



HY5N65

N-CHANNEL POWER MOSFET

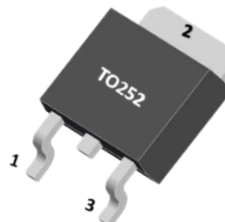
5A, 650V N-CHANNEL POWER MOSFET

DESCRIPTION

The HY5N65A is a high voltage power MOSFET and is designed to have better characteristics, such as fast switching time, low gate charge, low on-state resistance and have a high rugged avalanche characteristics. This power MOSFET is usually used at high speed switching applications in power supplies, PWM motor controls, high efficient AC to DC converters and bridge circuits.

FEATURES

- * $R_{DS(ON)} \leq 2.4\Omega$ @ $V_{GS}=10V$
- * Ultra Low Gate Charge (Typical 15 nC)
- * Low Reverse Transfer Capacitance (CR_{SS} = Typical 6.5 pF)
- * Fast Switching Capability
- * Avalanche Energy Specified
- * Improved dv/dt Capability, High Ruggedness

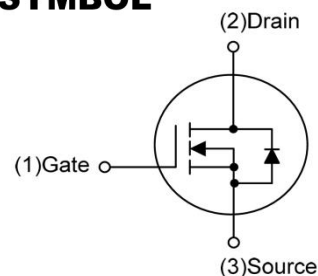


MARKING



: HY LOGO
HY5N65A=Device Code
XXXX=Date Code
Solid Dot=Green molding compound

SYMBOL



ABSOLUTE MAXIMUM RATINGS($T_c=25^\circ\text{C}$, unless otherwise specified.)

SYMBOL	PARAMETER		VALUE	UNIT
VDSS	Drain-Source Voltage		650	V
VGSS	Gate Source Voltage		± 30	V
IAR	Avalanche Current (Note 2)		5	A
ID	Drain Current	Continuous	5	A
IDM		Pulsed (Note 2)	20	
EAS	Avalanche Energy	Single Pulsed (Note 3)	210	mJ
EAR		Repetitive (Note 2)	10	
dv/dt	Peak Diode Recovery dv/dt (Note 4)		4.5	V/ns
PD	Power Dissipation	TO-220F	36	W
		TO-252	54	W
TJ	Junction Temperature		150	$^\circ\text{C}$
TSTG	Storage Temperature		-55 to 150	$^\circ\text{C}$
TOPR	Operation Temperature		-55 to 150	$^\circ\text{C}$



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- 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. Pulse width limited by $T_J(\text{MAX})$
3. $L = 16.8\text{mH}$, $I_{AS} = 5\text{A}$, $V_{DD} = 50\text{V}$, $R_G = 25\ \Omega$, Starting $T_J = 25^\circ\text{C}$
4. $I_{SD} \leq 5\text{A}$, $di/dt \leq 200\text{A}/\mu\text{s}$, $V_{DD} \leq BVD_{SS}$, Starting $T_J = 25^\circ\text{C}$

■ THERMAL DATA

PARAMETER		SYMBOL	RATINGS	UNIT
Junction to Ambient	TO-220F	θ_{JA}	62.5	$^\circ\text{C}/\text{W}$
	TO-252		160	
Junction to Case	TO-220F	θ_{JC}	3.47	$^\circ\text{C}/\text{W}$
	TO-252		2.3	

■ ELECTRICAL CHARACTERISTICS ($T_A = 25^\circ\text{C}$, 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	650			V
Drain-Source Leakage Current	I _{DSS}	V _{DS} =650V, V _{GS} =0V			1	μA
Gate-Source Leakage Current	I _{GSS}	V _{GS} =±30V, V _{DS} =0V			±100	nA
Breakdown Voltage Temperature Coefficient (Referenced to 25°C)	ΔBV _{DSS} /ΔT _J	I _D =250μA		0.6		V/°C
ON CHARACTERISTICS						
Drain-source on-state resistance	R _{DS(ON)}	V _{GS} =10V, I _D =2.5A		2.0	2.4	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		515	670	pF
Output Capacitance	C _{OSS}			55	72	
Reverse Transfer Capacitance	C _{RSS}			6.5	8.5	
SWITCHING PARAMETERS						
Total gate charge	Q _g	V _{DS} =520V, V _{GS} =10V I _D =5A (Note 1, 2)		15	19	nC
Gate-source charge	Q _{gs}			2.5		
Gate-drain charge	Q _{gd}			6.6		
Turn-On Delay Time	t _(on)	V _{DD} =325V, I _D =5A R _G =25Ω (Note 1, 2)		10	30	nS
Turn-On Rise time	t _r			42	90	
Turn-Off Delay Time	t _{D(off)}			38	85	
Turn-Off Fall time	t _f			46	100	
DRAIN-SOURCE DIODE CHARACTERISTICS AND MAXIMUM RATINGS						
Maximum Continuous Drain-Source Diode Forward Current	I _S				5	A
Maximum Pulsed Drain-Source Diode Forward Current	I _{SM}				20	A
Drain-Source Diode Forward Voltage	V _{SD}	V _{GS} = 0 V, I _S = 5A			1.4	V
Reverse Recovery Time	t _{rr}	V _{GS} = 0 V, I _S = 5A dI _F / dt = 100 A/μs		300		ns
Reverse Recovery Charge	Q _{rr}	(Note 1)		2.2		μC

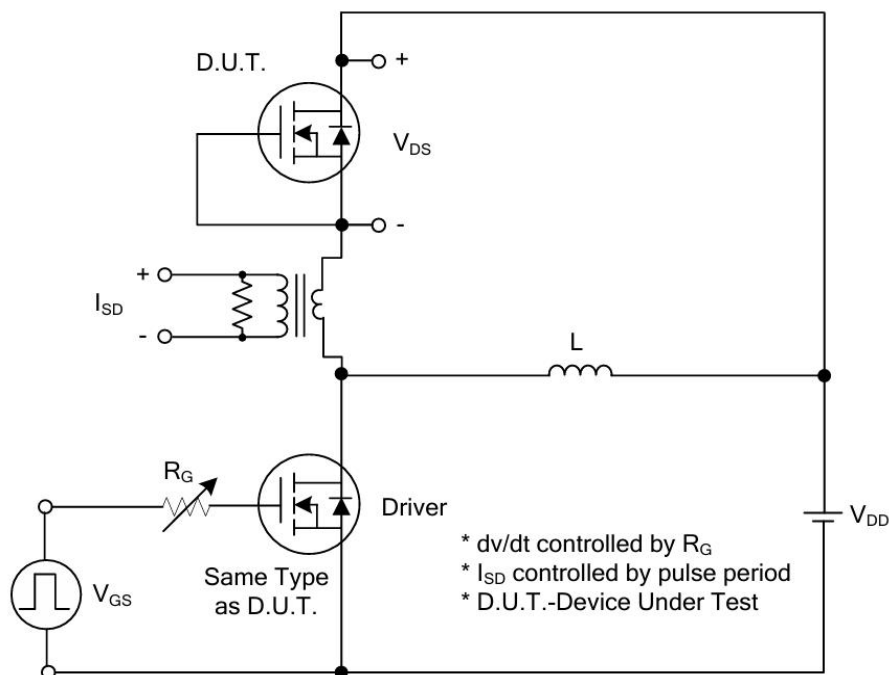
- Notes: 1. Pulse Test: Pulse width $\leq 300\mu\text{s}$, Duty cycle $\leq 2\%$.
2. Essentially independent of operating temperature.



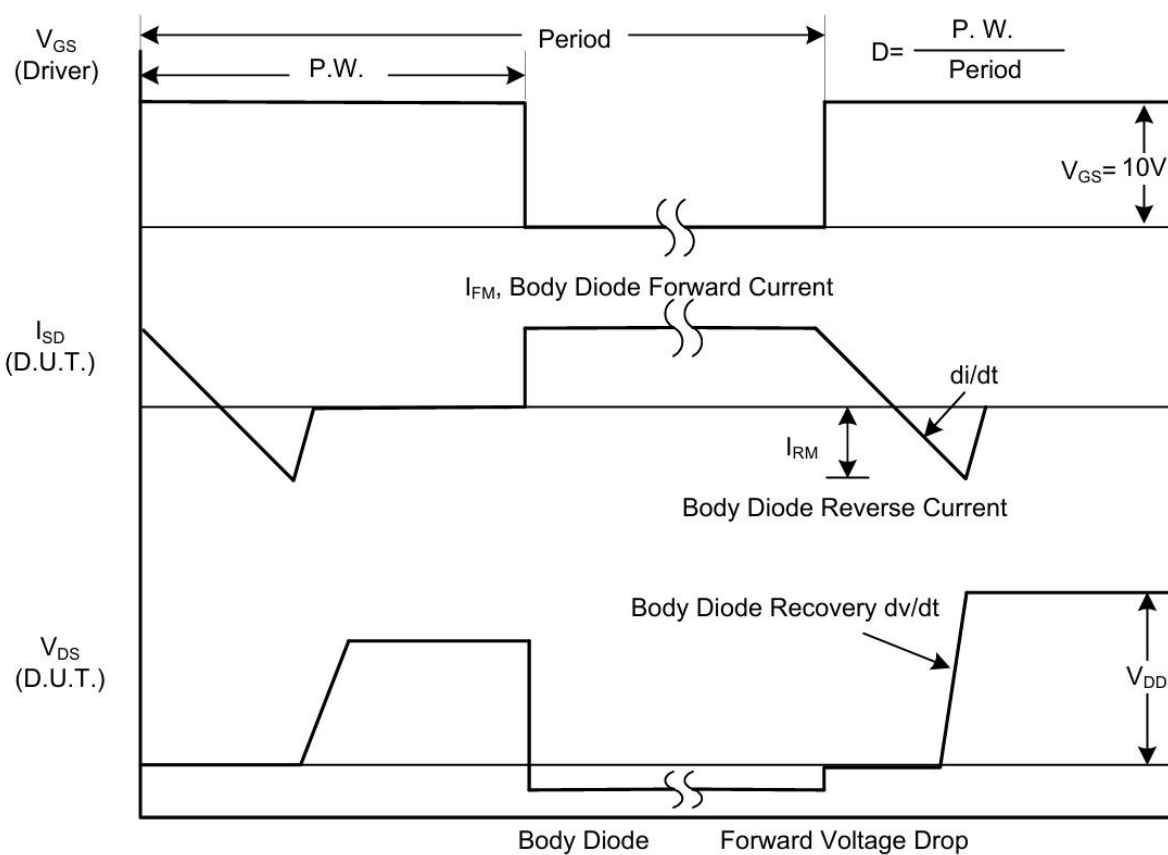
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■ TEST CIRCUITS AND WAVEFORMS



Peak Diode Recovery dv/dt Test Circuit



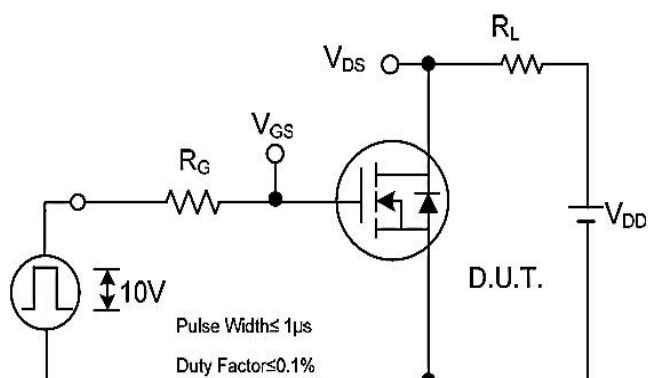
Peak Diode Recovery dv/dt Waveforms



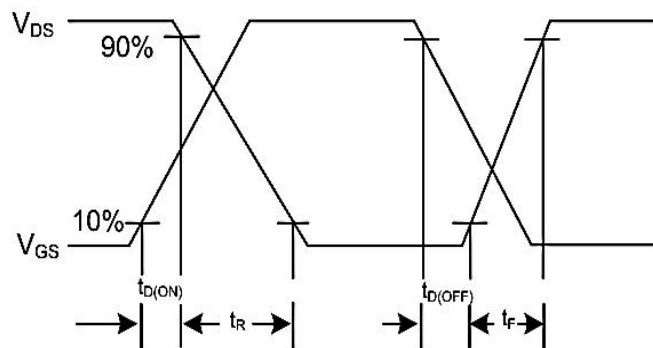
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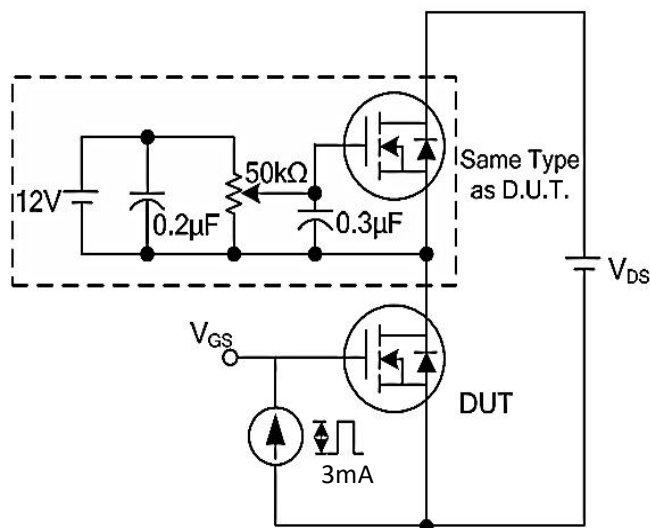
■ TEST CIRCUITS AND WAVEFORMS(Con.t)



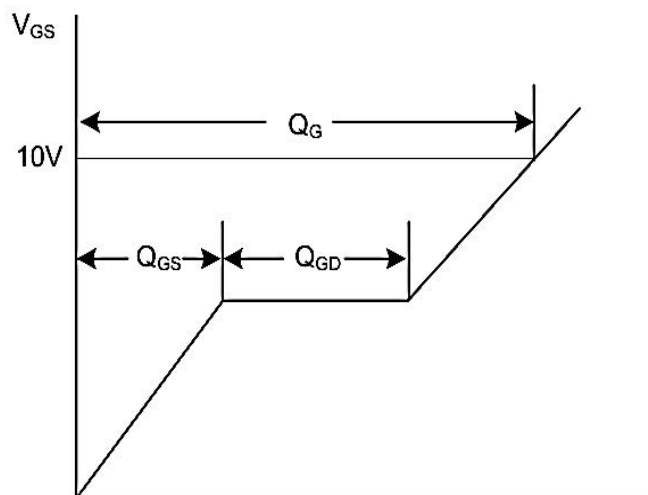
Switching Test Circuit



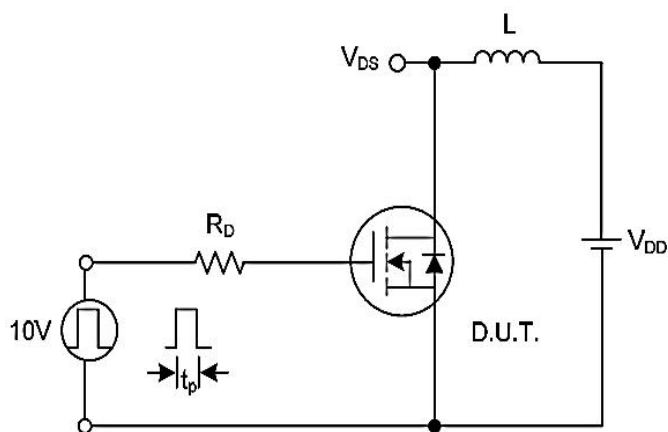
Switching Waveforms



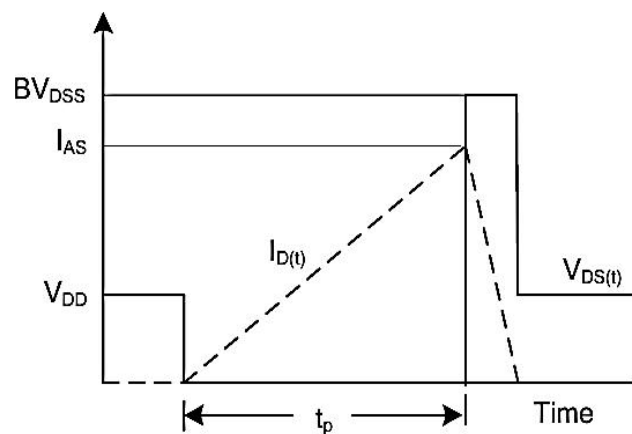
Gate Charge Test Circuit



Gate Charge Waveform



Unclamped Inductive Switching Test Circuit



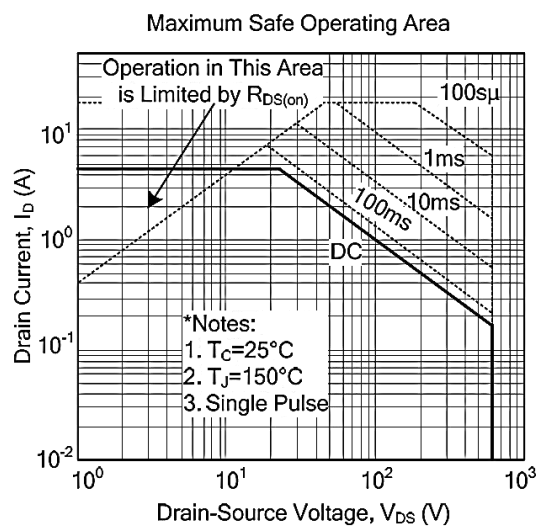
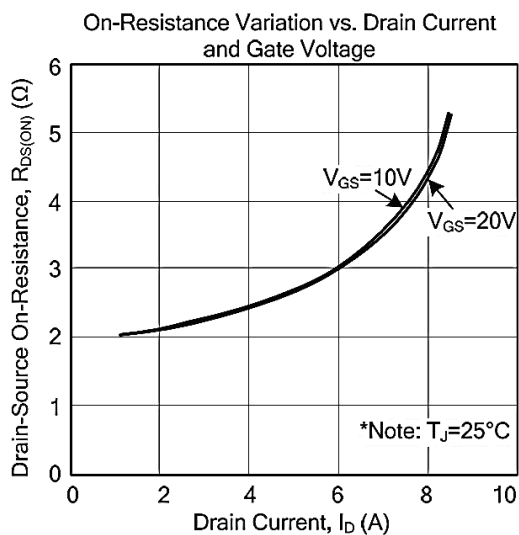
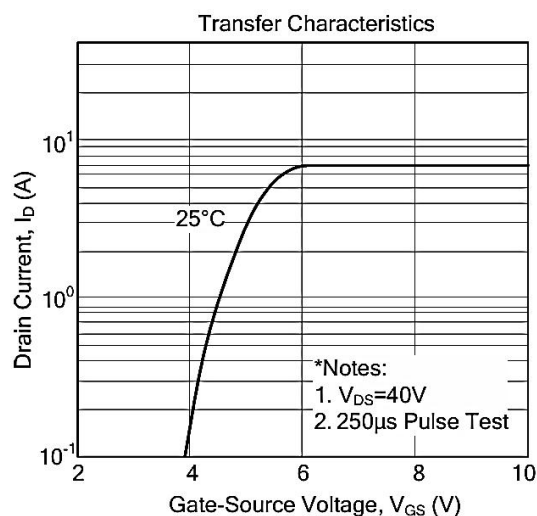
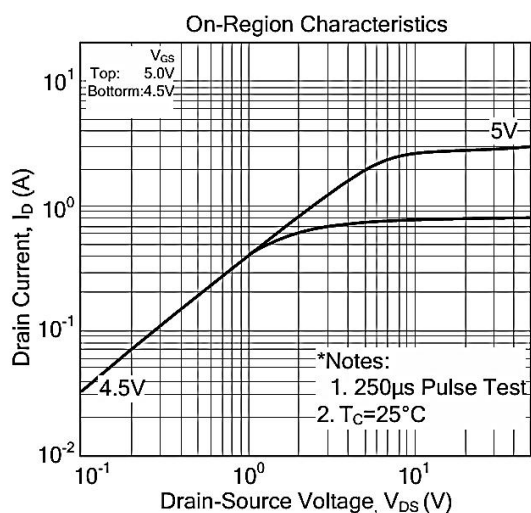
Unclamped Inductive Switching Waveforms



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■ TYPICAL CHARACTERISTICS

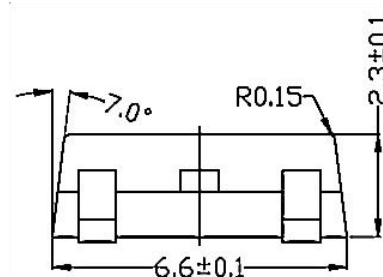
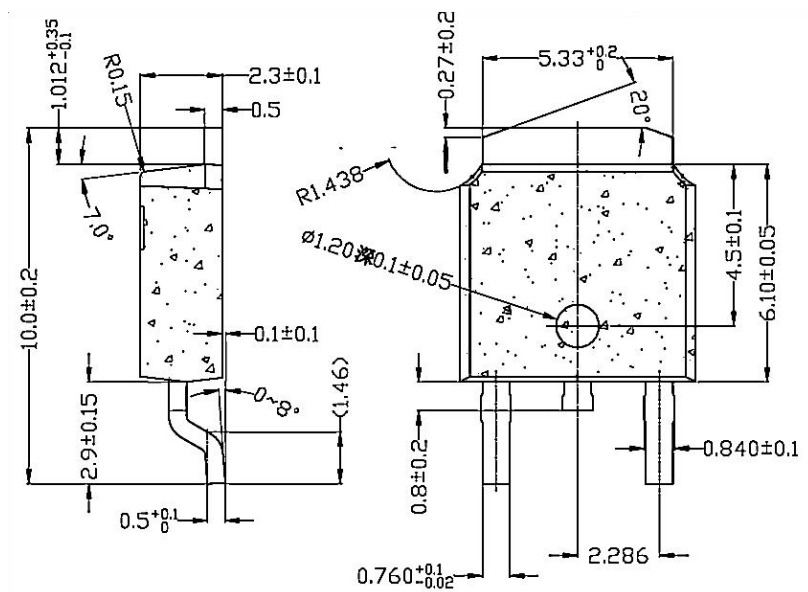




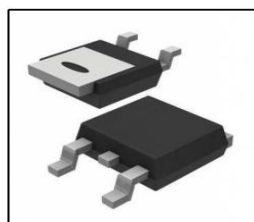
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TO - 252 PACKAGE OUTLINE DIMENSIONS



TO - 252 PACKING INFORMATION



2500PC
S/reel



2 Reel/BOX



Outer box

5 Inner
Box



Inner box

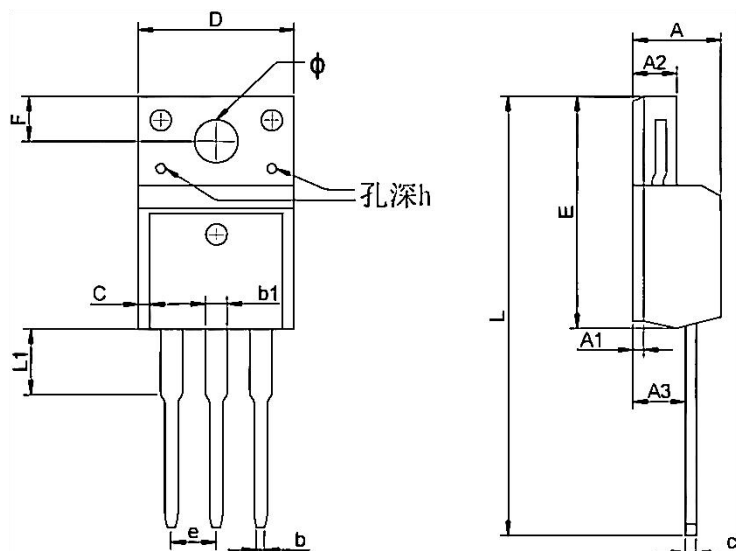
Package version	Reel dimensions $\Phi \times H$ (mm)	Per Reel (pcs)	Reels per box	Inner box dimensions $L \times W \times H$ (mm)	Outer box (pcs)	Outer box dimensions $L \times W \times H$ (mm)
TO-252	$\Phi 330 \times 20$	2500	2	360*340*50	25000	375*375*280



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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

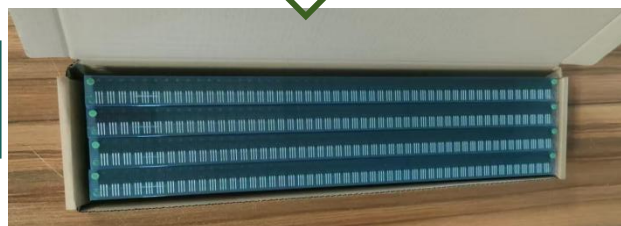


20 Tube



Outer Box

5 Inner
Box



Inner Box

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