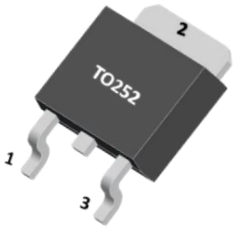
5A, 500V N-CHANNEL POWER MOSFET

■ DESCRIPTION



The HY5N50A is an N-channel mode power MOSFET using our advanced technology to provide customers with planar stripe and DMOS technology. This technology allows a minimum on-state resistance and superior switching performance. It also can withstand high energy pulse in the avalanche and commutation mode.

The HY5N50A is generally applied in high efficiency switch mode power supplies, active power factor correction and electronic lamp ballasts based on half bridge topology.

■ FEATURES

* $R_{DS(ON)}$ < 1.4Ω @V_{GS} = 10 V, I_D =2.5 A
* 100% avalanche tested
* High switching speed

■ MARKING

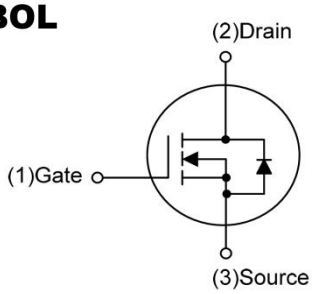
: HY LOGO

HY5N50A=Device Code

XXXX=Date Code

Solid Dot=Green molding compound

SYMBOL



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

SYMBOL	PARAMETER		VALUE	UNIT
V_{DSS}	Drain-Source Voltage		500	V
V_{GSS}	Gate Source Voltage		±30	V
I_{AR}	Avalanche Current (Note 2)		5	A
I_D	Drain Current	Continuous	5	A
I_{DM}		Pulsed (Note 2)	20	
E_{AS}	Avalanche Energy	Single Pulsed (Note 3)	300	mJ
E_{AR}		Repetitive (Note 2)	7.3	
dv/dt	Peak Diode Recovery dv/dt (Note 4)		4.5	V/ns
P_D	Power Dissipation	TO-220F	38	W
		TO-252	54	W
T_J	Junction Temperature		150	°C
T_{STG}	Storage Temperature		-55 to 150	°C

Notes: 1.Absolute maximum ratings are those values beyond which the device could be permanently damaged. Absolute maximum ratings are stress ratings only and functional device operation is not implied.
2. Repetitive Rating: Pulse width limited by maximum junction temperature.
3. L = 21.5mH, I_{AS}= 5A, V_{DD}= 50V, R_G= 25Ω, Starting T_J= 25°C
4. I_{SD} ≤ 5A, di/dt ≤ 200A/μs, V_{DD}≤ BV_{DSS} , Starting T_J= 25°C

■ THERMAL DATA

PARAMETER		SYMBOL	RATINGS	UNIT
Junction to Ambient	TO-220F	θJA	62.5	°C/W
	TO-252		110	
Junction to Case	TO-220F	θJC	3.25	°C/W
	TO-252		2.13	

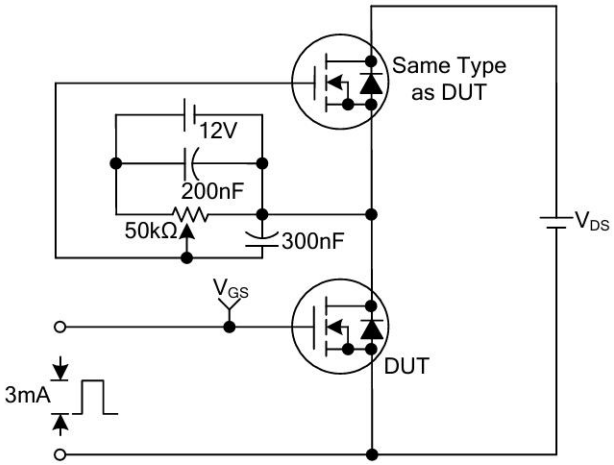
■ ELECTRICAL CHARACTERISTICS (T_A=25°C, unless otherwise specified)

PARAMETER		SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
OFF CHARACTERISTICS							
Drain-Source Breakdown Voltage		BV_{DSS}	V_{GS}=0V, I_D=250μA	500			V
Drain-Source Leakage Current		I_{DSS}	V_{DS}=500V, V_{GS}=0V			1	μA
			V_{DS}=400V, T_C=125°C			10	μA
Gate-Source Leakage Current	Forward	I_{GSS}	V_{GS}=+30V, V_{DS}=0V			+100	nA
	Reverse		V_{GS}=-30V, V_{DS}=0V			-100	
Breakdown Voltage Temperature Coefficient		△BV_{DSS}/△T_J	I_D=250μA, Referenced to 25°C		0.5		V/°C
ON CHARACTERISTICS							
Drain-source on-state resistance		$R_{DS(ON)}$	V_{GS}=10V, I_D=2.5A			1.4	Ω
Gate Threshold Voltage		$V_{GS(TH)}$	V_{GS}=V_{DS},I_D=250μA	2.0		4.0	V
DYNAMIC PARAMETERS							
Input Capacitance		C_{ISS}	V_{GS}=0V,V_{DS}=25V,f=1.0MHz		535	625	pF
Output Capacitance		C_{OSS}			70	105	pF
Reverse Transfer Capacitance		C_{RSS}			17	20	pF
SWITCHING PARAMETERS							
Turn-On Delay Time		$t_{D(on)}$	V_{DD}=30V,I_D=0.5A R_G=25Ω(Note 1, 2)		30	45	nS
Turn-On Rise time		tr			50	70	
Turn-Off Delay Time		$t_{D(off)}$			145	165	
Turn-Off Fall time		tf			72	105	

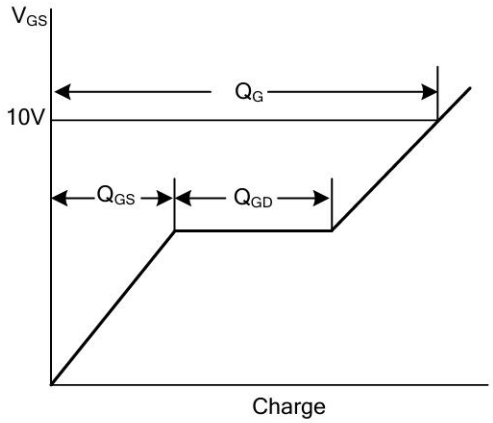
PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Total gate charge	Qg	V_{DS}=50V,V_{GS}=10V,I_D=1.3A		20	24	nC
Gate-source charge	Qgs	I_G=100μA (Note 1, 2)		4		
Gate-drain charge	Qgd			5		
SOURCE- DRAIN DIODE RATINGS AND CHARACTERISTICS						
Drain-Source Diode Forward Voltage	V_{SD}	V_{GS} = 0 V, IS =5A			1.4	V
Maximum Continuous Drain-Source Diode Forward Current	I_S				5	A
Maximum Pulsed Drain-Source Diode Forward Current	I_{SM}				20	A

Notes: 1. Pulse Test: Pulse width ≤ 300μs, Duty cycle ≤ 2%
2. Essentially independent of operating temperature

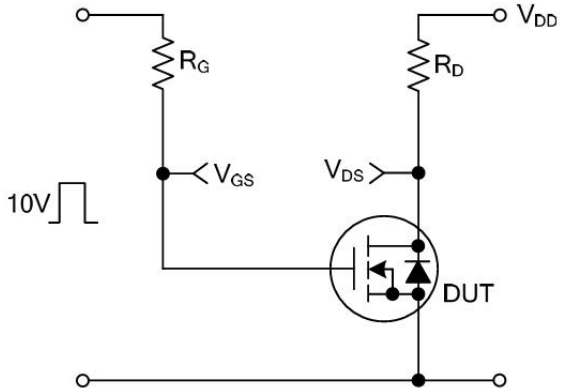
■ TEST CIRCUITS AND WAVEFORMS



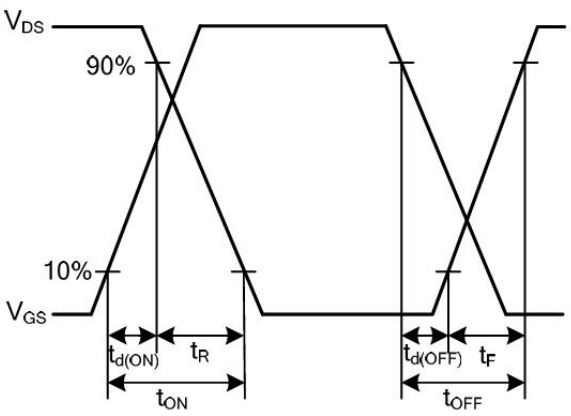
Gate Charge Test Circuit



Gate Charge Waveforms

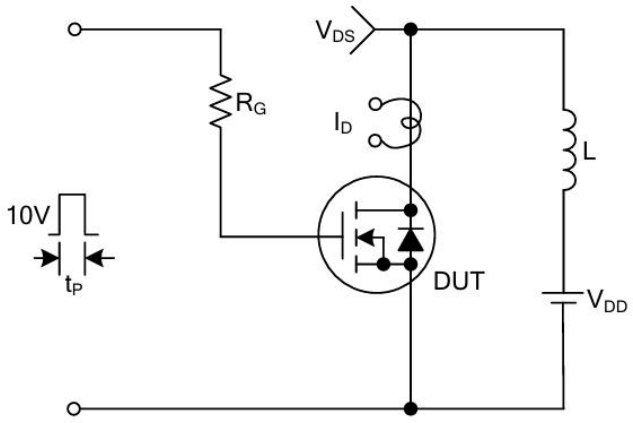


Resistive Switching Test Circuit

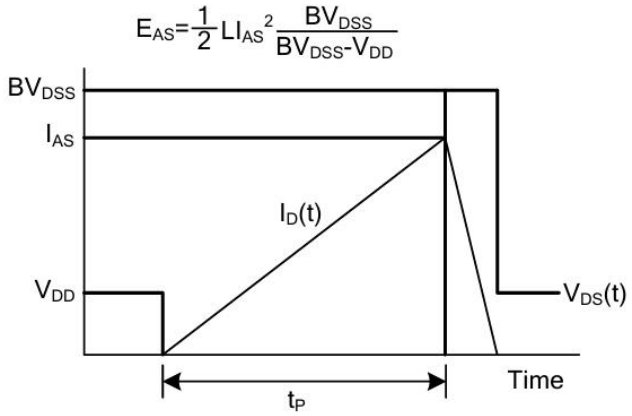


Resistive Switching Waveforms

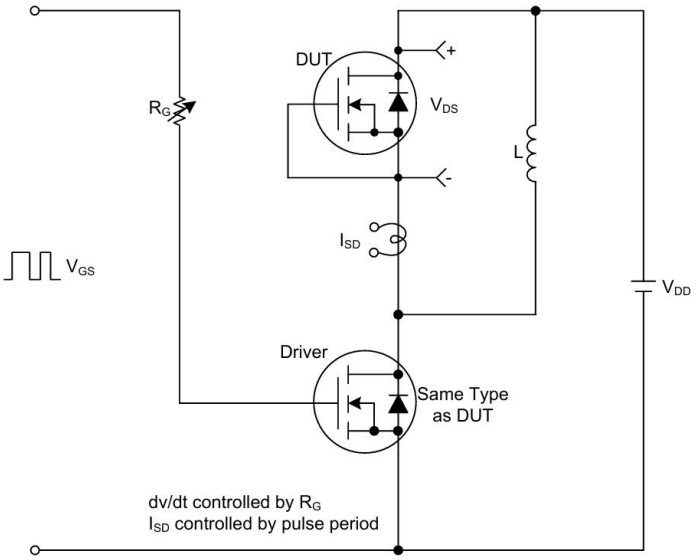
■ TEST CIRCUITS AND WAVEFORMS(Con.t)



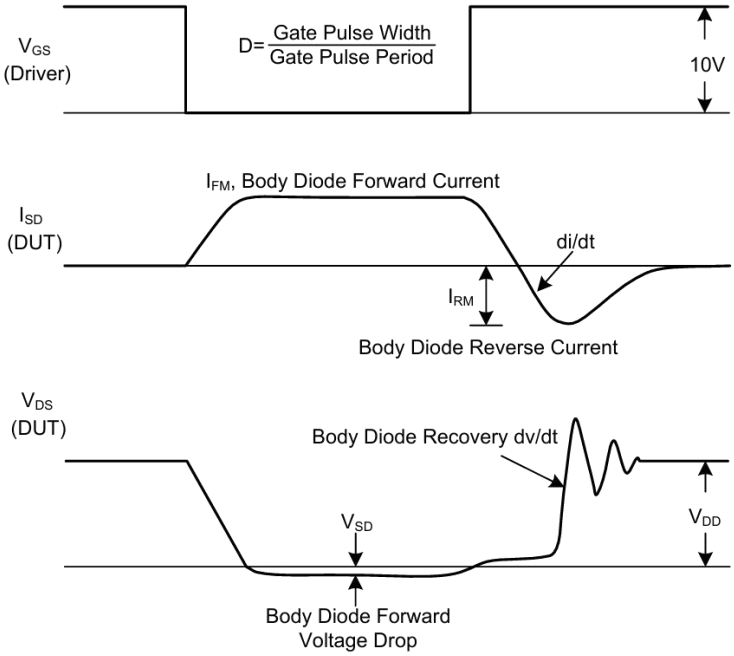
Unclamped Inductive Switching Test Circuit



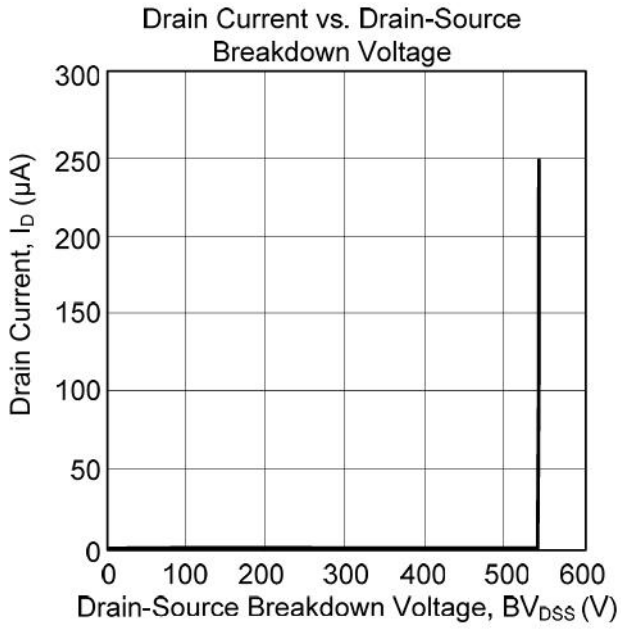
Unclamped Inductive Switching Waveforms

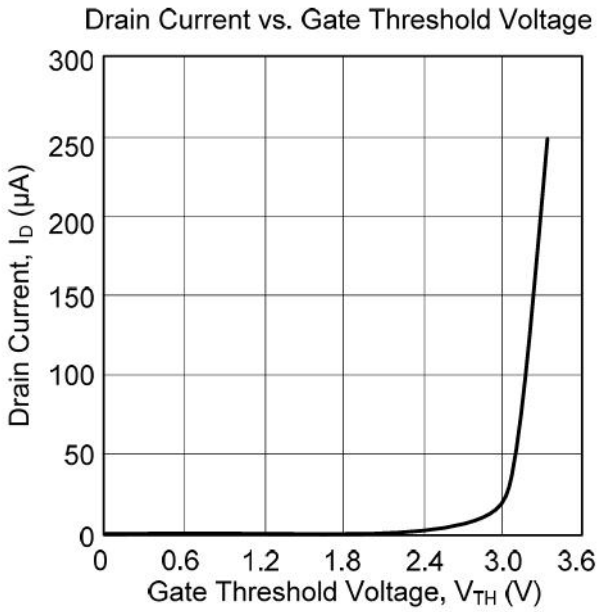


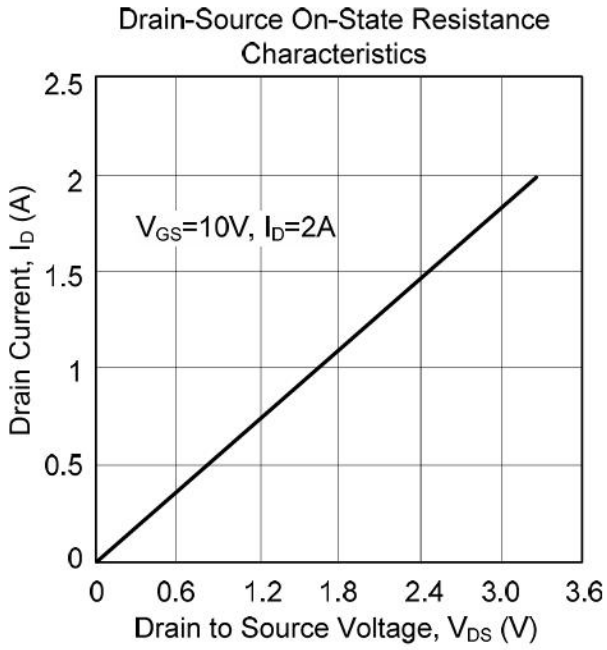
Peak Diode Recovery dv/dt Test Circuit & Waveforms

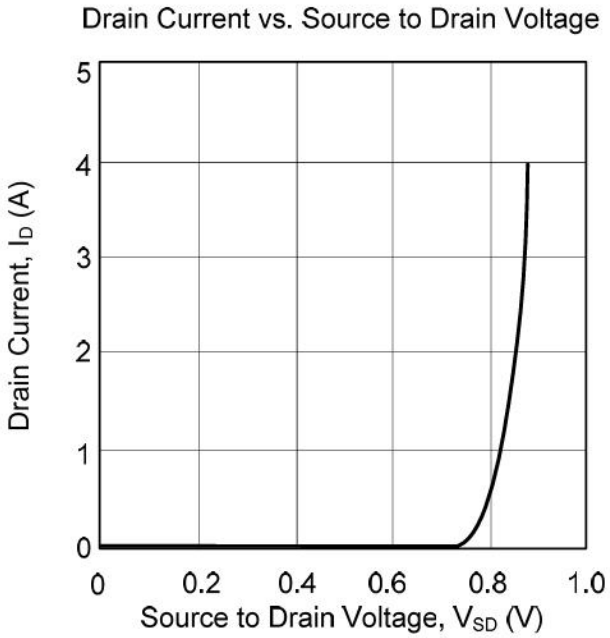


■ TYPICAL CHARACTERISTICS

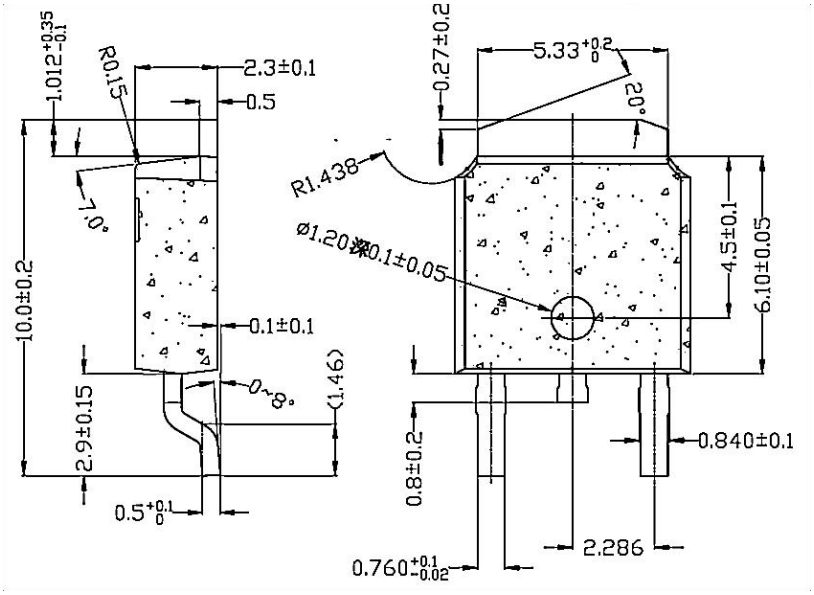


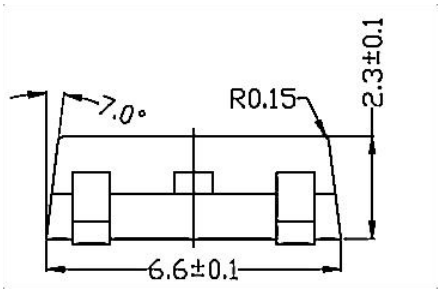




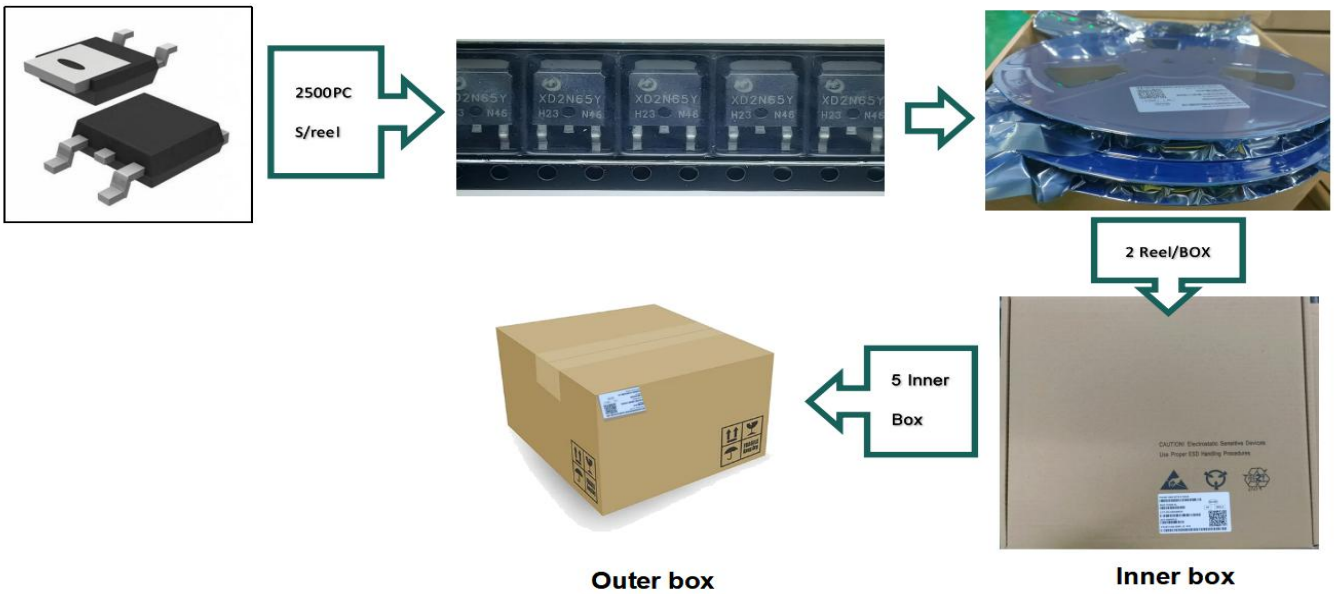


■ TO - 252 PACKAGE OUTLINE DIMENSIONS



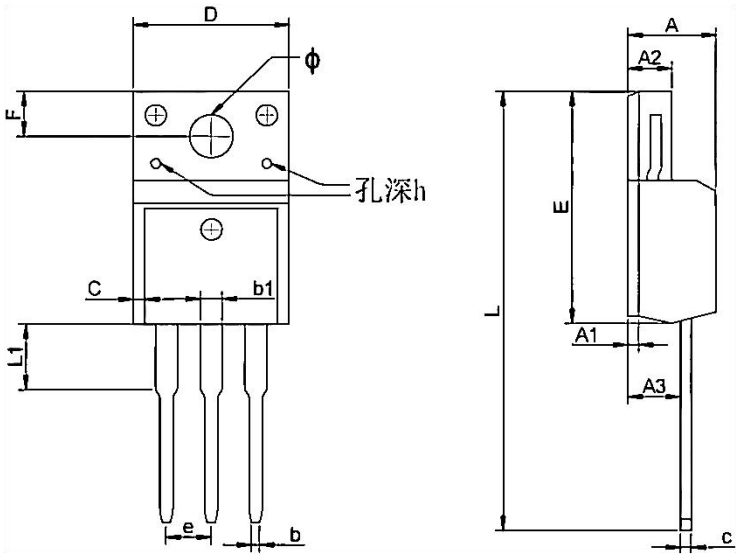


■ TO - 252 PACKING INFORMATION



Package version	Reel dimensions Φ×H (mm)	Per Reel (pcs)	Reels per box	Inner box dimensions L×W×H(mm)	Outer box (pcs)	Outer box dimensions L×W×H (mm)
TO-252	Φ330*20	2500	2	360*340*50	25000	375*375*280

■ 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