



## SOP4, DC Input Photo Transistor Coupler

### Description

The BF356 series combine an AlGaAs infrared emitting diode as the emitter which is optically coupled to a silicon planar phototransistor detector in a plastic SOP4 package.

With the robust coplanar double mold structure, BF356 series provide the most stable isolation feature.

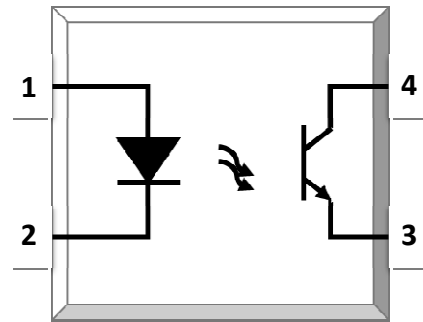
### Features

- High isolation 3750 VRMS
- CTR flexibility available see order information
- DC input with transistor output
- Operating temperature range - 55 °C to 110 °C
- REACH compliance
- Halogen free
- MSL class 1
- Regulatory Approvals
  - UL - UL1577
  - VDE - EN60747-5-5(VDE0884-5)
  - CQC – GB4943.1, GB8898

### Applications

- Switch mode power supplies
- Programmable controllers
- Household appliances
- Office equipment

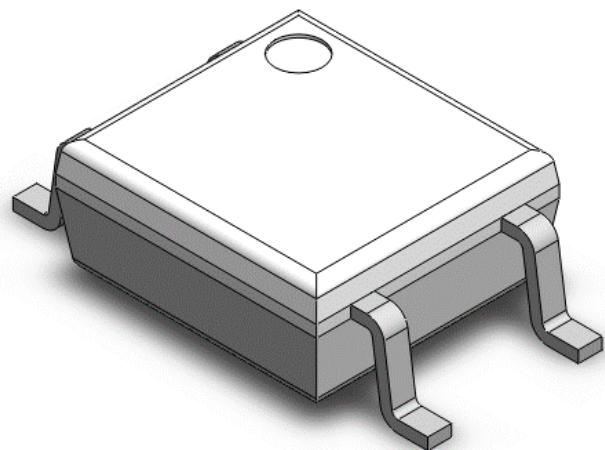
### SCHEMATIC



### PIN DEFINITION

1. Anode
2. Cathode
3. Emitter
4. Collector

### PACKAGE OUTLINE





**SOP4, DC Input Photo Transistor Coupler**

<b>ABSOLUTE MAXIMUM RATINGS</b>				
PARAMETER	SYMBOL	VALUE	UNIT	NOTE
<b>INPUT</b>				
Forward Current	$I_F$	60	mA	
Peak Forward Current	$I_{FP}$	1	A	1
Reverse Voltage	$V_R$	6	V	
Input Power Dissipation	$P_I$	100	mW	
<b>OUTPUT</b>				
Collector - Emitter Voltage	$V_{CEO}$	80	V	
Emitter - Collector Voltage	$V_{ECO}$	7	V	
Collector Current	$I_C$	50	mA	
Output Power Dissipation	$P_O$	150	mW	
<b>COMMON</b>				
Total Power Dissipation	$P_{tot}$	200	mW	
Isolation Voltage	$V_{iso}$	3750	Vrms	2
Operating Temperature	$T_{opr}$	-55~110	°C	
Storage Temperature	$T_{stg}$	-55~125	°C	
Soldering Temperature	$T_{sol}$	260	°C	

Note 1.100μs pulse, 100Hz frequency

Note 2. AC For 1 Minute, R.H. = 40 ~ 60%



**SOP4, DC Input Photo Transistor Coupler**

ELECTRICAL OPTICAL CHARACTERISTICS at Ta=25°C							
PARAMETER	SYMBOL	MIN	TYP.	MAX.	UNIT	TEST CONDITION	NOTE
INPUT							
Forward Voltage	V <sub>F</sub>	-	1.24	1.4	V	IF=10mA	
Reverse Current	I <sub>R</sub>	-	-	10	μA	VR=6V	
Input Capacitance	C <sub>in</sub>	-	10	-	pF	V=0, f=1kHz	
OUTPUT							
Collector Dark Current	I <sub>CEO</sub>	-	-	100	nA	VCE=20V, IF=0	
Collector-Emitter Breakdown Voltage	BV <sub>CEO</sub>	80	-	-	V	IC=0.1mA, IF=0	
Emitter-Collector Breakdown Voltage	BV <sub>ECO</sub>	7	-	-	V	IE=0.1mA, IF=0	
TRANSFER CHARACTERISTICS							
Current Transfer Ratio	BF356	CTR	50	-	600	%	IF=5mA, VCE=5V
	BF356A		80	-	160		
	BF356B		130	-	260		
	BF356C		200	-	400		
	BF356D		300	-	600		
Collector-Emitter Saturation Voltage	V <sub>CE(sat)</sub>	-	0.06	0.2	V	IF=20mA, IC=1mA	
Isolation Resistance	R <sub>ISO</sub>	10 <sup>12</sup>	10 <sup>14</sup>	-	Ω	DC500V, 40 ~ 60% R.H.	
Floating Capacitance	C <sub>IO</sub>	-	0.4	1	pF	V=0, f=1MHz	
Cut-off Frequency	f <sub>c</sub>	-	80	-	kHz	VCE=2V, IC=2mA RL=100Ω,-3dB	4
Response Time (Rise)	t <sub>r</sub>	-	3	18	μs	VCE=2V, IC=2mA RL=100Ω	3
Response Time (Fall)	t <sub>f</sub>	-	4	18	μs		3

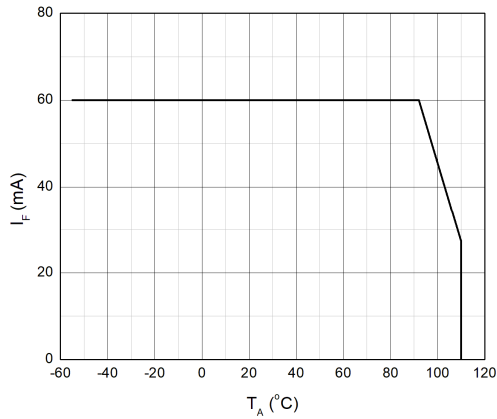
Note 3. Fig.12&13

Note 4. Fig.14

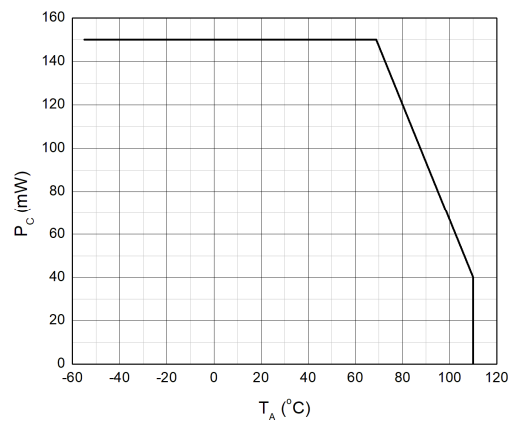


**CHARACTERISTIC CURVES**

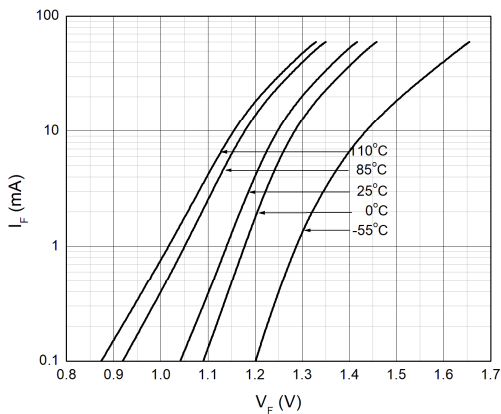
**Fig.1 Forward Current vs. Ambient Temperature**



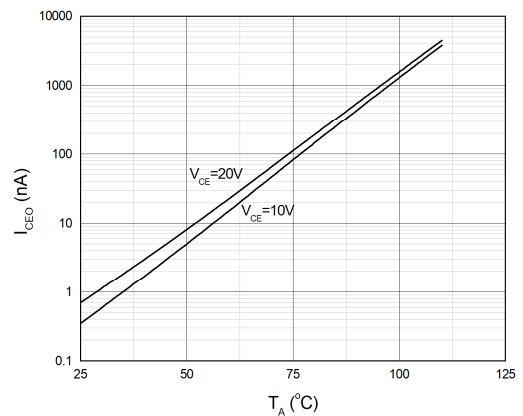
**Fig.2 Collector Power Dissipation vs. Ambient Temperature**



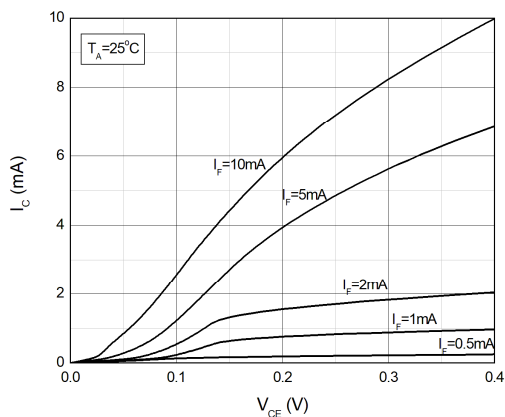
**Fig.3 Forward Current vs. Forward Voltage**



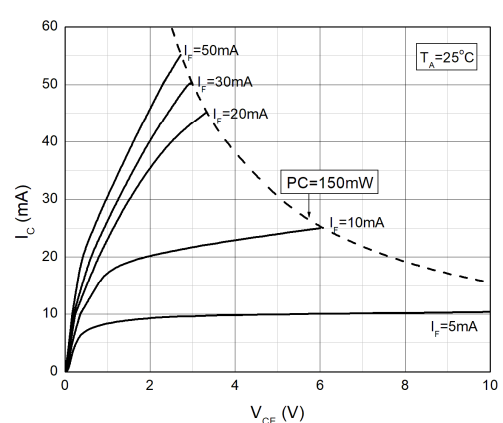
**Fig.4 Collector Dark Current vs. Ambient Temperature**



**Fig.5 Collector Current vs. Collector-emitter Voltage**



**Fig.6 Collector Current vs. Collector-emitter Voltage**





CHARACTERISTIC CURVES

Fig.7 Normalized Current Transfer Ratio vs. Forward Current

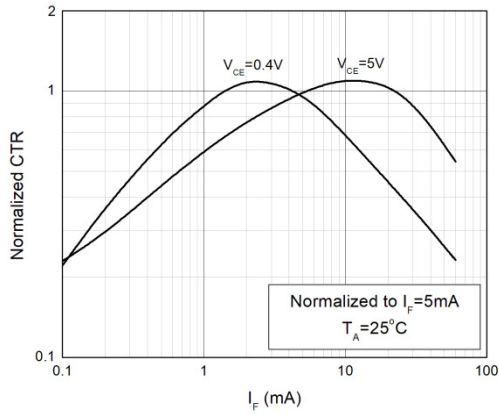


Fig.8 Normalized Current Transfer Ratio vs. Ambient Temperature

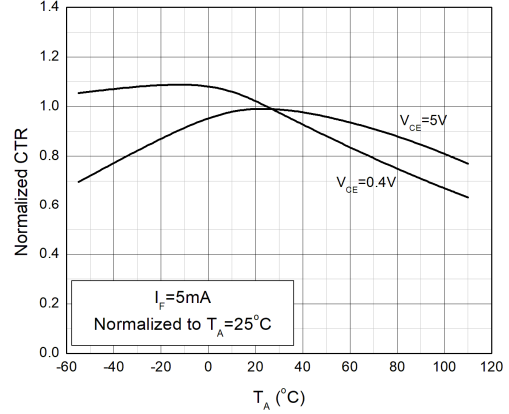


Fig.9 Collector-emitter Saturation Voltage vs. Ambient Temperature

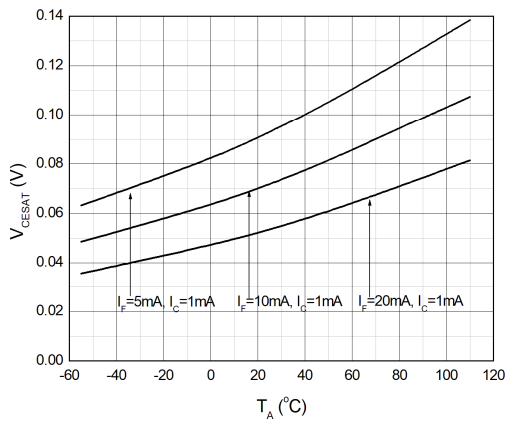


Fig.10 Switching Time vs. Load Resistance

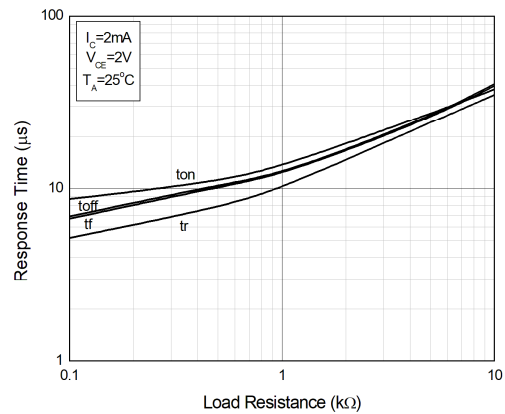
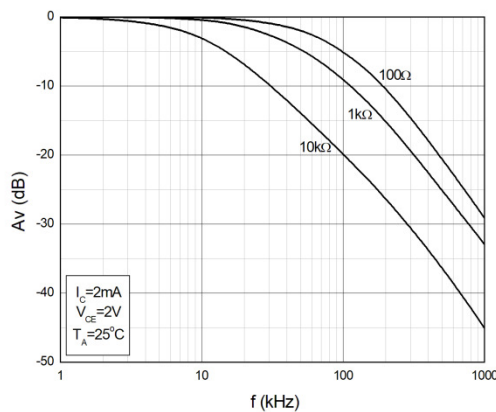


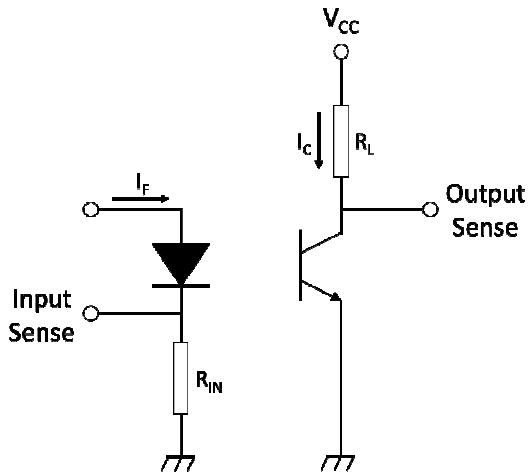
Fig.11 Frequency Response



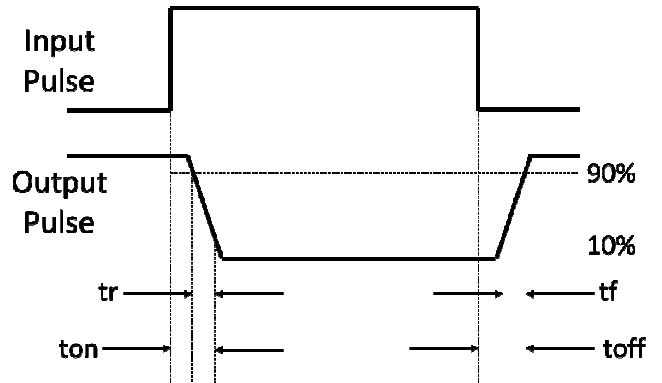


**TEST CIRCUITS**

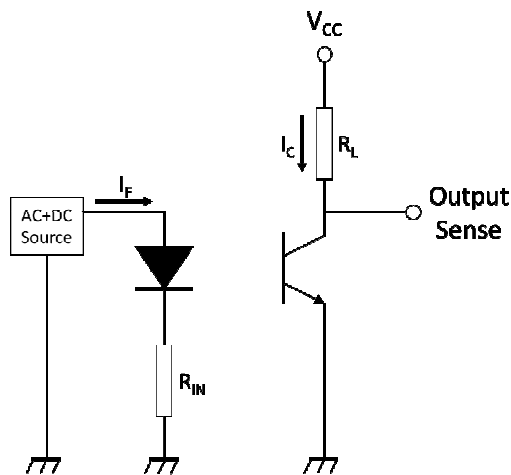
**Fig.12 Test Circuits of Response Time**



**Fig.13 Curves of Response Time**

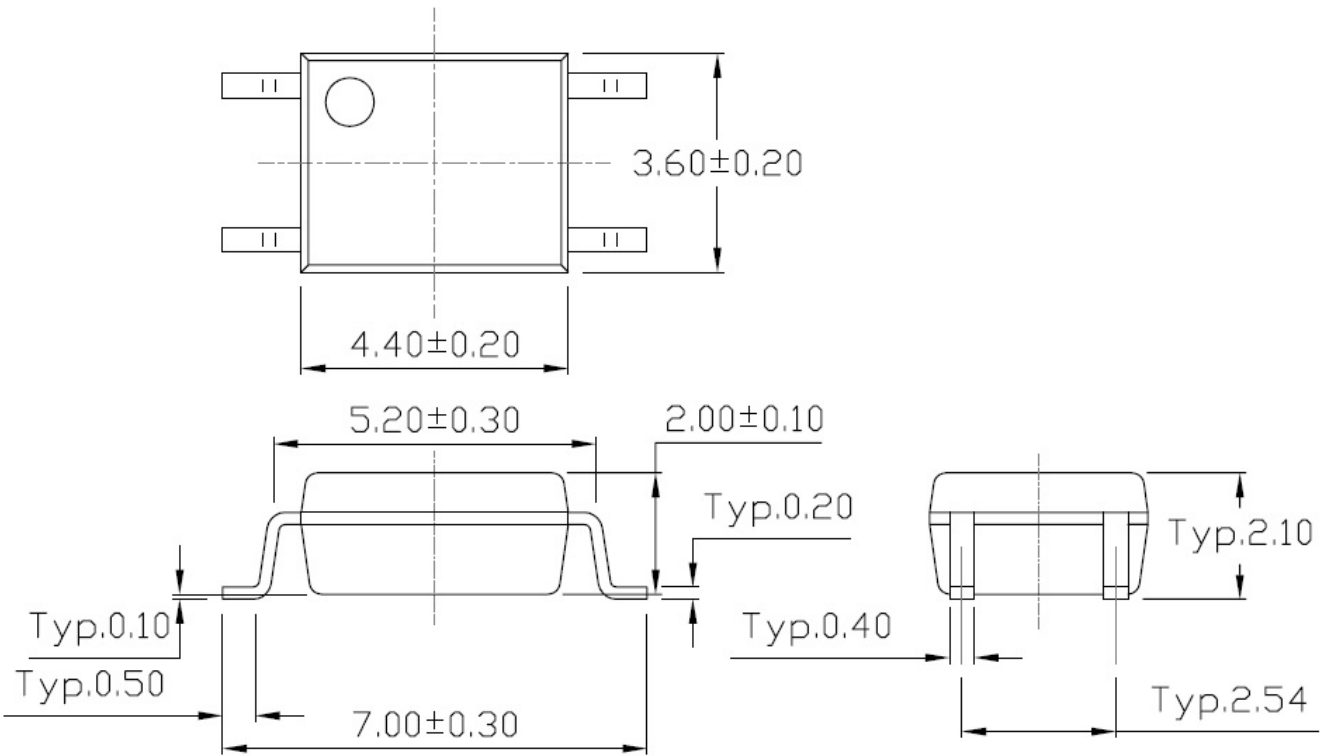


**Fig.14 Test Circuits of Frequency Response**

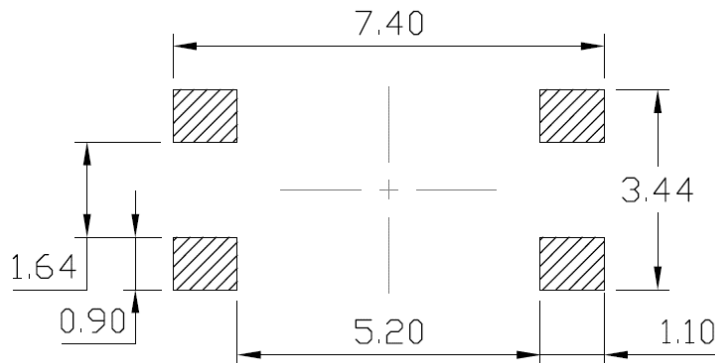




**PACKAGE DIMENSIONS (Dimensions in mm unless otherwise stated)**



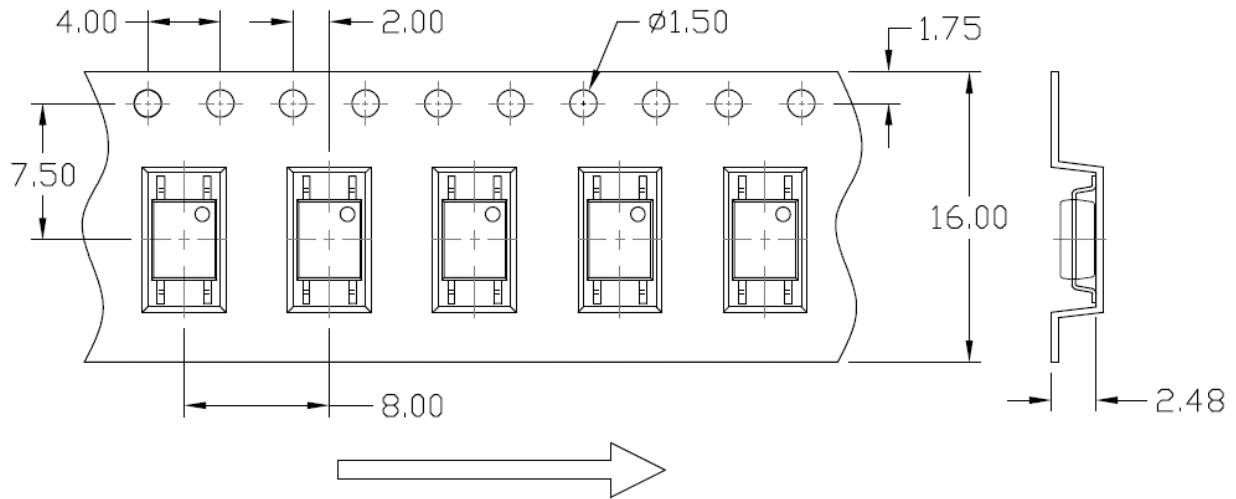
**Recommended Solder Mask (Dimensions in mm unless otherwise stated)**



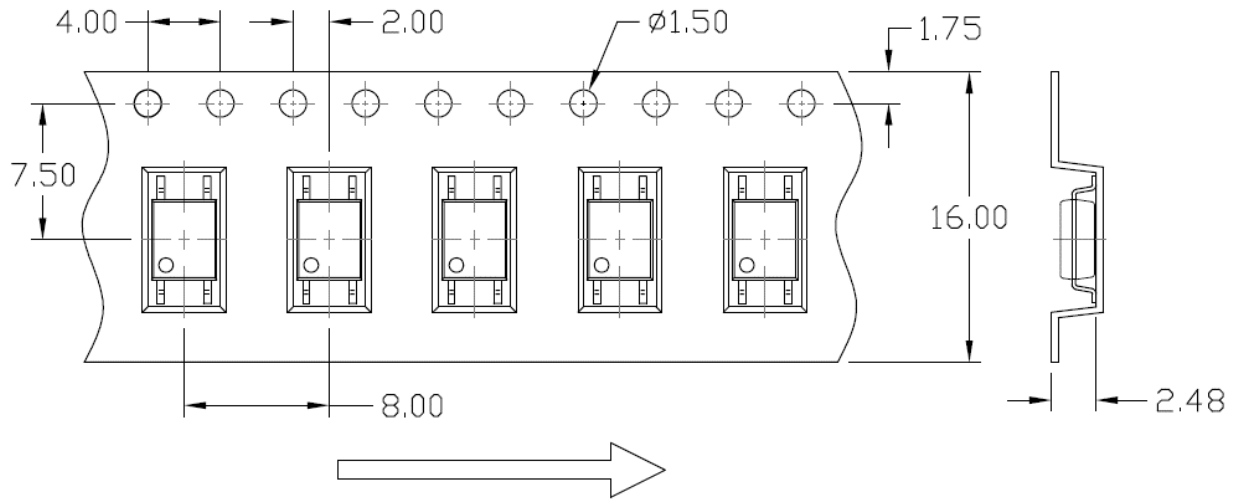


**CARRIER TAPE SPECIFICATIONS (Dimensions in mm unless otherwise stated)**

**Option T1**



**Option T2**

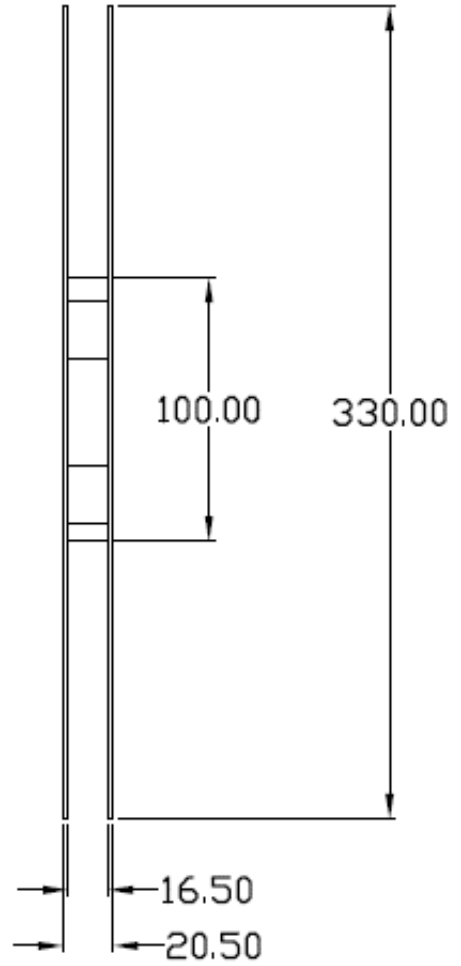
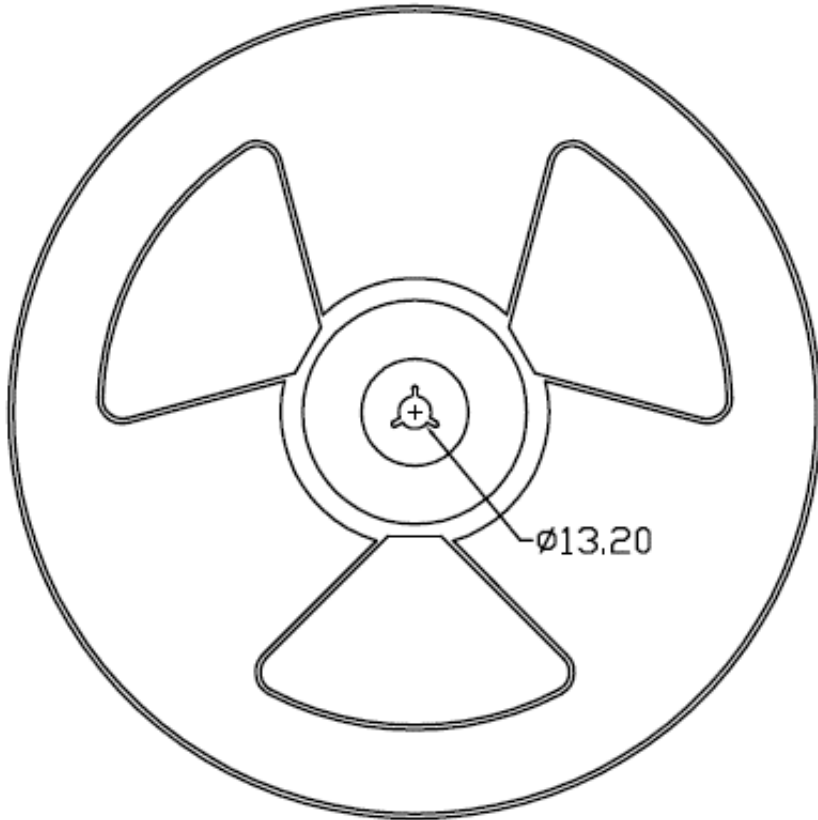






**REEL SPECIFICATIONS (Dimensions in mm unless otherwise stated)**

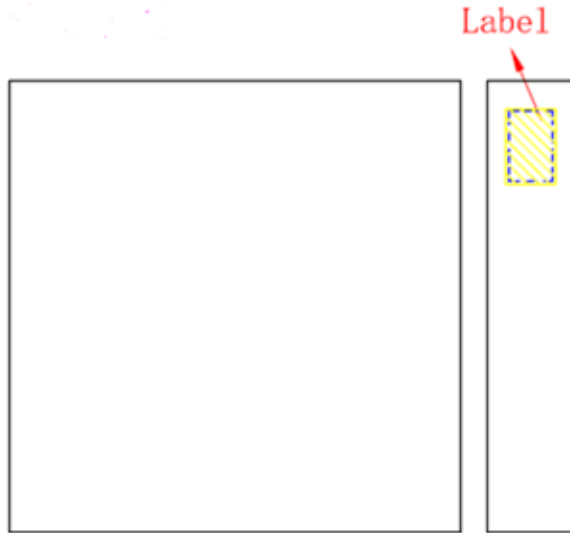
**Option T1 & T2**





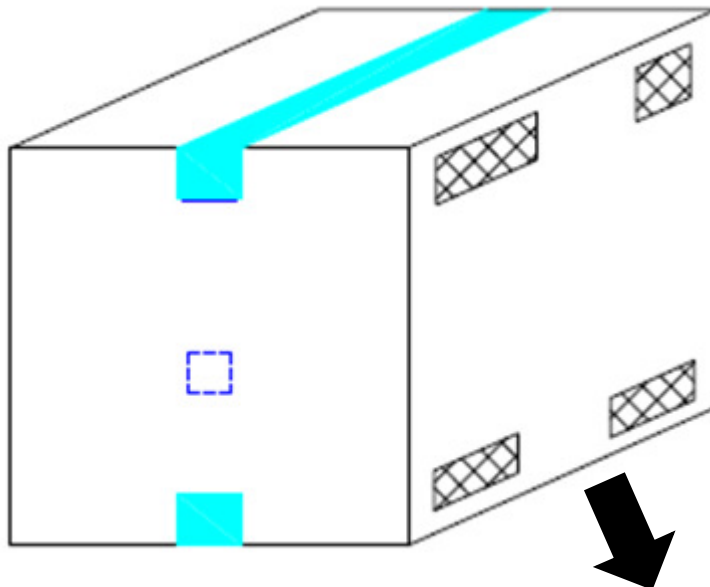
**BOX SPECIFICATIONS (Reel Type)**

**Inner Box**

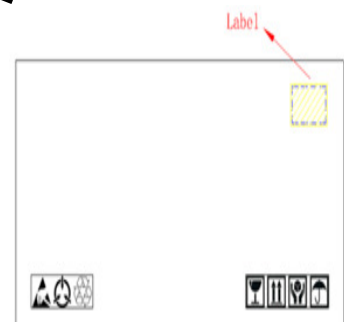


- L x W x H = 36cm x 36cm x 6.9cm

**Outer Box**



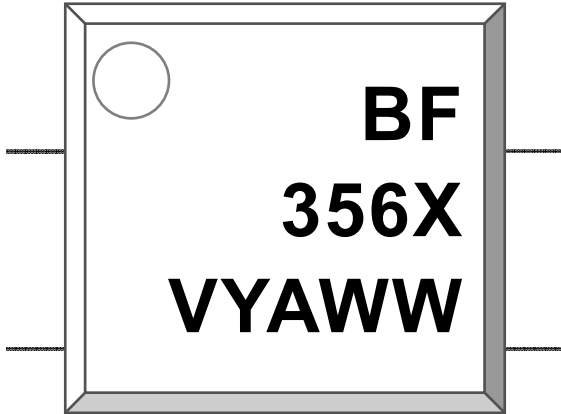
- L x W x H = 45cm x 38cm x 38cm





**ORDERING AND MARKING INFORMATION**

**MARKING INFORMATION**








**BF** : Company Abbr.  
**356** : Part Number  
**X** : CTR Rank  
**V** : VDE Option  
**Y** : Fiscal Year  
**A** : Manufacturing Code  
**WW** : Work Week

**ORDERING INFORMATION**

**BF356X(Z)-GV**

BF – Company Abbr.  
 356 – Part Number  
 X – Rank (A/B/C/D or None)  
 Z – Tape and Reel Option (T1/T2)  
 G – Green  
 V – VDE Option (V or None)

**LABEL INFORMATION**


 毕方半导体（深圳）有限公司  
 BF Semiconductor(ShenZhen) Co., Ltd  
 Part No : XXXXXXXXXXXXXXXX Bin Code : X  
  
 Lot No : XXXXXXXXXXXX  
 Date Code : XXXX  
 Q'ty : XXXX pcs  




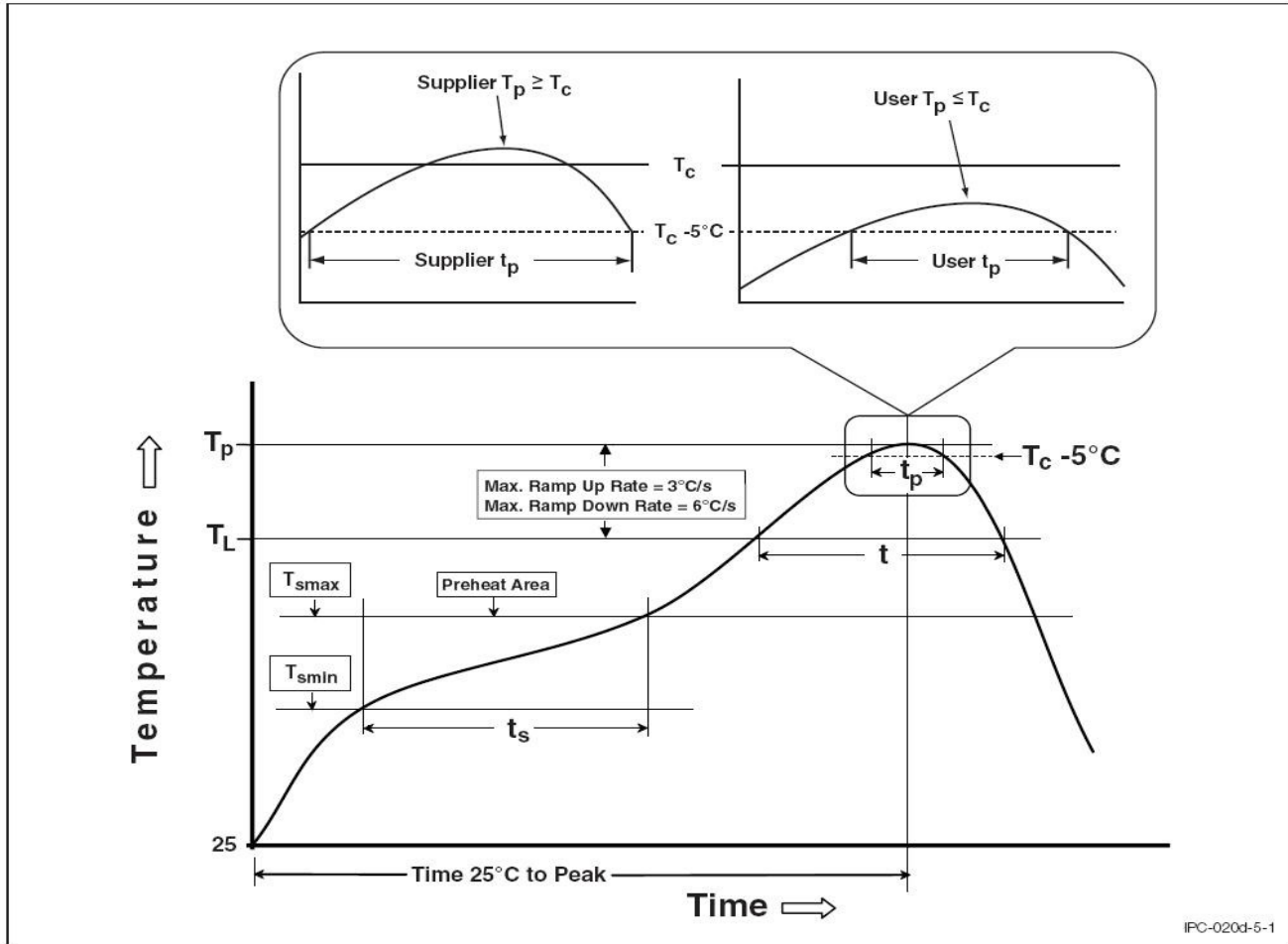
**PACKING QUANTITY**

Option	Quantity	Quantity – Inner box	Quantity – Outer box
T1	3000 Units/Reel	3 Reels/Inner box	5 Inner box/Outer box = 45k Units
T2	3000 Units/Reel	3 Reels/Inner box	5 Inner box/Outer box = 45k Units



**REFLOW INFORMATION**

**REFLOW PROFILE**



IPC-020d-5-1

Profile Feature	Sn-Pb Assembly Profile	Pb-Free Assembly Profile
Temperature Min. (T <sub>smin</sub> )	100	150°C
Temperature Max. (T <sub>smax</sub> )	150	200°C
Time (t <sub>s</sub> ) from (T <sub>smin</sub> to T <sub>smax</sub> )	60-120 seconds	60-120 seconds
Ramp-up Rate (t <sub>L</sub> to t <sub>P</sub> )	3°C/second max.	3°C/second max.
Liquidous Temperature (T <sub>L</sub> )	183°C	217°C
Time (t <sub>L</sub> ) Maintained Above (T <sub>L</sub> )	60 – 150 seconds	60 – 150 seconds
Peak Body Package Temperature	235°C +0°C / -5°C	260°C +0°C / -5°C
Time (t <sub>P</sub> ) within 5°C of 260°C	20 seconds	30 seconds
Ramp-down Rate (T <sub>P</sub> to T <sub>L</sub> )	6°C/second max	6°C/second max
Time 25°C to Peak Temperature	6 minutes max.	8 minutes max.



**DISCLAIMER**

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- The characteristic curves shown in this datasheet are representing typical performance which are not guaranteed.
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- This product is not intended to be used for military, aircraft, automotive, medical, life sustaining or lifesaving applications or any other application which can result in human injury or death.
- Please contact BF SEMICONDUCTOR sales agent for special application request.
- Immerge unit's body in solder paste is not recommended.
- Parameters provided in datasheets may vary in different applications and performance may vary over time. All operating parameters, including typical parameters, must be validated in each customer application by the customer's technical experts. Product specifications do not expand or otherwise modify BF SEMICONDUCTOR's terms and conditions of purchase, including but not limited to the warranty expressed therein.
- Discoloration might be occurred on the package surface after soldering, reflow or long-time use. It neither impacts the performance nor reliability.