

SWITCHING  
N-CHANNEL POWER MOS FET  
INDUSTRIAL USE**Description**

The 2SK3116 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
2SK3116	TO-220
2SK3116-S	TO-262
2SK3116-ZJ	TO-263

**Features**

- Low gate charge  
 $Q_G = 26 \text{ nC TYP. } (V_{DD} = 450 \text{ V}, V_{GS} = 10 \text{ V}, I_D = 7.5 \text{ A})$
- Gate voltage rating  $\pm 30 \text{ V}$
- Low on-state resistance  
 $R_{DS(on)} = 1.2 \Omega \text{ (MAX.) } (V_{GS} = 10 \text{ V}, I_D = 3.75 \text{ A})$
- Avalanche capability ratings

**Absolute Maximum Rating ( $T_A = 25^\circ\text{C}$ )**

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) ( $T_c = 25^\circ\text{C}$ )	$I_{D(DC)}$	$\pm 7.5$	A
Drain current (pulse) <sup>Note1</sup>	$I_{D(pulse)}$	$\pm 30$	A
Total power dissipation ( $T_A = 25^\circ\text{C}$ )	$P_{T1}$	1.5	W
Total power dissipation ( $T_c = 25^\circ\text{C}$ )	$P_{T2}$	70	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>	$I_{AS}$	7.5	A
Single avalanche energy <sup>Note2</sup>	$E_{AS}$	37.5	mJ
Diode recovery dv/dt <sup>Note3</sup>	$dt/dt$	3.5	V/ns

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

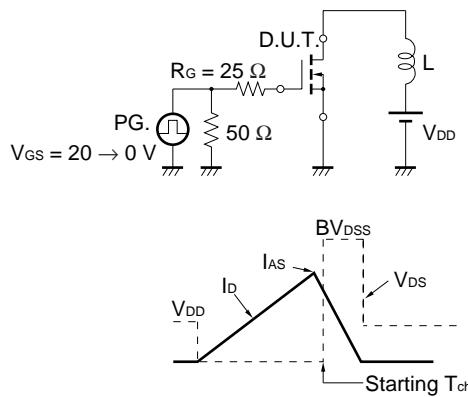
2. Starting  $T_{ch} = 25^\circ\text{C}$ ,  $V_{DD} = 150 \text{ V}$ ,  $R_G = 25 \Omega$ ,  $V_{GS} = 20 \text{ V} \rightarrow 0 \text{ V}$
3.  $I_F \leq 3.0 \text{ A}$ ,  $V_{clamp} = 600 \text{ V}$ ,  $di/dt \leq 100 \text{ A}/\mu\text{s}$ ,  $T_A = 25^\circ\text{C}$

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

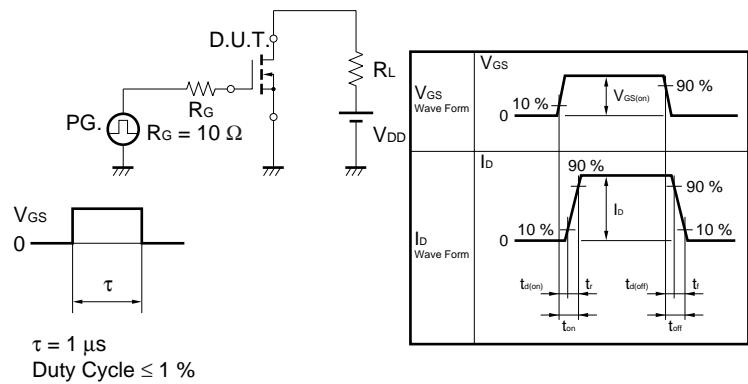
Electrical Characteristics ( $T_A = 25^\circ\text{C}$ )

Characteristics	Symbol	MIN.	TYP.	MAX.	Unit	Test Conditions
Drain leakage current	$I_{DSS}$			100	$\mu\text{A}$	$V_{DS} = 600 \text{ V}, V_{GS} = 0 \text{ V}$
Gate leakage current	$I_{GSS}$			$\pm 100$	nA	$V_{GS} = \pm 30 \text{ V}, V_{DS} = 0 \text{ V}$
Gate cut-off voltage	$V_{GS(\text{off})}$	2.5		3.5	V	$V_{DS} = 10 \text{ V}, I_D = 1 \text{ mA}$
Forward transfer admittance	$ y_{fs} $	2.0			S	$V_{DS} = 10 \text{ V}, I_D = 3.75 \text{ A}$
Drain to source on-state resistance	$R_{DS(\text{on})}$		0.9	1.2	$\Omega$	$V_{GS} = 10 \text{ V}, I_D = 3.75 \text{ A}$
Input capacitance	$C_{iss}$		1100		pF	$V_{DS} = 10 \text{ V}$
Output capacitance	$C_{oss}$		200		pF	$V_{GS} = 0 \text{ V}$
Reverse transfer capacitance	$C_{rss}$		20		pF	$f = 1 \text{ MHz}$
Turn-on delay time	$t_{d(\text{on})}$		18		ns	$V_{DD} = 150 \text{ V}, I_D = 3.75 \text{ A}$
Rise time	$t_r$		15		ns	$V_{GS(\text{on})} = 10 \text{ V}$
Turn-off delay time	$t_{d(\text{off})}$		50		ns	$R_G = 10 \Omega$
Fall time	$t_f$		15		ns	$R_L = 50 \Omega$
Total gate charge	$Q_G$		26		nC	$V_{DD} = 450 \text{ V}$
Gate to source charge	$Q_{GS}$		6		nC	$V_{GS} = 10 \text{ V}$
Gate to drain charge	$Q_{GD}$		10		nC	$I_D = 7.5 \text{ A}$
Diode forward voltage	$V_{F(S-D)}$		1.0		V	$I_F = 7.5 \text{ A}, V_{GS} = 0 \text{ V}$
Reverse recovery time	$T_{rr}$		1.6		$\mu\text{s}$	$I_F = 7.5 \text{ A}, V_{GS} = 0 \text{ V}$
Reverse recovery charge	$Q_{rr}$		7.6		$\mu\text{C}$	$di/dt = 50 \text{ A}/\mu\text{s}$

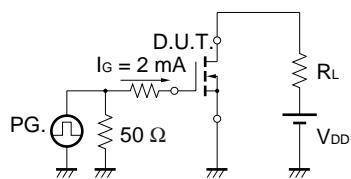
Test circuit 1 Avalanche capability

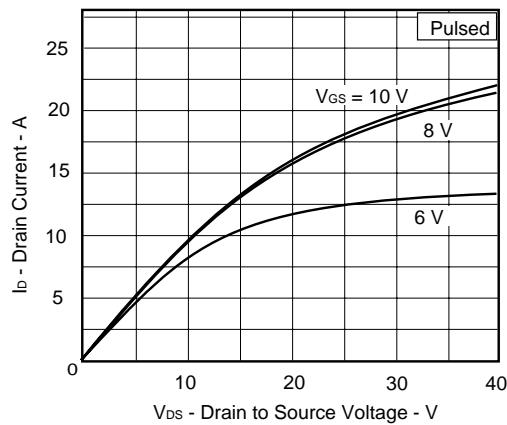


Test circuit 2 Switching time

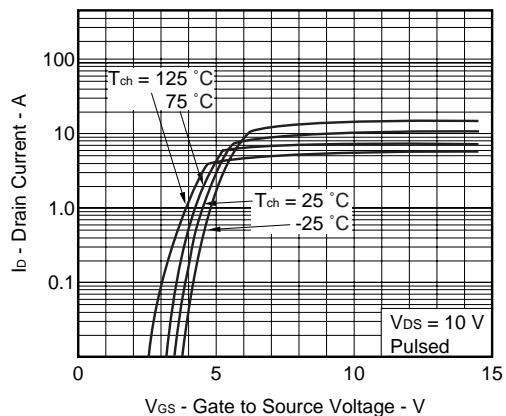
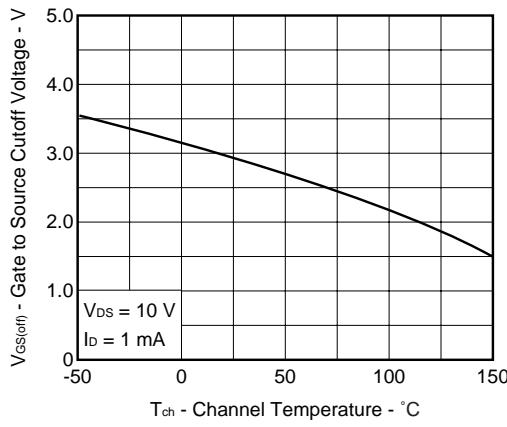
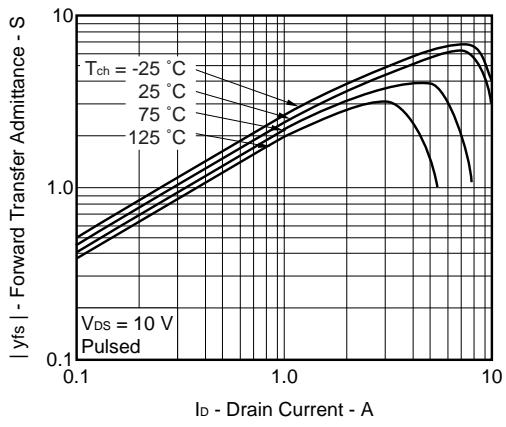
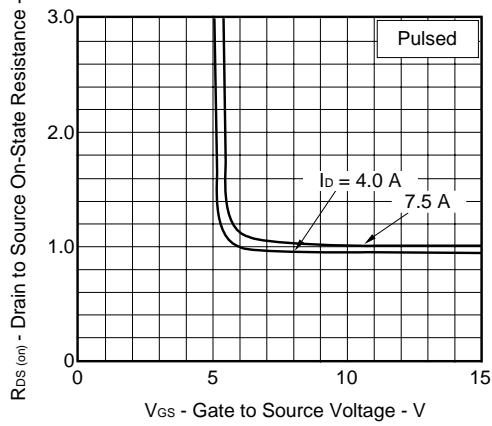
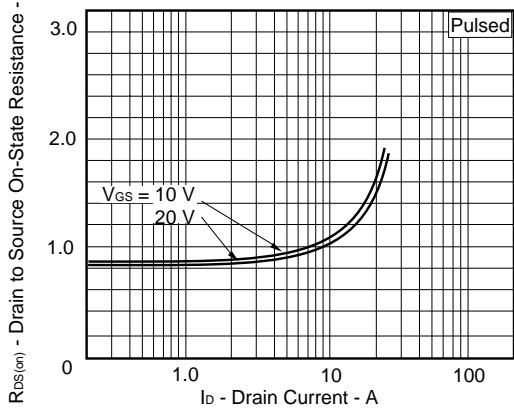


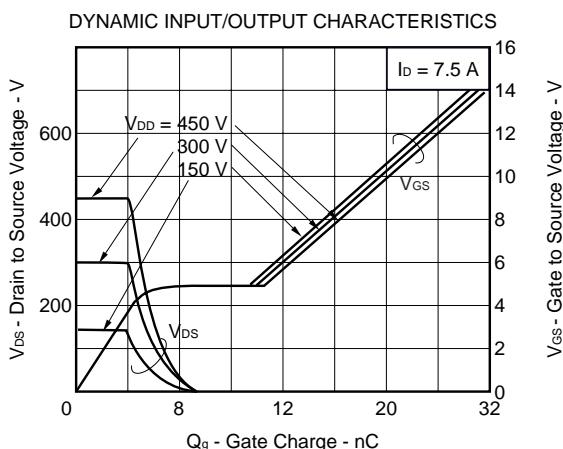
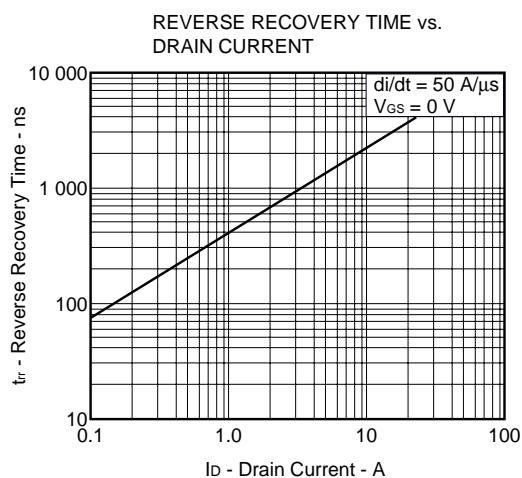
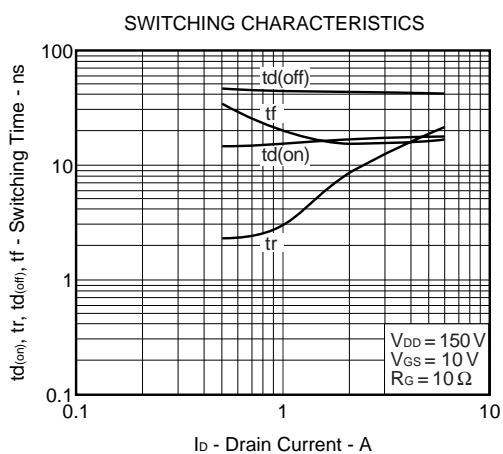
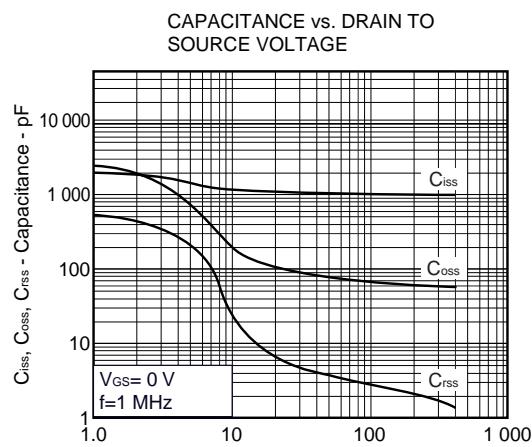
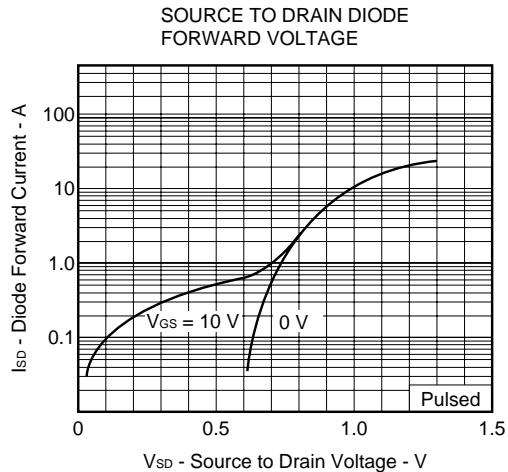
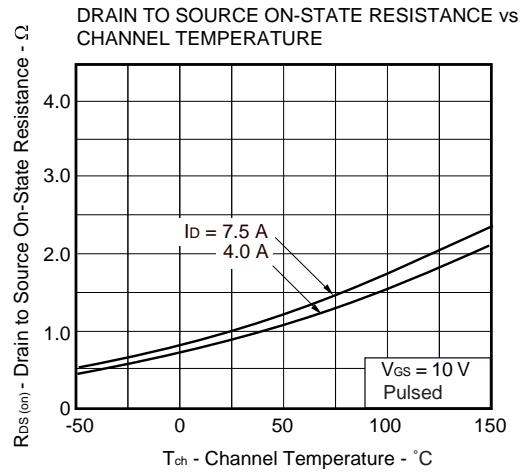
Test circuit 3 Gate charge

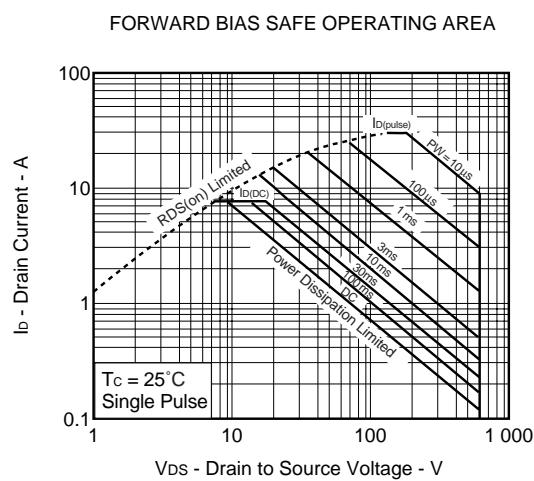
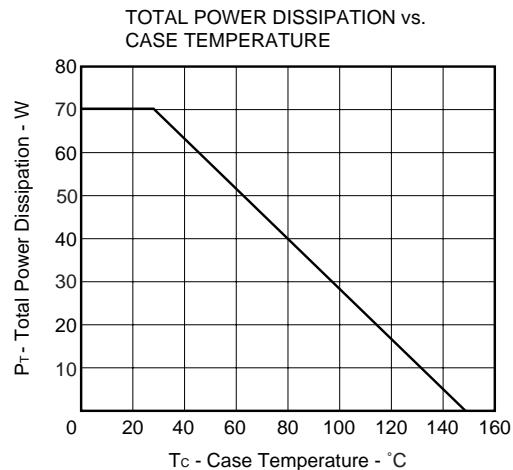
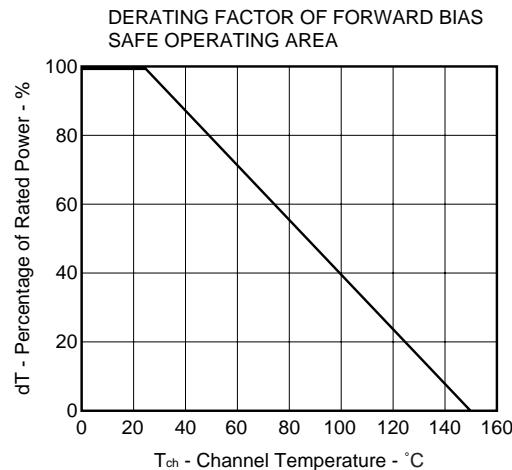


Typical Characteristics( $T_A = 25^\circ\text{C}$ )DRAIN CURRENT vs.  
DRAIN TO SOURCE VOLTAGE

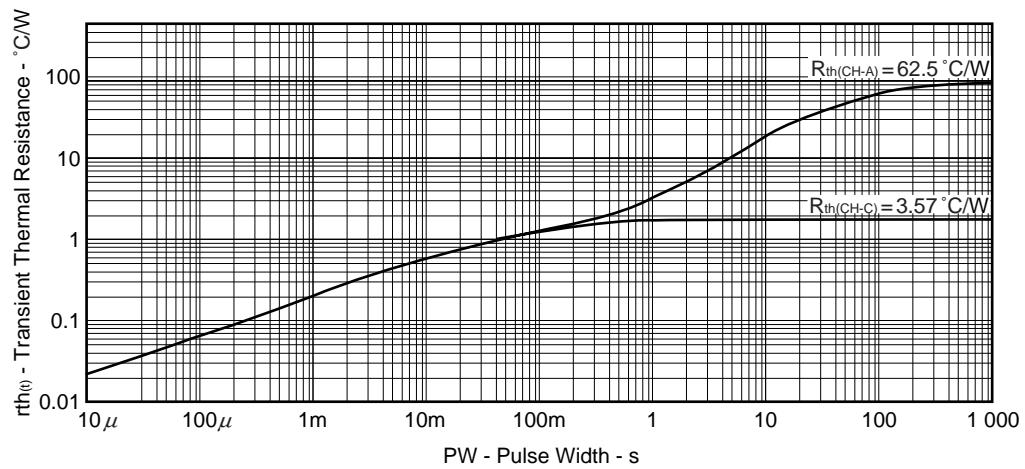
FORWARD TRANSFER CHARACTERISTICS

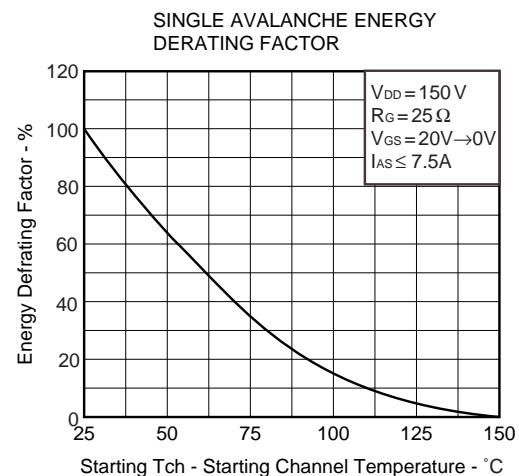
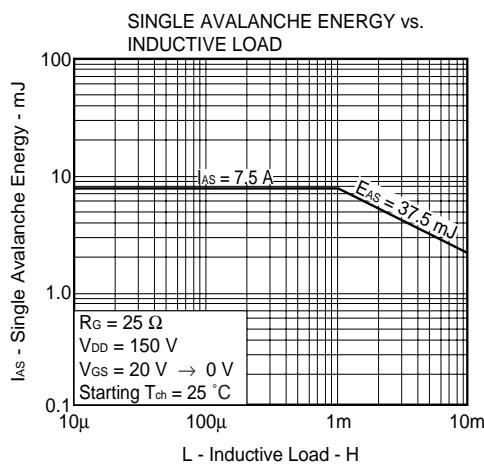
GATE TO SOURCE CUTOFF VOLTAGE  
vs. CHANNEL TEMPERATUREFORWARD TRANSFER ADMITTANCE vs.  
DRAIN CURRENTDRAIN TO SOURCE ON-STATE RESISTANCE vs.  
GATE TO SOURCE VOLTAGEDRAIN TO SOURCE ON-STATE  
RESISTANCE vs. DRAIN CURRENT





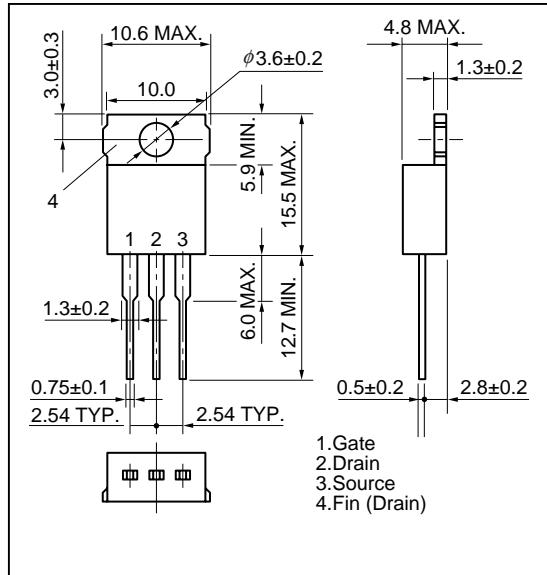
TRANSIENT THERMAL RESISTANCE vs. PULSE WIDTH



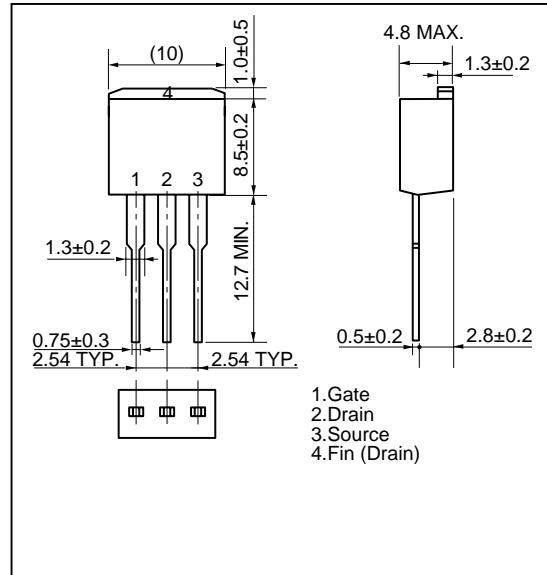


## Package Drawing (Unit : mm)

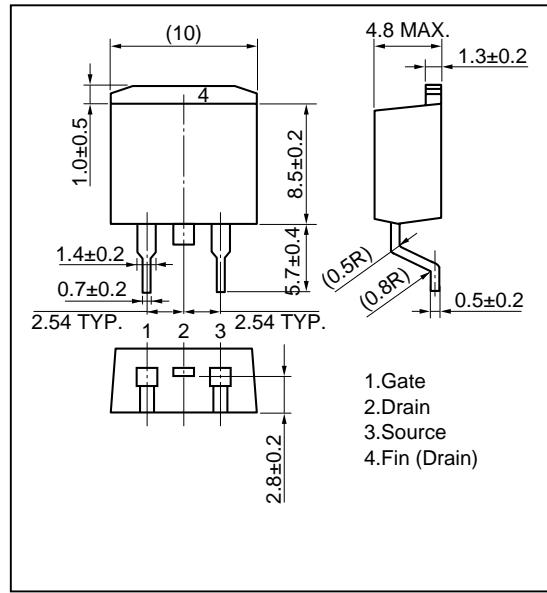
1)TO-220AB (MP-25)



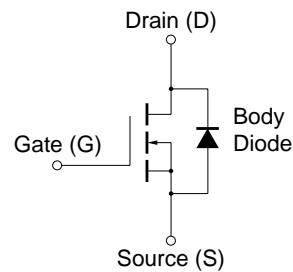
2)TO-262 (TO-220 Fin Cut:MP-25S)



3)TO-263 (JEDEC TYPE:MP-25ZJ)



## 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.