NEC

MOS FIELD EFFECT TRANSISTOR
2SK3715

SWITCHING
N-CHANNEL POWER MOS FET

DESCRIPTION

The 2SK3715 is N-channel MOS Field Effect Transistor designed for high current switching applications.

ORDERING INFORMATION

PART NUMBER	PACKAGE
2SK3715	Isolated TO-220

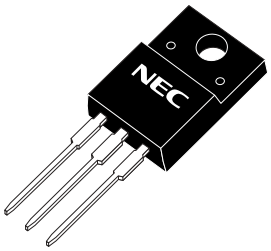
FEATURES

- Super low on-state resistance

  $R_{DS(on)1}$ = 6.0 mΩ MAX. (V_{GS} = 10 V, I_D = 38 A)

  $R_{DS(on)2}$ = 9.5 mΩ MAX. (V_{GS} = 4 V, I_D = 38 A)
- Low C_{iss}: C_{iss} = 8400 pF TYP.
- Built-in gate protection diode

(Isolated TO-220)



ABSOLUTE MAXIMUM RATINGS (T_A = 25°C)

Drain to Source Voltage (V_{GS} = 0 V)	V_{DSS}	60	V
Gate to Source Voltage (V_{DS} = 0 V)	V_{GSS}	±20	V
Drain Current (DC) (T_C = 25°C)	$I_{D(DC)}$	±75	A
Drain Current (pulse) Note1	$I_{D(pulse)}$	±300	A
Total Power Dissipation (T_C = 25°C)	P_{T1}	40	W
Total Power Dissipation (T_A = 25°C)	P_{T2}	2.0	W
Channel Temperature	T_{ch}	150	°C
Storage Temperature	T_{stg}	–55 to +150	°C
Single Avalanche Current Note2	I_{AS}	67	A
Single Avalanche Energy Note2	E_{AS}	450	mJ

Notes 1. PW ≤ 10 μs, Duty Cycle ≤ 1%

2. Starting T_{ch} = 25°C, V_{DD} = 30 V, R_G = 25 Ω, V_{GS} = 20 → 0 V

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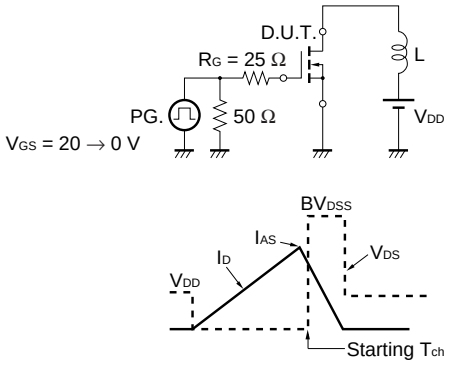
The mark ★ shows major revised points.

ELECTRICAL CHARACTERISTICS (T_A = 25°C)

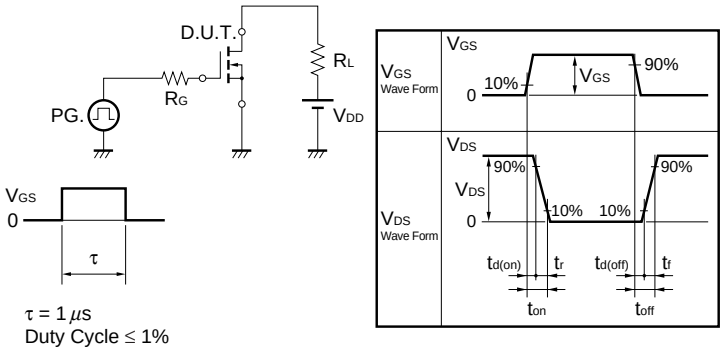
CHARACTERISTICS	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNIT
Zero Gate Voltage Drain Current	I_{DSS}	V_{DS} = 60 V, V_{GS} = 0 V			10	μA
Gate Leakage Current	I_{GSS}	V_{GS} = ±20 V, V_{DS} = 0 V			±10	μA
Gate Cut-off Voltage	$V_{GS(off)}$	V_{DS} = 10 V, I_D = 1 mA	1.5	2.0	2.5	V
Forward Transfer Admittance Note	$\|y_{fs}\|$	V_{DS} = 10 V, I_D = 38 A	33	65		S
Drain to Source On-state Resistance Note	$R_{DS(on)1}$	V_{GS} = 10 V, I_D = 38 A		4.8	6.0	mΩ
	$R_{DS(on)2}$	V_{GS} = 4 V, I_D = 38 A		6.1	9.5	mΩ
Input Capacitance	C_{iss}	V_{DS} = 10 V		8400		pF
Output Capacitance	C_{oss}	V_{GS} = 0 V		1200		pF
Reverse Transfer Capacitance	C_{rss}	f = 1 MHz		530		pF
Turn-on Delay Time	$t_{d(on)}$	V_{DD} = 30 V, I_D = 38 A		24		ns
Rise Time	t_r	V_{GS} = 10 V		15		ns
Turn-off Delay Time	$t_{d(off)}$	R_G = 0 Ω		116		ns
Fall Time	t_f			11		ns
Total Gate Charge	Q_G	V_{DD} = 48 V		145		nC
Gate to Source Charge	Q_{GS}	V_{GS} = 10 V		21		nC
Gate to Drain Charge	Q_{GD}	I_D = 75 A		39		nC
Body Diode Forward Voltage Note	$V_{F(S-D)}$	I_F = 75 A, V_{GS} = 0 V		0.92	1.5	V
Reverse Recovery Time	t_{rr}	I_F = 50 A, V_{GS} = 0 V		59		ns
Reverse Recovery Charge	Q_{rr}	di/dt = 50 A/μs		136		nC

★ **Note** Pulsed

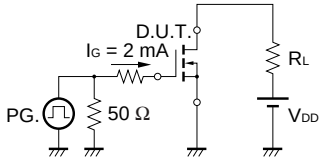
TEST CIRCUIT 1 AVALANCHE CAPABILITY



TEST CIRCUIT 2 SWITCHING TIME

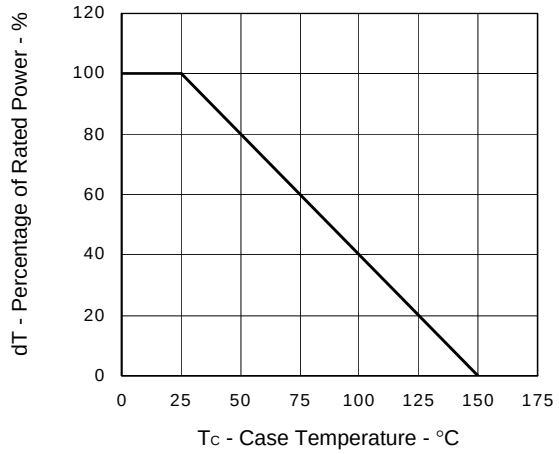


TEST CIRCUIT 3 GATE CHARGE

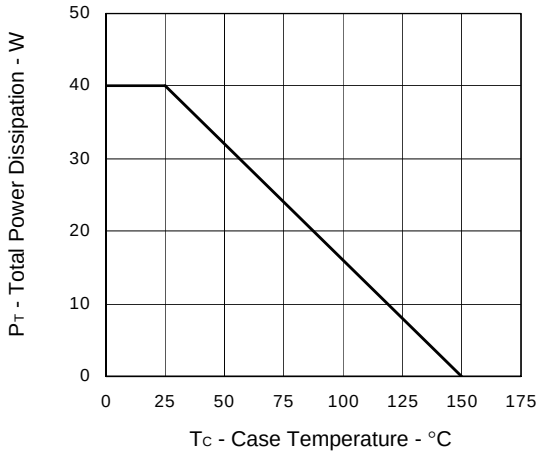


TYPICAL CHARACTERISTICS (T_A = 25°C)

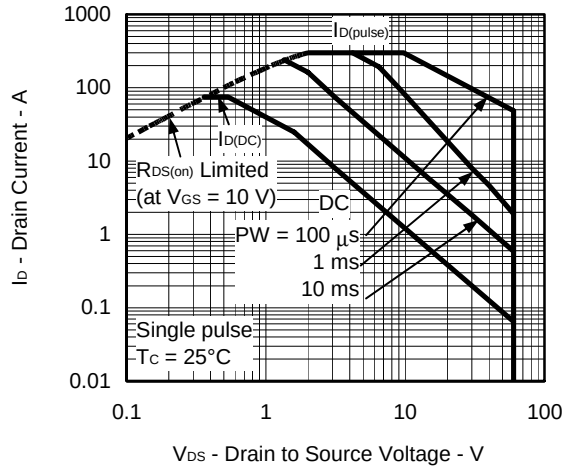
DERATING FACTOR OF FORWARD BIAS SAFE OPERATING AREA



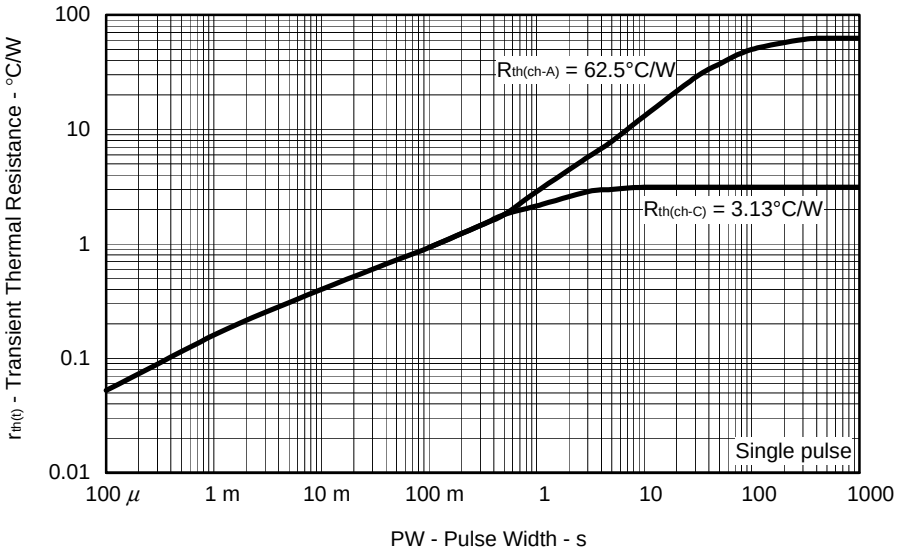
TOTAL POWER DISSIPATION vs. CASE TEMPERATURE



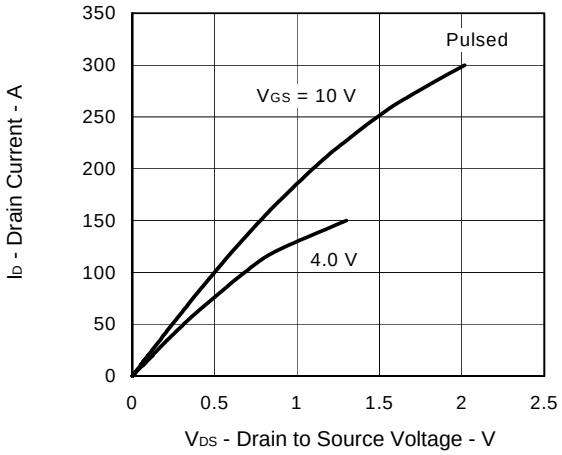
★ FORWARD BIAS SAFE OPERATING AREA



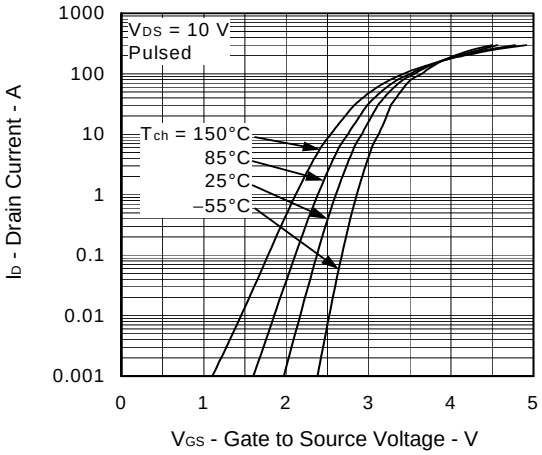
TRANSIENT THERMAL RESISTANCE vs. PULSE WIDTH



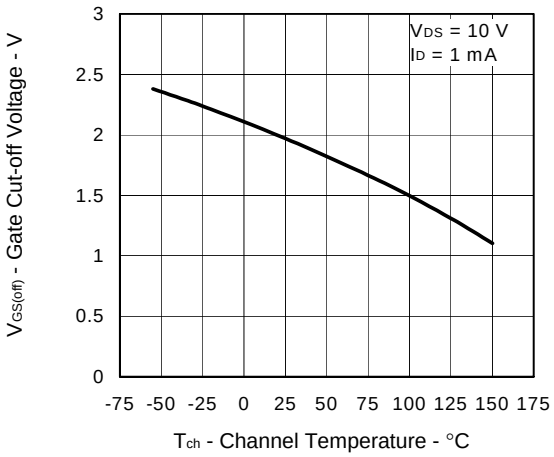
DRAIN CURRENT vs.
DRAIN TO SOURCE VOLTAGE



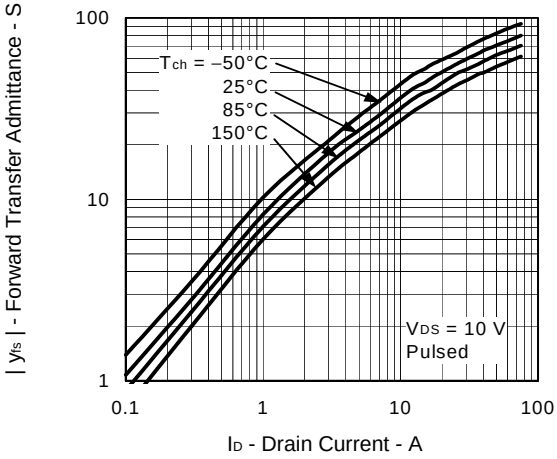
FORWARD TRANSFER CHARACTERISTICS



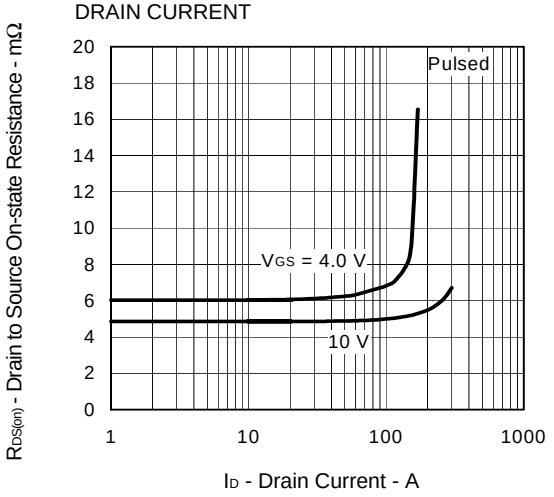
GATE CUT-OFF VOLTAGE vs.
CHANNEL TEMPERATURE



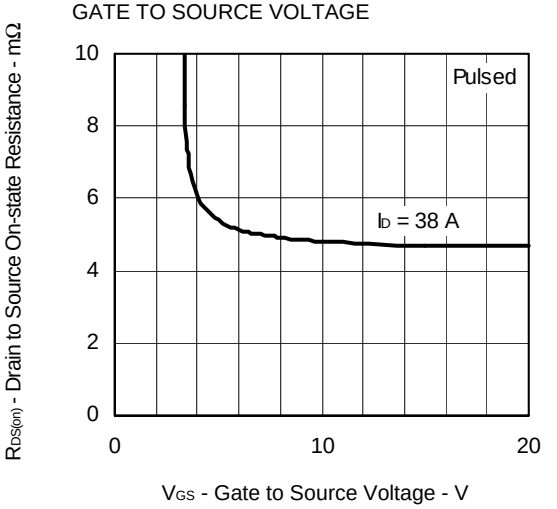
FORWARD TRANSFER ADMITTANCE vs.
DRAIN CURRENT



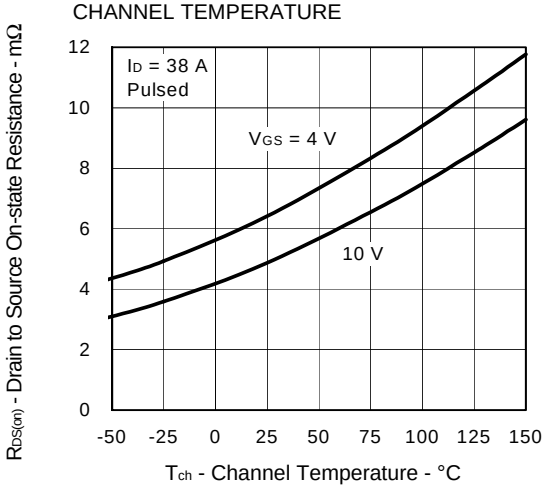
DRAIN TO SOURCE ON-STATE RESISTANCE vs.
DRAIN CURRENT



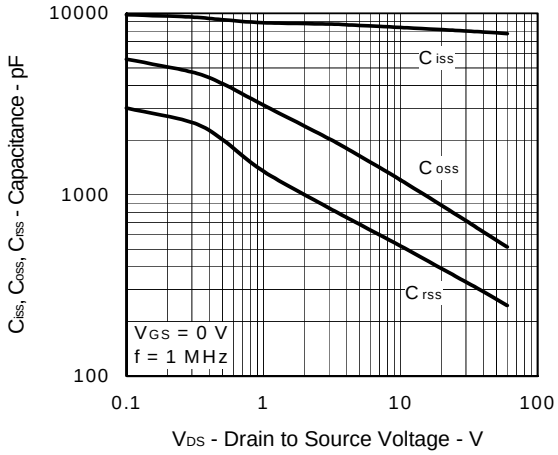
DRAIN TO SOURCE ON-STATE RESISTANCE vs.
GATE TO SOURCE VOLTAGE



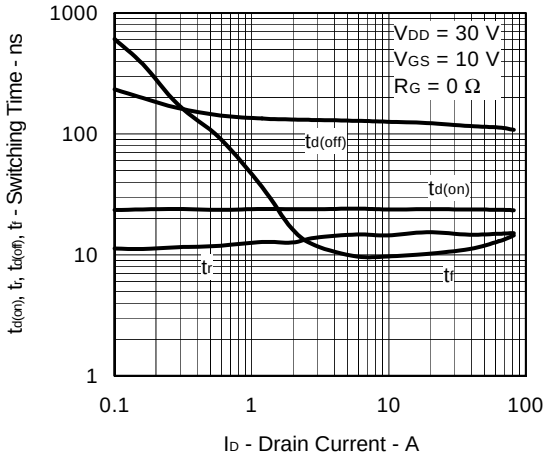
DRAIN TO SOURCE ON-STATE RESISTANCE vs. CHANNEL TEMPERATURE



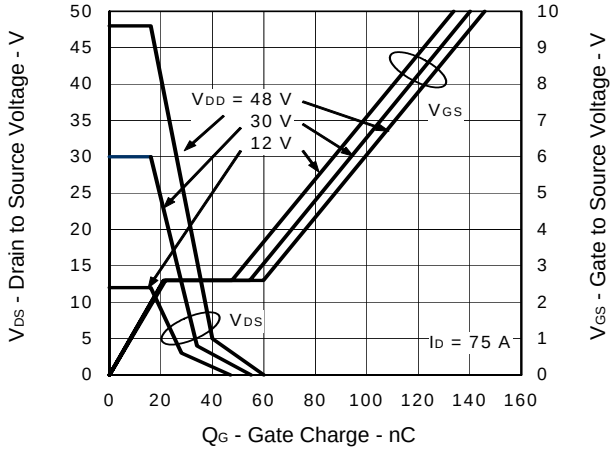
CAPACITANCE vs. DRAIN TO SOURCE VOLTAGE



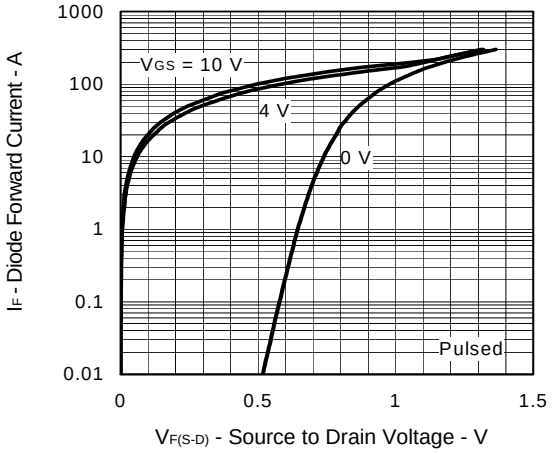
SWITCHING CHARACTERISTICS



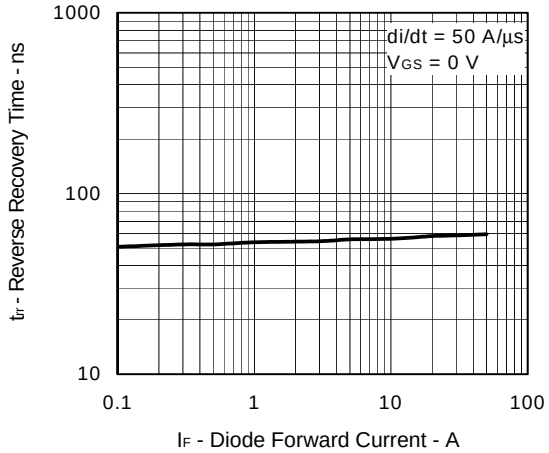
DYNAMIC INPUT/OUTPUT CHARACTERISTICS



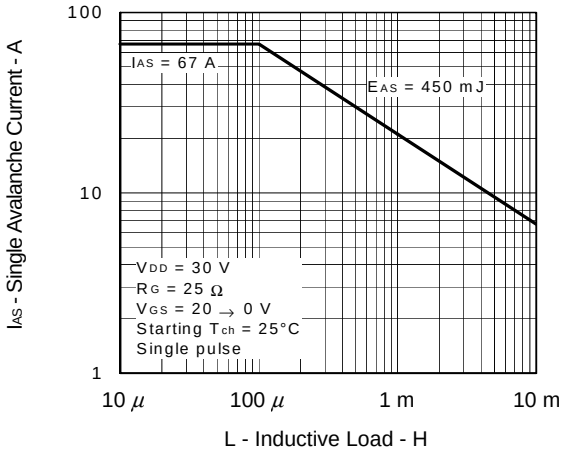
SOURCE TO DRAIN DIODE FORWARD VOLTAGE



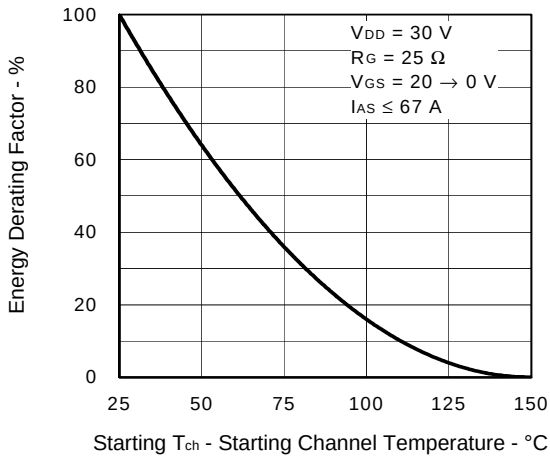
REVERSE RECOVERY TIME vs. DIODE FORWARD CURRENT



SINGLE AVALANCHE CURRENT vs.
INDUCTIVE LOAD

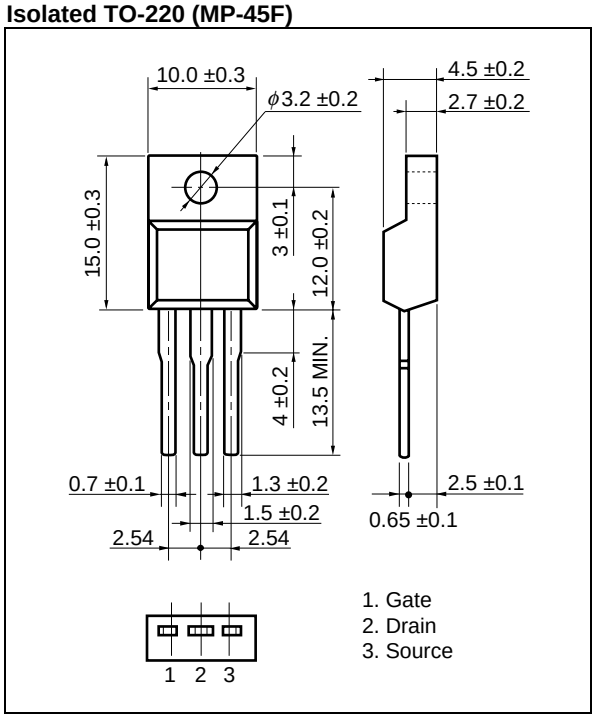


SINGLE AVALANCHE ENERGY
DERATING FACTOR

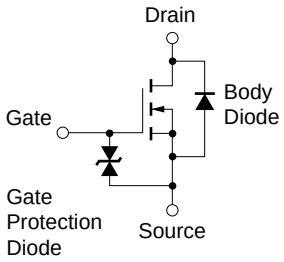


PACKAGE DRAWING (Unit: mm)

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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