

NEC

MOS FIELD EFFECT TRANSISTOR 2SJ649

SWITCHING P-CHANNEL POWER MOS FET

DESCRIPTION

The 2SJ649 is P-channel MOS Field Effect Transistor designed for solenoid, motor and lamp driver.

ORDERING INFORMATION

PART NUMBER	PACKAGE
2SJ649	Isolated TO-220

FEATURES

- Low on-state resistance:
 - $R_{DS(on)1} = 48 \text{ m}\Omega \text{ MAX. (} V_{GS} = -10 \text{ V, } I_D = -10 \text{ A)}$
 - $R_{DS(on)2} = 75 \text{ m}\Omega \text{ MAX. (} V_{GS} = -4.0 \text{ V, } I_D = -10 \text{ A)}$
- Low input capacitance:
 - $C_{iss} = 1900 \text{ pF TYP. (} V_{DS} = -10 \text{ V, } V_{GS} = 0 \text{ V)}$
- Built-in gate protection diode

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

Drain to Source Voltage ($V_{GS} = 0 \text{ V}$)	V_{DSS}	-60	V
Gate to Source Voltage ($V_{DS} = 0 \text{ V}$)	V_{GSS}	∓ 20	V
Drain Current (DC) ($T_C = 25^\circ\text{C}$)	$I_{D(DC)}$	∓ 20	A
Drain Current (pulse) ^{Note1}	$I_{D(pulse)}$	∓ 70	A
Total Power Dissipation ($T_C = 25^\circ\text{C}$)	P_T	25	W
Total Power Dissipation ($T_A = 25^\circ\text{C}$)	P_T	2.0	W
Channel Temperature	T_{ch}	150	$^\circ\text{C}$
Storage Temperature	T_{stg}	-55 to +150	$^\circ\text{C}$
Single Avalanche Current ^{Note2}	I_{AS}	-20	A
Single Avalanche Energy ^{Note2}	E_{AS}	40	mJ

(Isolated TO-220)



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

2. Starting $T_{ch} = 25^\circ\text{C}$, $V_{DD} = -30 \text{ V}$, $R_G = 25 \Omega$, $V_{GS} = -20 \rightarrow 0 \text{ V}$

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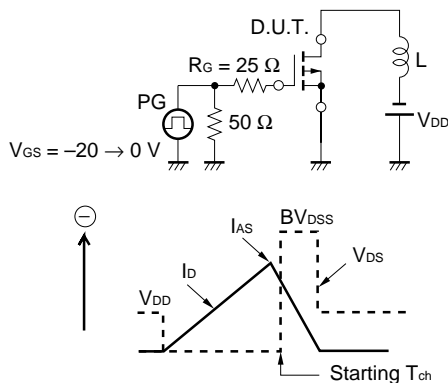


ELECTRICAL CHARACTERISTICS (T_A = 25°C)

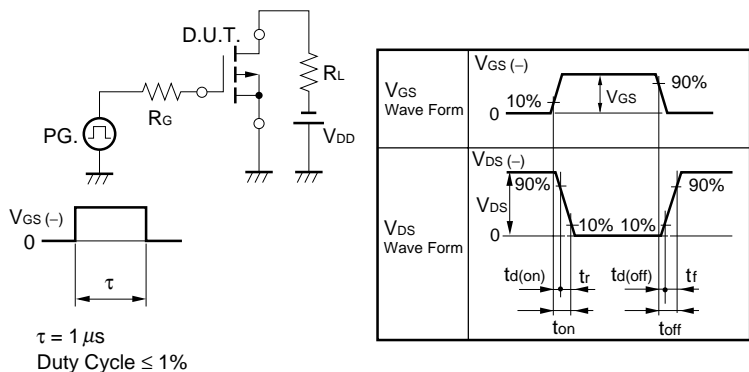
Characteristics	Symbol	Test Conditions	MIN.	TYP.	MAX.	Unit
Zero Gate Voltage Drain Current	I _{DSS}	V _{DS} = -60 V, V _{GS} = 0 V			-10	μA
Gate Leakage Current	I _{GSS}	V _{GS} = ±20 V, V _{DS} = 0 V			±10	μA
Gate Cut-off Voltage	V _{GS(off)}	V _{DS} = -10 V, I _D = -1 mA	-1.5	-2.0	-2.5	V
Forward Transfer Admittance ^{Note}	y _{fs}	V _{DS} = -10 V, I _D = -10 A	10	20		S
Drain to Source On-state Resistance ^{Note}	R _{DS(on)1}	V _{GS} = -10 V, I _D = -10 A		38	48	mΩ
	R _{DS(on)2}	V _{GS} = -4.0 V, I _D = -10 A		47	75	mΩ
Input Capacitance	C _{iss}	V _{DS} = -10 V		1900		pF
Output Capacitance	C _{oss}	V _{GS} = 0 V		350		pF
Reverse Transfer Capacitance	C _{rss}	f = 1 MHz		140		pF
Turn-on Delay Time	t _{d(on)}	V _{DD} = -30 V, I _D = -10 A		10		ns
Rise Time	t _r	V _{GS} = -10 V		10		ns
Turn-off Delay Time	t _{d(off)}	R _G = 0 Ω		73		ns
Fall Time	t _f			17		ns
Total Gate Charge	Q _G	V _{DD} = -48 V		38		nC
Gate to Source Charge	Q _{GS}	V _{GS} = -10 V		7		nC
Gate to Drain Charge	Q _{GD}	I _D = -20 A		10		nC
Body Diode Forward Voltage ^{Note}	V _{F(S-D)}	I _F = 20 A, V _{GS} = 0 V		0.95		V
Reverse Recovery Time	t _{rr}	I _F = 20 A, V _{GS} = 0 V		49		ns
Reverse Recovery Charge	Q _{rr}	di/dt = 100 A/μs		100		nC

Note Pulsed: PW ≤ 350 μs, Duty Cycle ≤ 2%

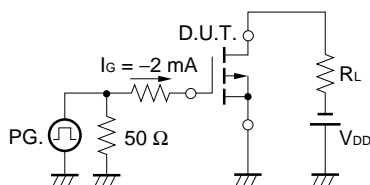
TEST CIRCUIT 1 AVALANCHE CAPABILITY



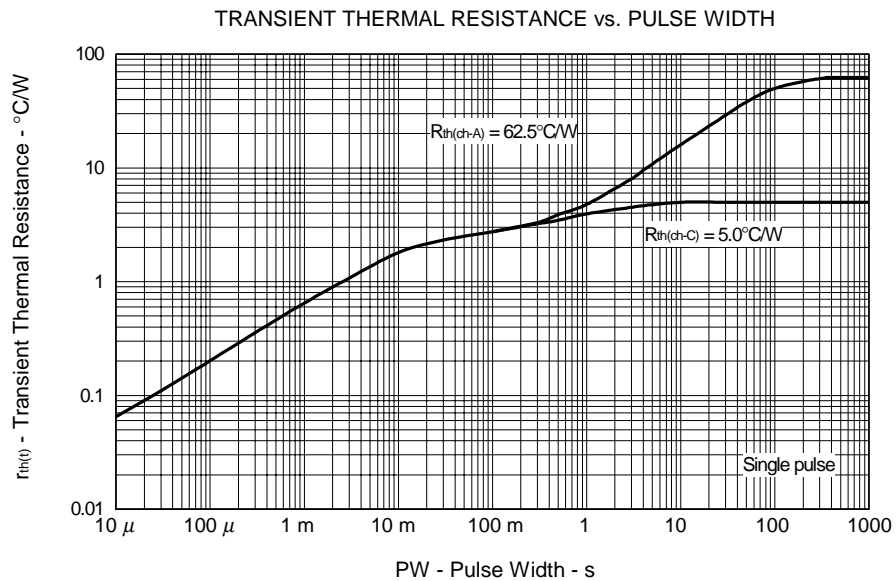
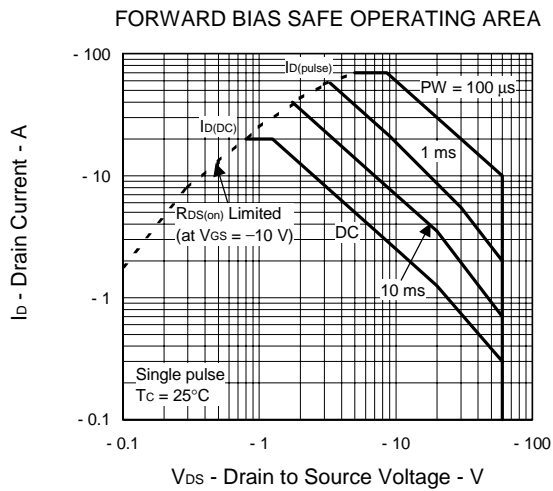
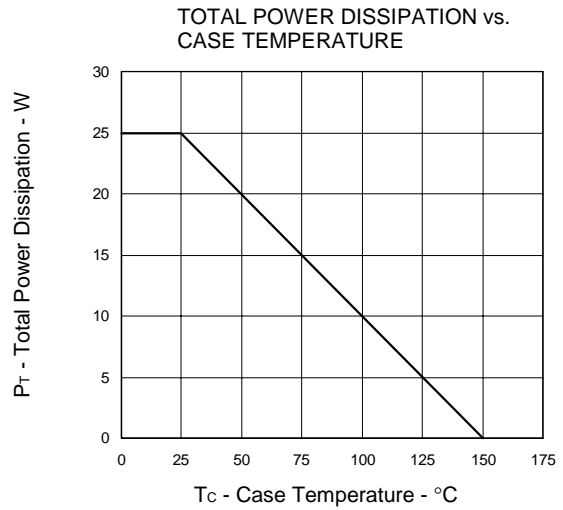
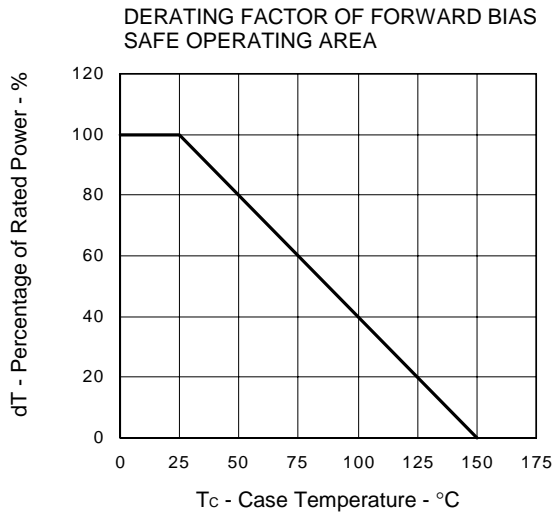
TEST CIRCUIT 2 SWITCHING TIME



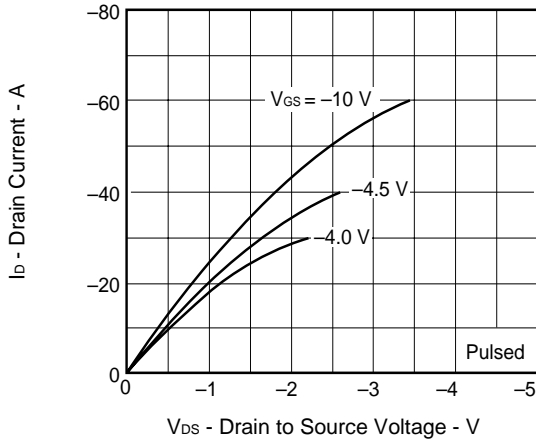
TEST CIRCUIT 3 GATE CHARGE



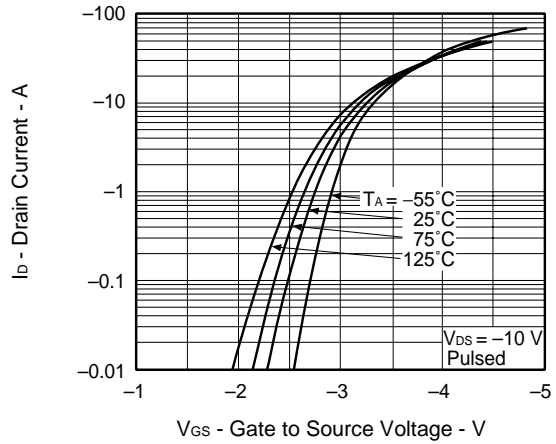
TYPICAL CHARACTERISTICS (T_A = 25°C)



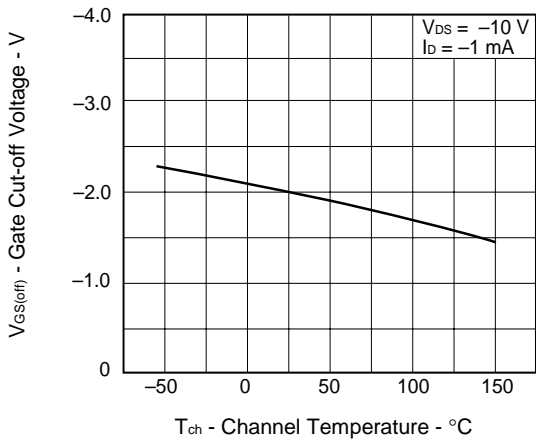
DRAIN CURRENT vs. DRAIN TO SOURCE VOLTAGE



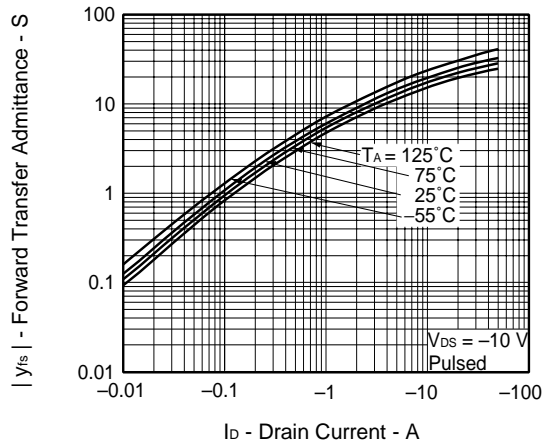
FORWARD TRANSFER CHARACTERISTICS



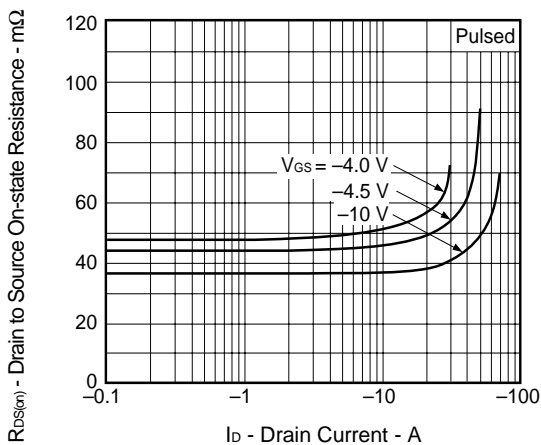
GATE CUT-OFF VOLTAGE vs. CHANNEL TEMPERATURE



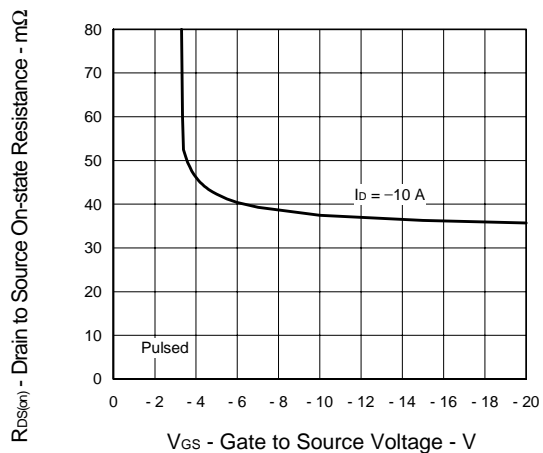
FORWARD TRANSFER ADMITTANCE vs. DRAIN CURRENT



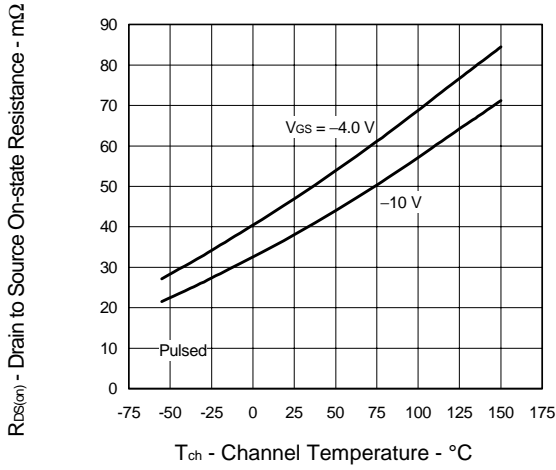
DRAIN TO SOURCE ON-STATE RESISTANCE vs. DRAIN CURRENT



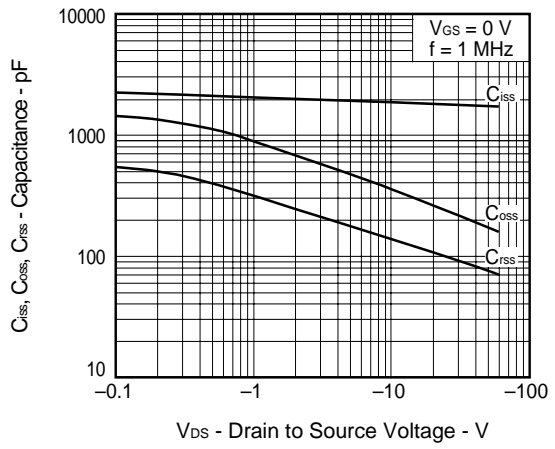
DRAIN TO SOURCE ON-STATE RESISTANCE vs. GATE TO SOURCE VOLTAGE



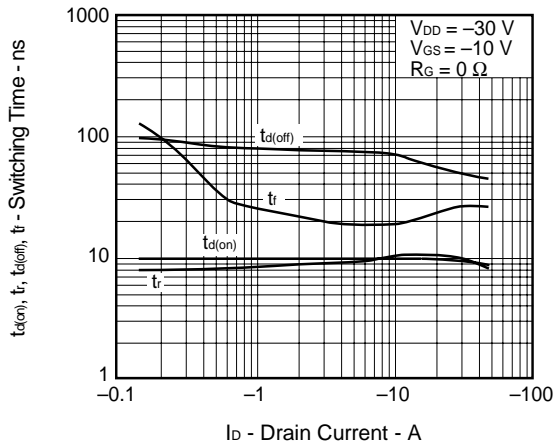
DRAIN TO SOURCE ON-STATE RESISTANCE vs. CHANNEL TEMPERATURE



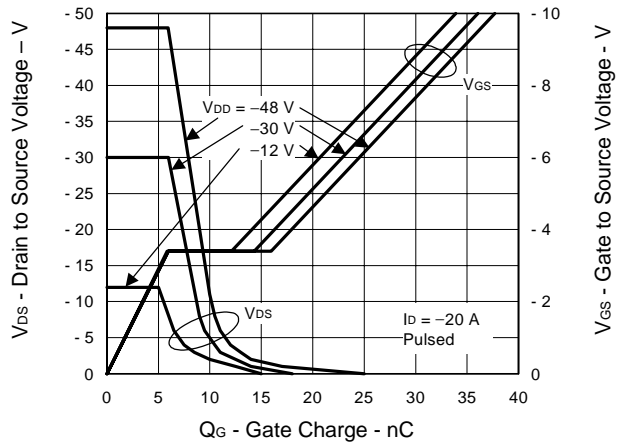
CAPACITANCE vs. DRAIN TO SOURCE VOLTAGE



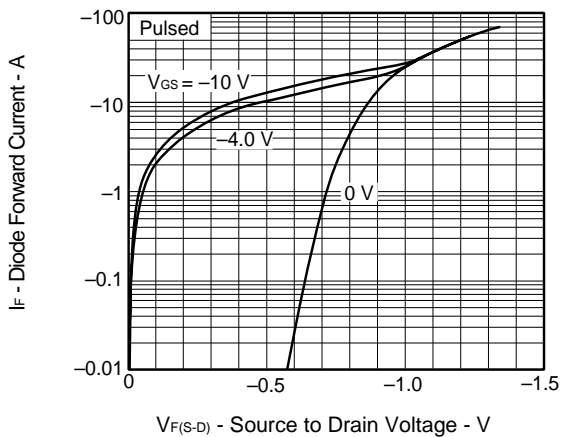
SWITCHING CHARACTERISTICS



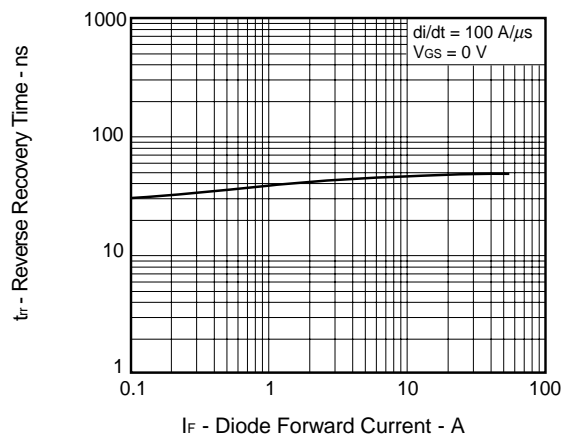
DYNAMIC INPUT/OUTPUT CHARACTERISTICS



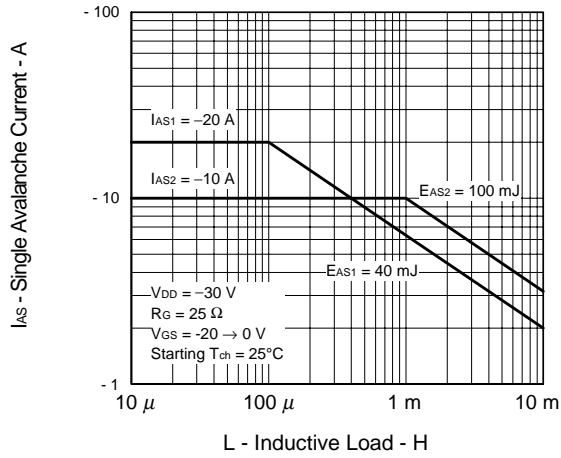
SOURCE TO DRAIN DIODE FORWARD VOLTAGE



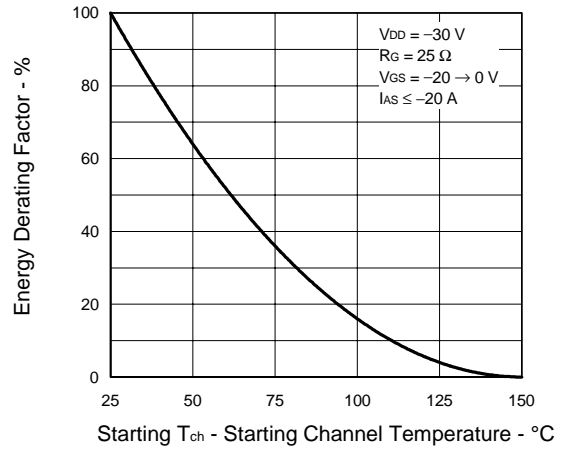
REVERSE RECOVERY TIME vs. DIODE FORWARD CURRENT



SINGLE AVALANCHE CURRENT vs. INDUCTIVE LOAD

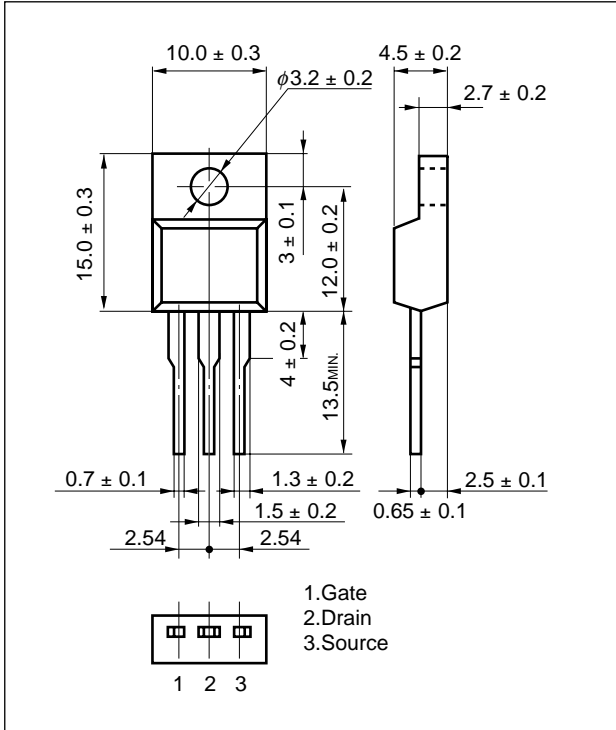


SINGLE AVALANCHE ENERGY DERATING FACTOR

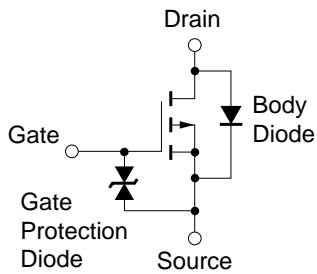


PACKAGE DRAWING (Unit: mm)

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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