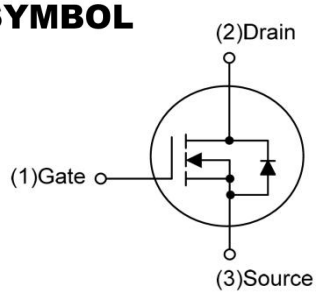
■ DESCRIPTION

SJ-FET is new generation of high voltage MOSFET family that is utilizing an advanced charge balance mechanism for outstanding low on-resistance and lower gate charge performance .This advanced technology has been tailored to minimize conduction loss , provide superior switching performance , and withstand extreme dv/dt rate and higher avalanche energy.SJ-FET is suitable for various AC/DC power conversion in switching mode operation for higher efficiency.

■ FEATURES

* Very low FOM $R_{DS(on)}$ × Qg
* 100% avalanche tested
* RoHS compliant

SYMBOL



■ APPLICATIONS

* Uninterruptible Power Supply (UPS)
* Power Factor Correction (PFC)
* Charger

■ ABSOLUTE MAXIMUM RATINGS(TA=25°C, unless otherwise specified.)

Parameter		Symbol	Value	Unit
Drain-Source Voltage (note2)		VDSS	650	V
Continuous Drain Current	TC = 25ºC	ID	20	A
	TC = 100ºC		12	
Pulsed Drain Current (note1)		IDM	53	A
Gate-Source Voltage		VGSS	±30	V
Single Pulse Avalanche Energy (note2)		EAS	103	mJ
Drain Source voltage slope (Vds=480V) (note3)		dV/dt	100	V/ns
Power Dissipation	TO-220F	PD	36	W
Operating Junction and Storage Temperature Range		TJ, Tstg	-55~+150	ºC
Thermal Resistance, Junction-to-Case		RthJC	3.47	ºC/W
Thermal Resistance, Junction-to-Ambient		RthJC	80	ºC/W

NOTES:

1. Repetitive Rating: Pulse width limited by maximum junction temperature.
2. I_{AS} =4A, V_{DD} = 50V, R_G = 25Ω , Starting T_J = 25 ºC.

■ ELECTRICAL CHARACTERISTICS(T_J= 25ºC, unless otherwise specified)

Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Unit
Off&On Characteristics						
Drain-Source Breakdown Voltage	$V_{(BR)DSS}$	V_{GS} = 0V, I_D = 250μA	650	--	--	V
Zero Gate Voltage Drain Current	I_{DSS}	V_{DS} = 650V, V_{GS} = 0V T_J = 25ºC	--	--	1	μA
		V_{DS} = 650V, V_{GS} = 0V T_J = 150ºC	--	--	100	
Gate-Source Leakage Current	I_{GSS}	V_{GS} = ±30V	--	--	±100	nA
Gate-Source Threshold Voltage	$V_{GS(th)}$	V_{DS} = V_{GS}, I_D = 250μA	2.5	--	4.5	V
Drain-Source On-State-Resistance	$R_{DS(on)}$	V_{GS} = 10V, I_D = 8.5A	--	150	180	mΩ
Dynamic&Switching Characteristics						
Input Capacitance	Ciss	V_{GS} = 0V, V_{DS} = 400V f = 100KHz	--	1230	--	pF
Output Capacitance	Coss		--	35	--	
Reverse Transfer Capacitance	Crss		--	--	--	
Total Gate Charge	Qg	V_{DD} = 400V, I_D = 8.5A V_{GS} = 10V (Note 4)	--	57	--	nC
Gate-Source Charge	Qgs		--	13	--	
Gate-Drain Charge	Qgd		--	21	--	
Turn-on Delay Time	td(on)	V_{DD} = 400V, I_D = 8.5A R_G = 10Ω , V_{GS} = 10V	--	15	--	ns
Turn-on Rise Time	tr		--	11	--	
Turn-off Delay Time	td(off)		--	71	--	
Turn-off Fall Time	tf		--	10	--	
Drain-Source Body Diode Characteristics						
Body Diode Forward Voltage	V_{SD}	T_J = 25ºC, I_{SD} = 8.5A V_{GS} = 0V	--	0.9	1.4	V
Reverse Recovery Time	trr	V_R = 400V, I_F = 8.5A diF/dt = 100A/μs	--	284	--	ns
Reverse Recovery Charge	Qrr		--	3.34	--	μC

Notes：

1. I_{SD}≤I_D, di/dt ≤ 200A/us, V_{DD} ≤ BV_{DSS}, Starting T_J = 25 ℃.
2. Essentially Independent of Operating Temperature Typical Characteristics

■ TEST CIRCUITS AND WAVEFORMS

Figure A：Gate Charge Test Circuit and Waveform

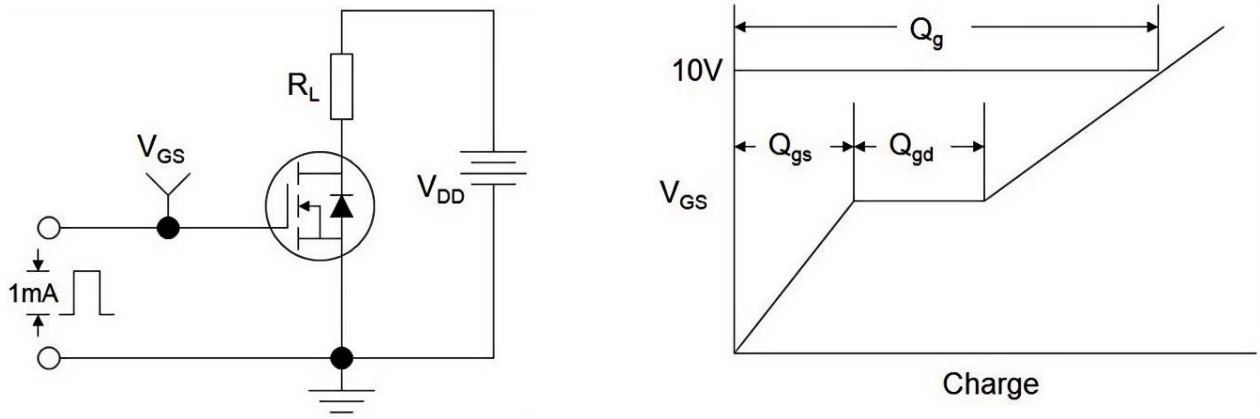


Figure B：Resistive Switching Test Circuit and Waveform

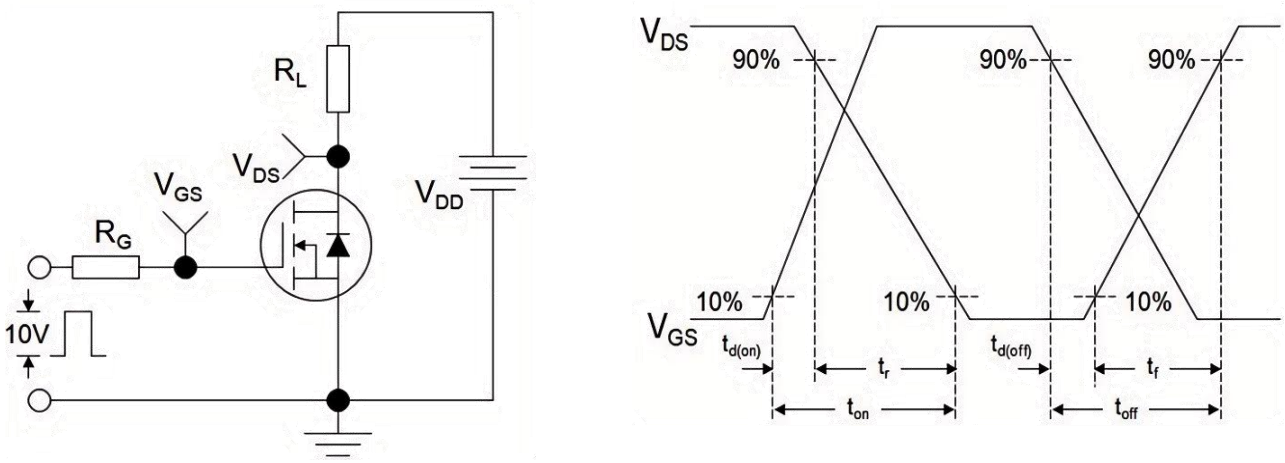
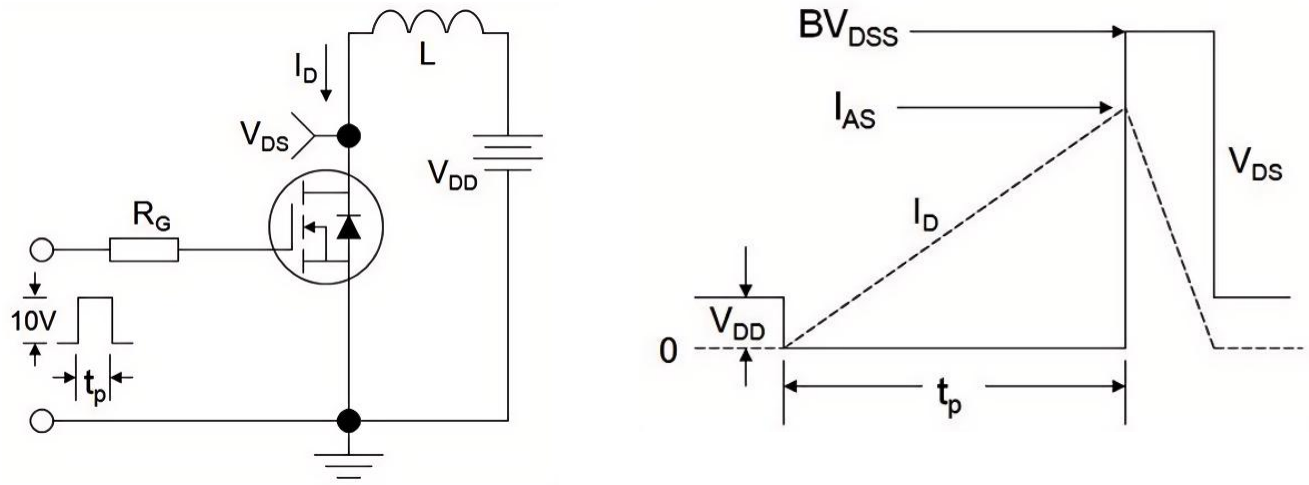


Figure C：Unclamped Inductive Switching Test Circuit and Waveform



■ TYPICAL CHARACTERISTICS（TJ = 25ºC, unless otherwise noted）

Figure 1. Output Characteristics

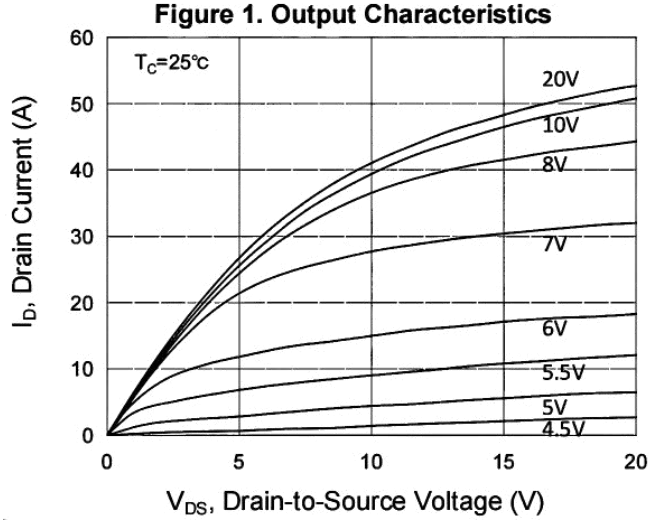


Figure 2. Transfer Characteristics

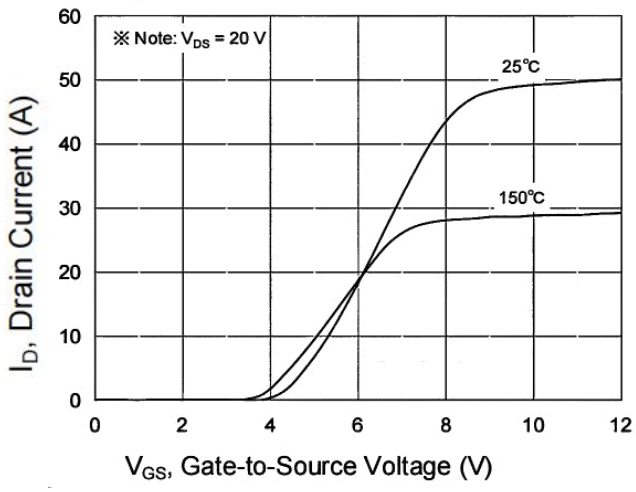


Figure 3. On-Resistance vs. Drain Current

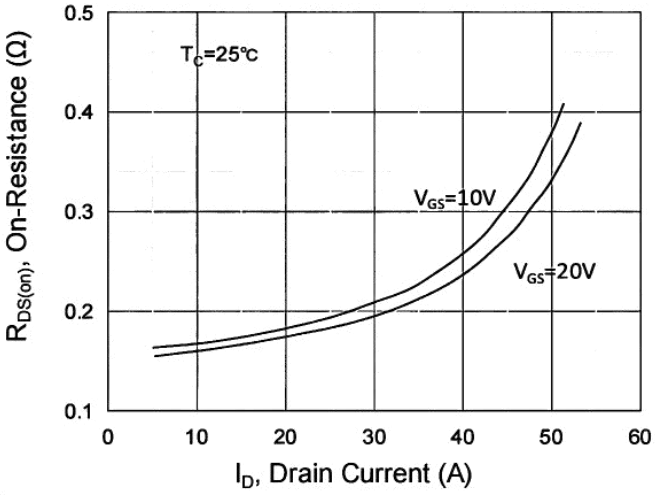


Figure 4. Capacitance

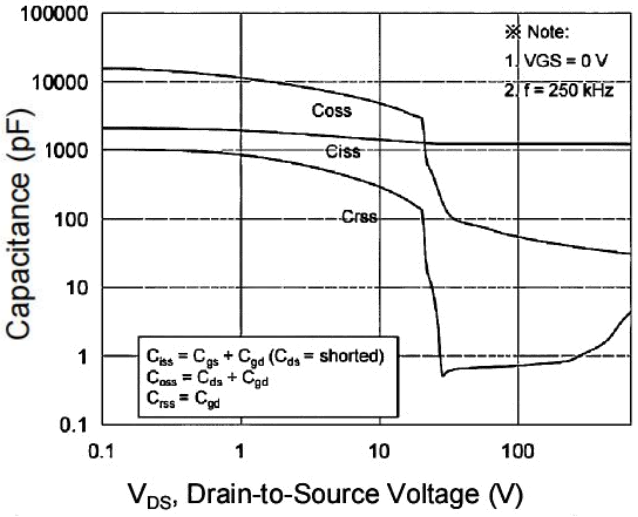


Figure 5. Gate Charge

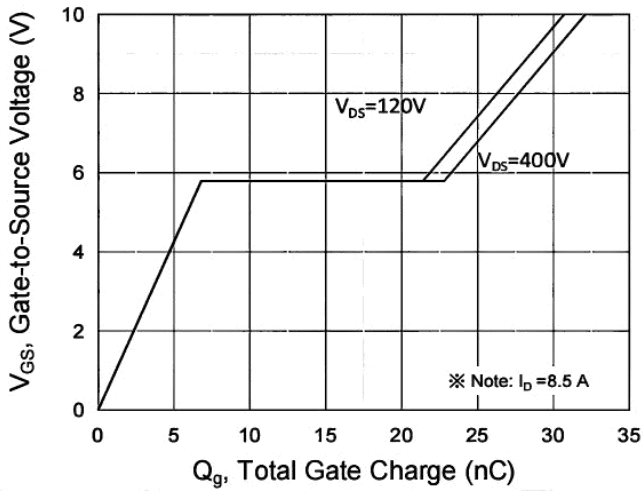
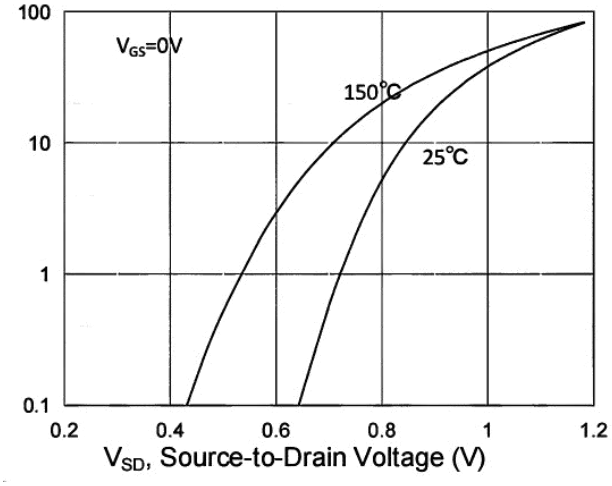


Figure 6. Body Diode Forward Voltage



■ TYPICAL CHARACTERISTICS(Con.t)

Figure 7. On-Resistance vs. Temperature

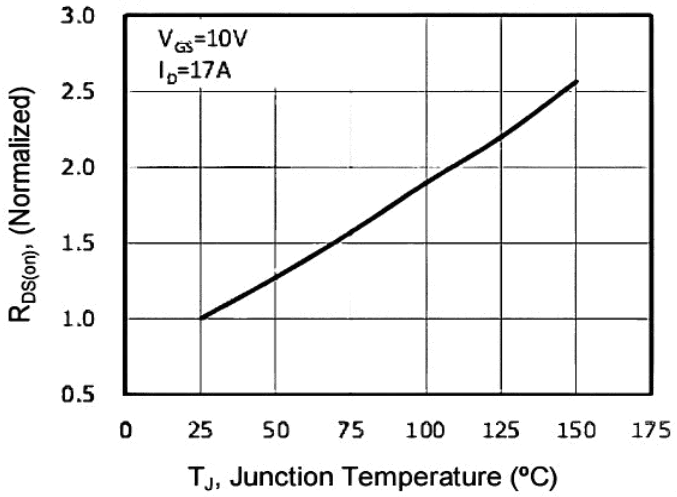


Figure 8. Breakdown Voltage vs. Junction Temperature

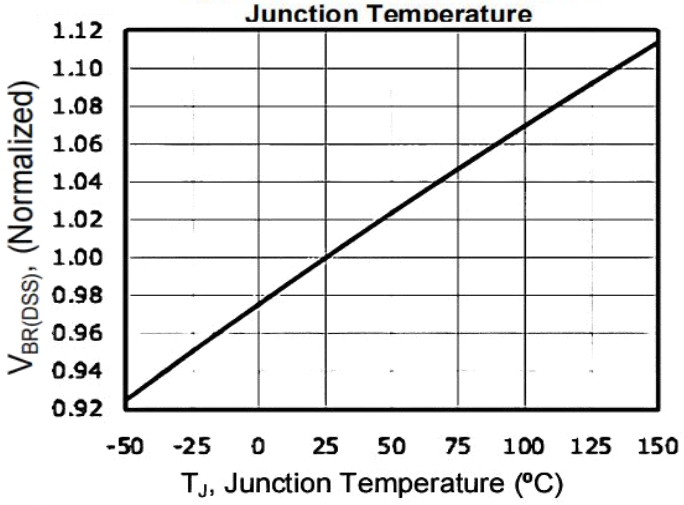


Figure 9. Transient Thermal Impedance TO-263/TO-220/TO-247

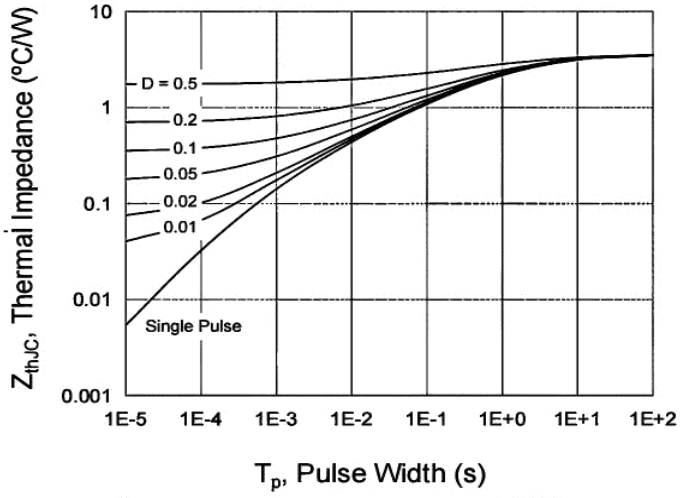


Figure 10. Safe Operation Area TO-263/TO-220/TO-247

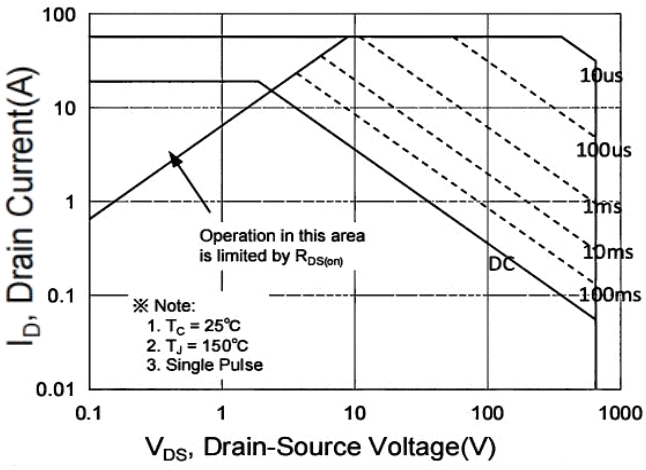


Figure 11. Transient Thermal Impedance TO-220F

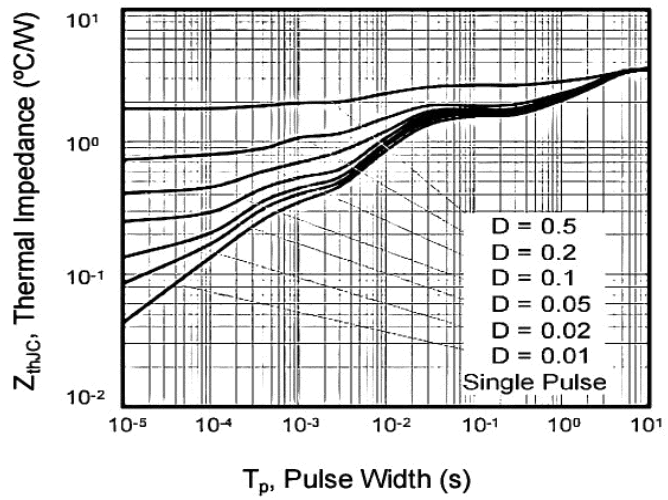
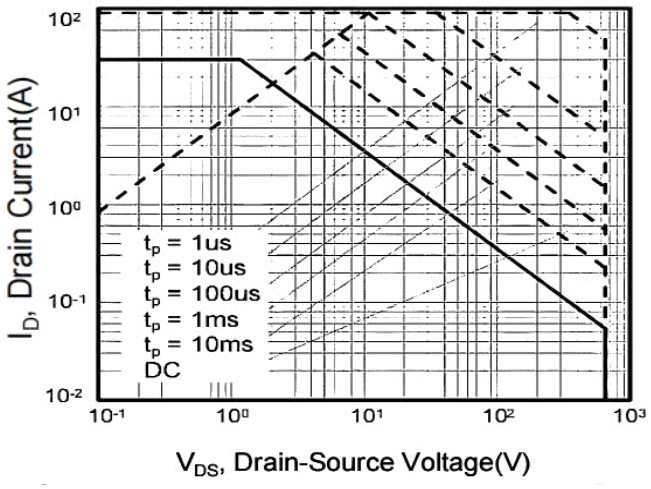
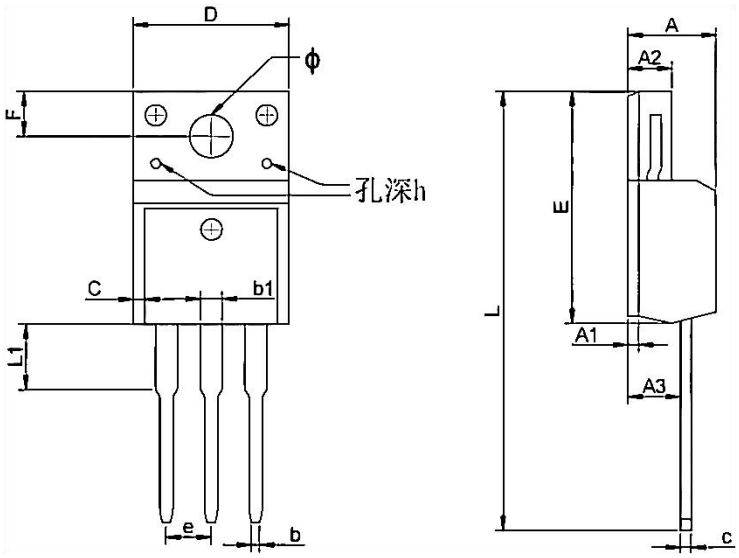


Figure 12. Safe Operation Area TO-220F



■ TO- 220F PACKAGE OUTLINE DIMENSIONS



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max	Min	Max
A	4.300	4.750	0.169	0.185
A1	1.830 REF		0.072 REF	
A2	2.300	2.850	0.090	0.112
A3	2.500	2.900	0.098	0.114
b	0.400	0.420	0.016	0.016
b1	1.220	1.280	0.048	0.050
C	0.690	0.720	0.027	0.028
c	0.490	0.510	0.019	0.020
D	9.960	10.200	0.392	0.400
E	15.000	15.950	0.588	0.625
e	2.574 TYP		0.101TYP	
F	3.470 REF		0.136 REF	
y	3.200 REF		0.125 REF	
h	0.000	0.300	0.000	0.012
L	28.780	28.900	1.128	1.133
L1	2.990	3.100	0.117	0.122

■ TO - 220F PACKING INFORMATION

50PCS

20 Tube

5 Inner Box

Outer Box

Inner Box

Package version	Tube dimensions LxW×H (mm)	Per Tube (pcs)	Tube per box	Inner box dimensions LxW×H (mm)	PCS/ Inner box	Outer box dimensions L×W×H(mm)	PCS/ Outer box
TO-220F	530*32*7	50	20	580*155*50	1000	602*277*188	5000