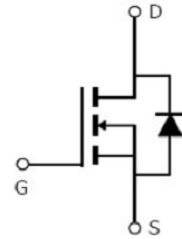


Main Product Characteristics:

V_{DSS}	40V
$R_{DS(on)}$	2.87mohm(typ.)
I_D	120A ^①


TO220

**Marking and pin
Assignment**

Schematic diagram
Features and Benefits:

- Advanced trench MOSFET process technology
- Special designed for PWM, load switching and general purpose applications
- Ultra low on-resistance with low gate charge
- Fast switching and reverse body recovery
- 175°C operating temperature


Description:

It utilizes the latest trench processing techniques to achieve the high cell density and reduces the on-resistance with high repetitive avalanche rating. These features combine to make this design an extremely efficient and reliable device for use in power switching application and a wide variety of other applications

Absolute max Rating:

Symbol	Parameter	Max.	Units
I_D @ TC = 25°C	Continuous Drain Current, V_{GS} @ 10V	120 ^①	A
I_D @ TC = 100°C	Continuous Drain Current, V_{GS} @ 10V	90 ^①	
I_{DM}	Pulsed Drain Current ^②	480	
P_D @ TC = 25°C	Power Dissipation ^③	190	W
	Linear Derating Factor	1.27	W/°C
V_{DS}	Drain-Source Voltage	40	V
V_{GS}	Gate-to-Source Voltage	± 20	V
E_{AS}	Single Pulse Avalanche Energy @ L=0.3mH	346	mJ
I_{AS}	Avalanche Current @ L=0.3mH	48	A
T_J T_{STG}	Operating Junction and Storage Temperature Range	-55 to + 175	°C

Thermal Resistance

Symbol	Characterizes	Typ.	Max.	Units
$R_{\theta JC}$	Junction-to-case ^③	—	0.79	°C/W
$R_{\theta JA}$	Junction-to-ambient ($t \leq 10s$) ^④	—	62	°C/W
	Junction-to-Ambient (PCB mounted, steady-state) ^④	—	40	°C/W

Electrical Characterizes @ $T_A=25^\circ\text{C}$ unless otherwise specified

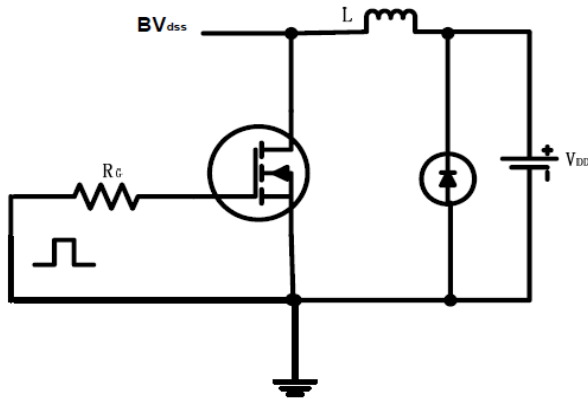
Symbol	Parameter	Min.	Typ.	Max.	Units	Conditions
$V_{(BR)DSS}$	Drain-to-Source breakdown voltage	40	—	—	V	$V_{GS} = 0V, I_D = 250\mu A$
$R_{DS(on)}$	Static Drain-to-Source on-resistance	—	2.87	4	mΩ	$V_{GS}=10V, I_D = 30A$
		—	5.33	—		$T_J = 125^\circ\text{C}$
$V_{GS(th)}$	Gate threshold voltage	1	—	3	V	$V_{DS} = V_{GS}, I_D = 250\mu A$
		—	1.0	—		$T_J = 125^\circ\text{C}$
I_{DSS}	Drain-to-Source leakage current	—	—	1	μA	$V_{DS} = 40V, V_{GS} = 0V$
		—	—	50		$T_J = 125^\circ\text{C}$
I_{GSS}	Gate-to-Source forward leakage	—	—	100	nA	$V_{GS} = 20V$
		-100	—	—		$V_{GS} = -20V$
Q_g	Total gate charge	—	111.2	—	nC	$I_D = 80A,$ $V_{DS}=25V,$ $V_{GS} = 10V$
Q_{gs}	Gate-to-Source charge	—	21.0	—		
Q_{gd}	Gate-to-Drain("Miller") charge	—	30.3	—		
$t_{d(on)}$	Turn-on delay time	—	17.8	—	ns	$V_{GS}=10V, V_{DS} = 20V,$ $R_L=0.5\Omega,$ $R_{GEN}=7\Omega,$ $I_D = 80A$
t_r	Rise time	—	139.4	—		
$t_{d(off)}$	Turn-Off delay time	—	107.3	—		
t_f	Fall time	—	142.3	—		
C_{iss}	Input capacitance	—	7081	—	pF	$V_{GS} = 0V,$ $V_{DS} = 25V,$ $f = 1MHz$
C_{oss}	Output capacitance	—	496	—		
C_{rss}	Reverse transfer capacitance	—	479	—		

Source-Drain Ratings and Characteristics

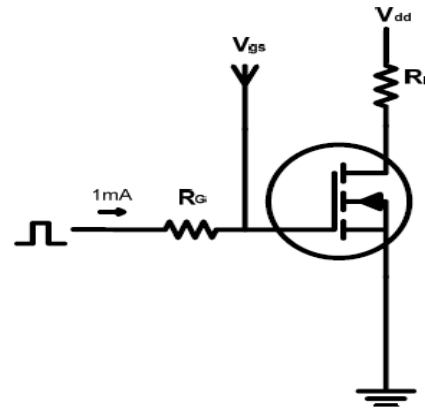
Symbol	Parameter	Min.	Typ.	Max.	Units	Conditions
I_S	Continuous Source Current (Body Diode)	—	—	120 ^①	A	MOSFET symbol showing the integral reverse p-n junction diode. 
I_{SM}	Pulsed Source Current (Body Diode)	—	—	480	A	
V_{SD}	Diode Forward Voltage	—	0.70	1.3	V	$I_S=2.1A, V_{GS}=0V$
t_{rr}	Reverse Recovery Time	—	19.2	—	ns	$T_J = 25^\circ\text{C}, I_F = 75A, di/dt = 100A/\mu s$
Q_{rr}	Reverse Recovery Charge	—	12.0	—	nC	

Test circuits and Waveforms

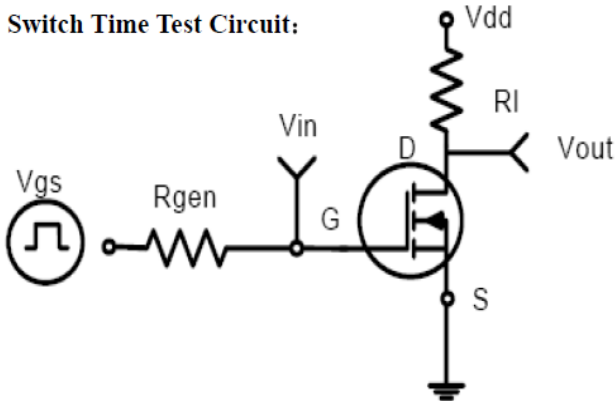
EAS test circuits:



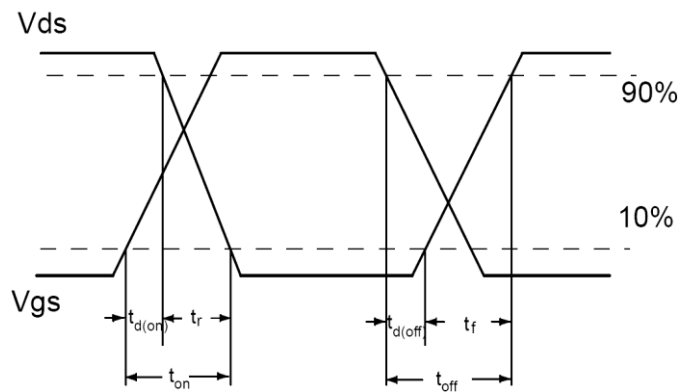
Gate charge test circuit:



Switch Time Test Circuit:



Switch Waveforms:



Notes:

- ① Calculated continuous current based on maximum allowable junction temperature. Package limitation current is 75A.
- ② Repetitive rating; pulse width limited by max junction temperature.
- ③ The power dissipation PD is based on max junction temperature, using junction-to-case thermal resistance.
- ④ The value of $R_{\theta JA}$ is measured with the device mounted on 1 in 2 FR-4 board with 2oz. Copper, in a still air environment with $T_A = 25^\circ\text{C}$
- ⑤ These curves are based on the junction-to-case thermal impedance which is measured with the device mounted to a large heatsink, assuming a maximum junction temperature of $T_{J(MAX)} = 175^\circ\text{C}$.

Typical electrical and thermal characteristics

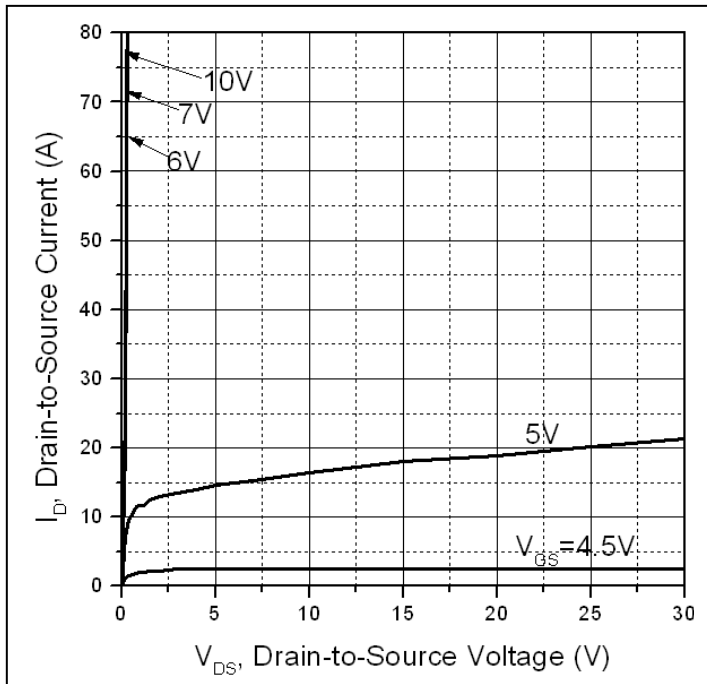


Figure 1: Typical Output Characteristics

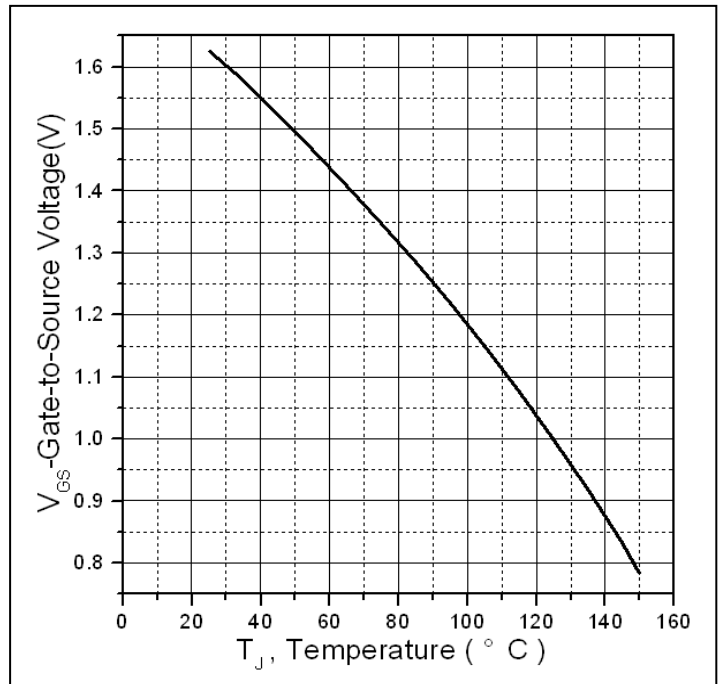


Figure 2: Gate to source cut-off voltage

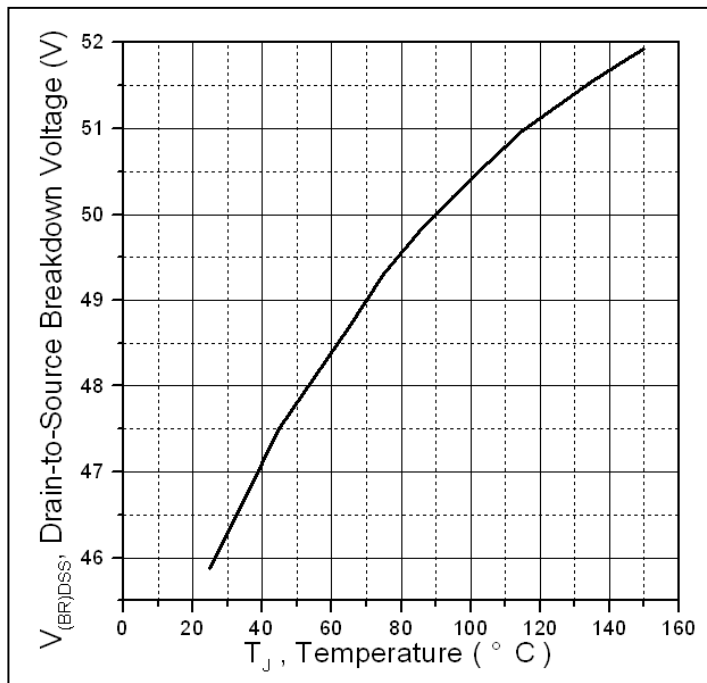


Figure 3: Drain-to-Source Breakdown Voltage vs. Temperature

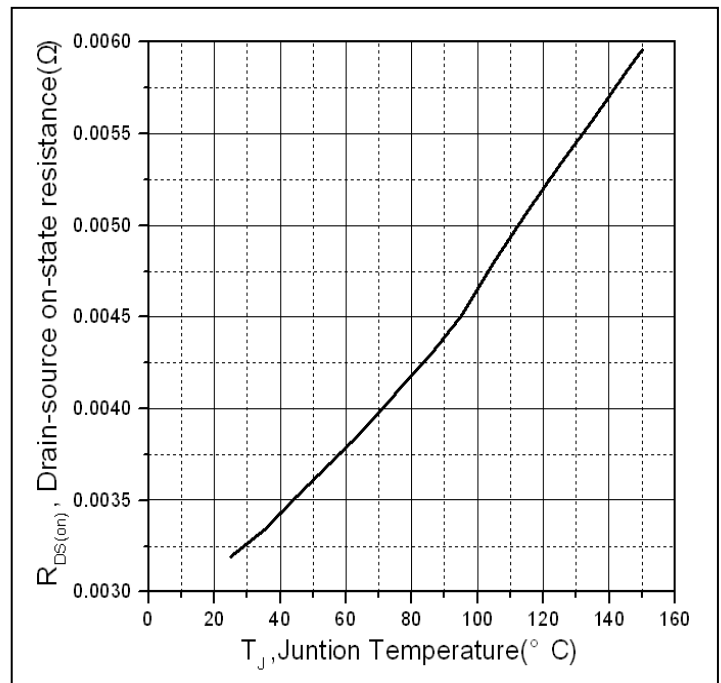


Figure 4: Normalized On-Resistance Vs. Case Temperature

Typical electrical and thermal characteristics

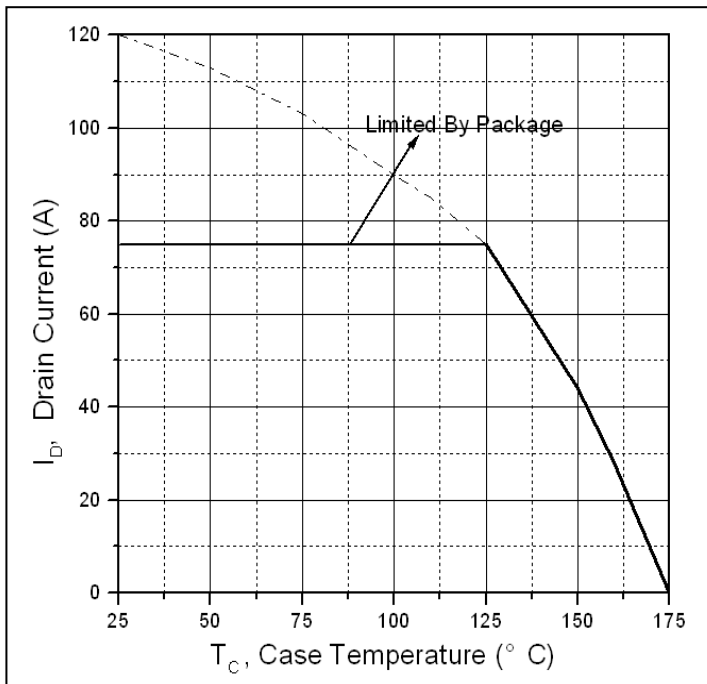


Figure 5. Maximum Drain Current Vs. Case Temperature

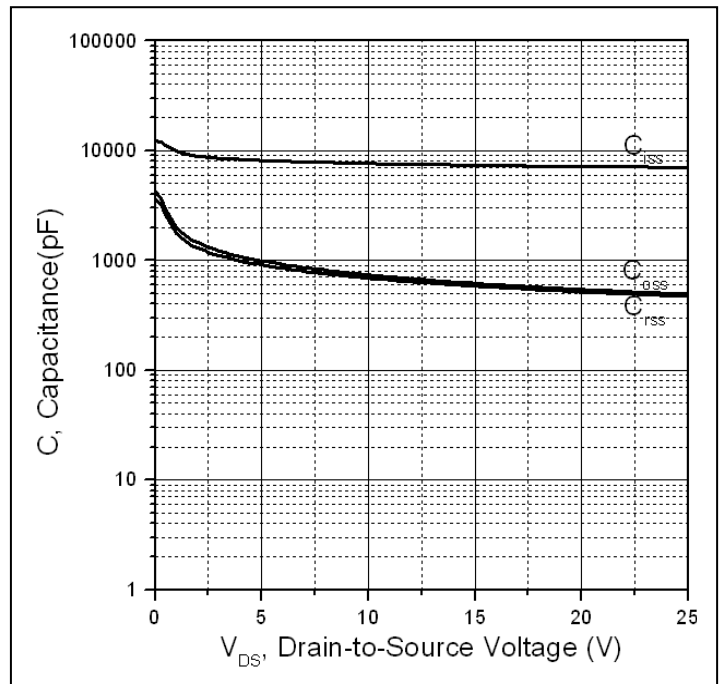


Figure 6. Typical Capacitance Vs. Drain-to-Source Voltage

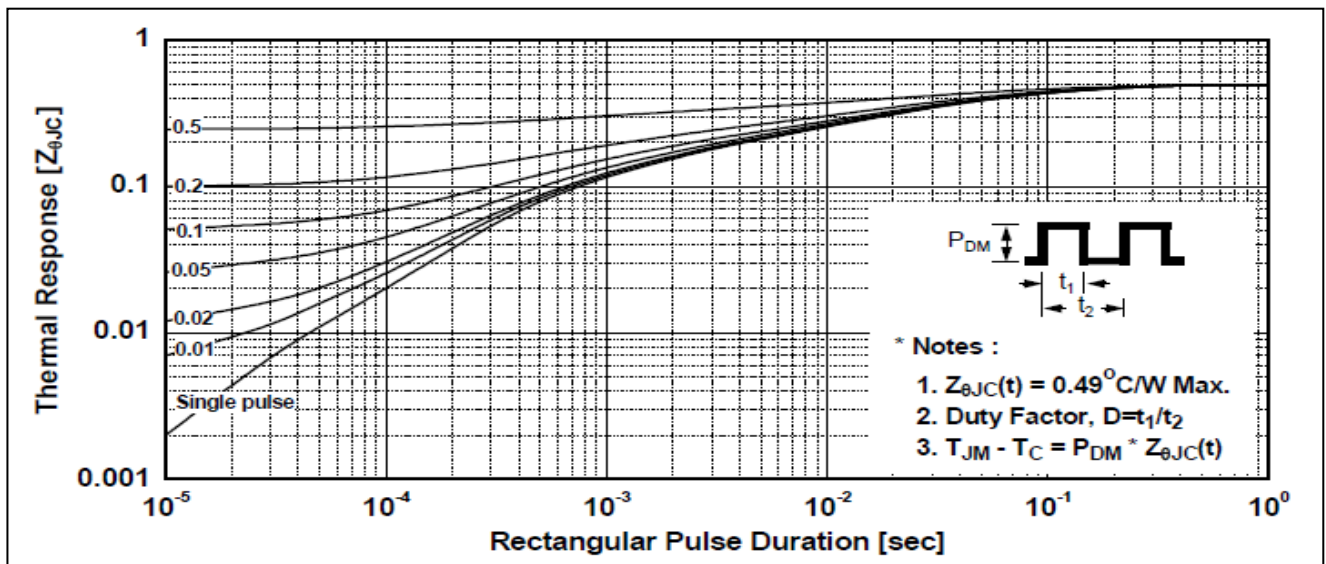
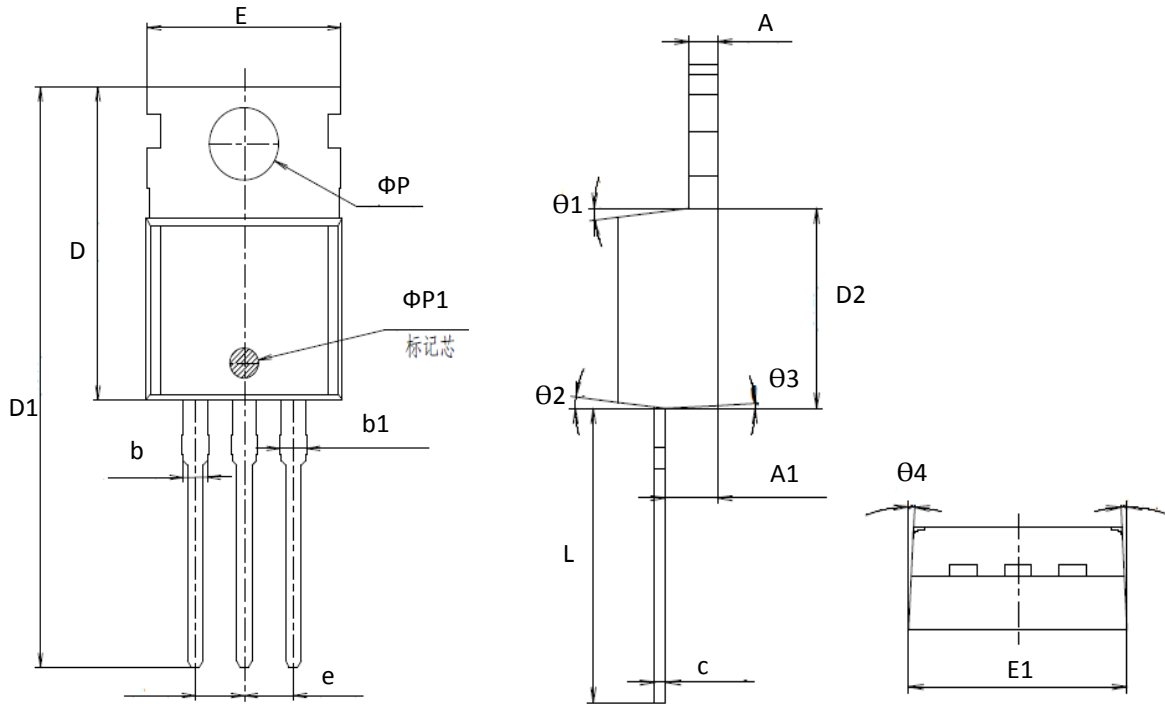


Figure7. Maximum Effective Transient Thermal Impedance, Junction-to-Case

Mechanical Data:
TO220 PACKAGE OUTLINE DIMENSION_GN


Symbol	Dimension In Millimeters			Dimension In Inches		
	Min	Nom	Max	Min	Nom	Max
A	-	1.300	-	-	0.051	-
A1	2.200	2.400	2.600	0.087	0.094	0.102
b	-	1.270	-	-	0.050	-
b1	1.270	1.370	1.470	0.050	0.054	0.058
c	-	0.500	-	-	0.020	-
D	-	15.600	-	-	0.614	-
D1	-	28.700	-	-	1.130	-
D2	-	9.150	-	-	0.360	-
E	9.900	10.000	10.100	0.390	0.394	0.398
E1	-	10.160	-	-	0.400	-
ΦP	-	3.600	-	-	0.142	-
$\Phi P1$		1.500			0.059	
e	2.54BSC			0.1BSC		
L	12.900	13.100	13.300	0.508	0.516	0.524
$\theta 1$	-	7°	-	-	7°	-
$\theta 2$	-	7°	-	-	7°	-
$\theta 3$	-	3°	-	5°	7°	9°
$\theta 4$	-	3°	-	1°	3°	5°

Ordering and Marking Information**Device Marking: SSFT4004****Package (Available)****TO220****Operating Temperature Range****C : -55 to 175 °C****Devices per Unit**

Package Type	Units/Tube	Tubes/Inner Box	Units/Inner Box	Inner Boxes/Carton Box	Units/Carton Box
TO220	50	20	1000	6	6000

Reliability Test Program

Test Item	Conditions	Duration	Sample Size
High Temperature Reverse Bias(HTRB)	T_j=125°C to 175°C @ 80% of Max V_{DSS}/V_{CES}/V_R	168 hours 500 hours 1000 hours	3 lots x 77 devices
High Temperature Gate Bias(HTGB)	T_j=150°C or 175°C @ 100% of Max V_{GSS}	168 hours 500 hours 1000 hours	3 lots x 77 devices

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