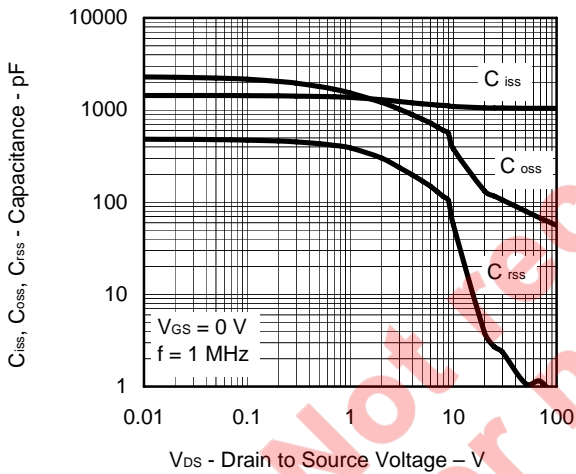
DRAIN TO SOURCE ON-STATE RESISTANCE vs. CHANNEL TEMPERATURE



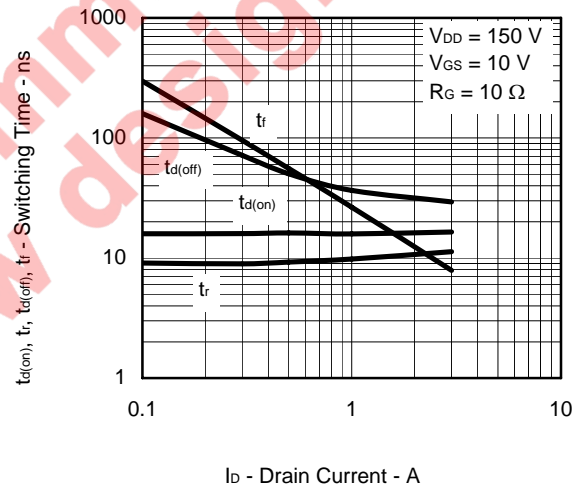
SOURCE TO DRAIN DIODE FORWARD VOLTAGE



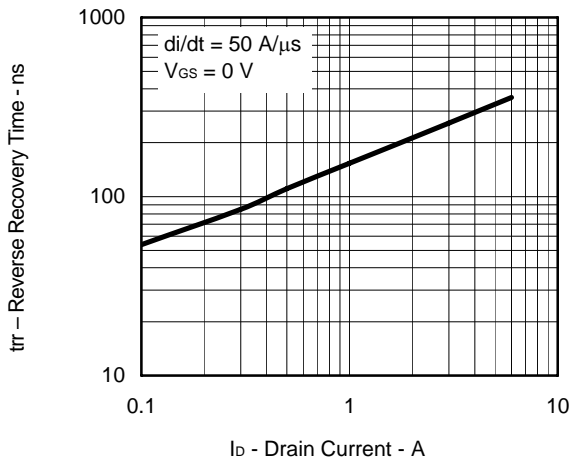
CAPACITANCE vs. DRAIN TO SOURCE VOLTAGE



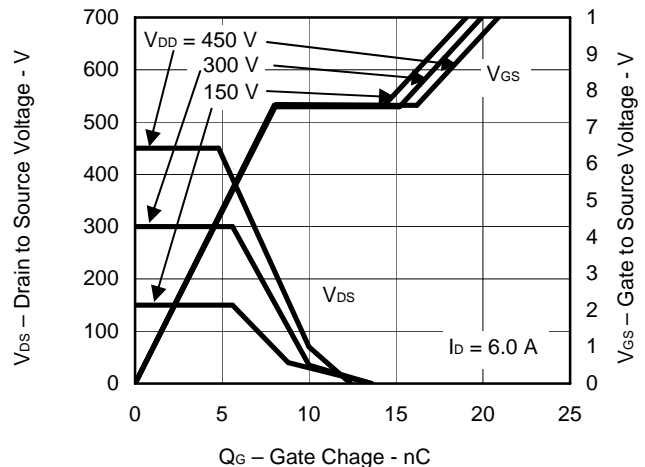
SWITCHING CHARACTERISTICS



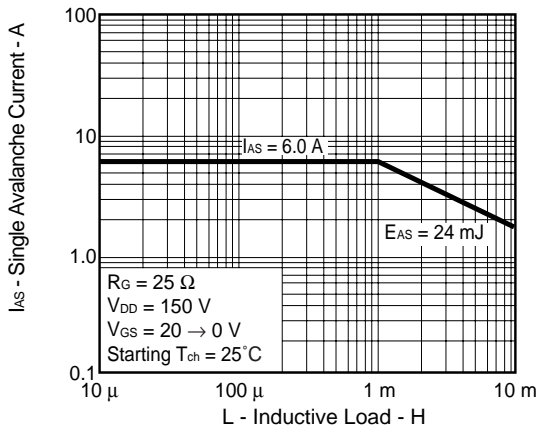
REVERSE RECOVERY TIME vs. DRAIN CURRENT



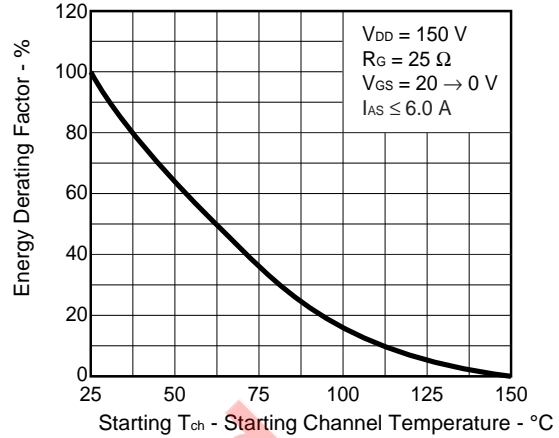
DYNAMIC INPUT/OUTPUT CHARACTERISTICS



SINGLE AVALANCHE CURRENT vs. INDUCTIVE LOAD

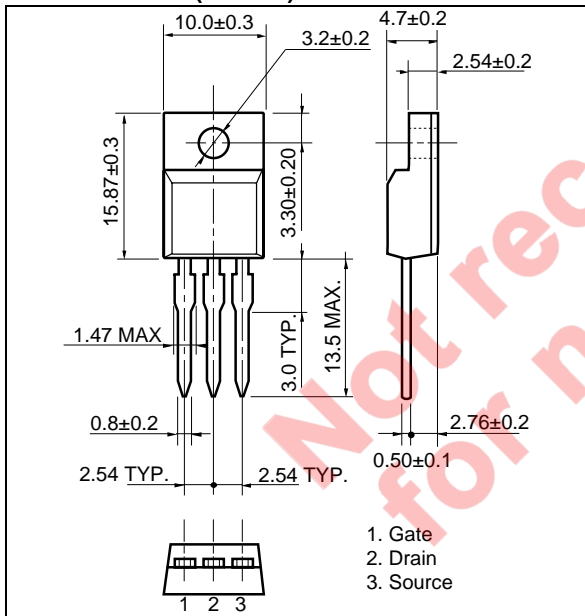


SINGLE AVALANCHE ENERGY DERATING FACTOR

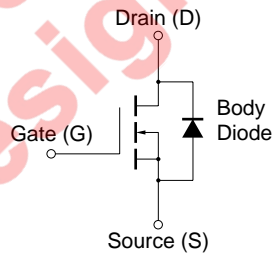


PACKAGE DRAWING (Unit: mm)

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.