

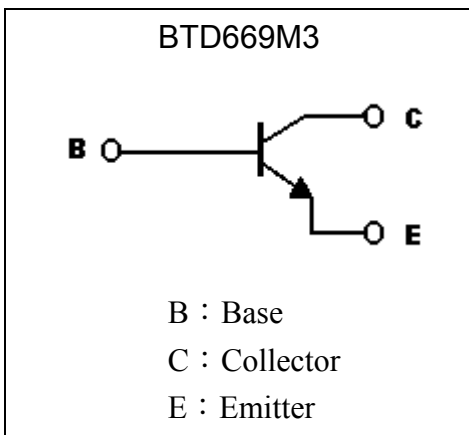
**General Purpose NPN Epitaxial Planar Transistor**

# BTD669M3

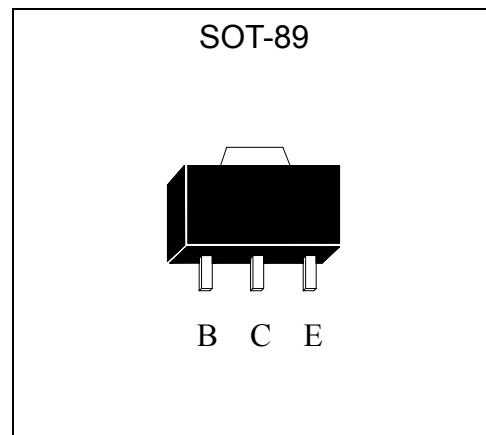
## Features

- High breakdown voltage,  $BV_{CEO} \geq 160V$
- Large continuous collector current capability
- Low collector saturation voltage
- Pb-free lead plating and halogen-free package

## Symbol

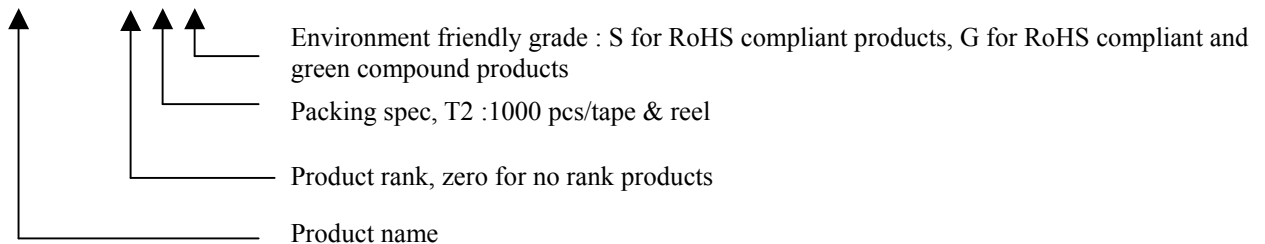


## Outline



## Ordering Information

Device	Package	Shipping
BTD669M3-0-T2-G	SOT-89 (Pb-free lead plating and halogen-free package)	1000 pcs / Tape & Reel





**Absolute Maximum Ratings** (Ta=25°C)

Parameter	Symbol	Limits	Unit
Collector-Base Voltage	V <sub>CB0</sub>	180	V
Collector-Emitter Voltage	V <sub>CEO</sub>	160	V
Emitter-Base Voltage	V <sub>EBO</sub>	6	V
Collector Current	I <sub>C</sub>	1	A
Collector Current (Pulse)	I <sub>CP</sub>	3	A
Base Current	I <sub>B</sub>	0.2	A
Power Dissipation	Pd	0.6	W
		1 (Note 1)	W
		2 (Note 2)	W
Operating Junction Temperature Range	T <sub>j</sub>	-55~+150	°C
Storage Temperature Range	T <sub>stg</sub>	-55~+150	°C

**Thermal Characteristics**

Parameter	Symbol	Value	Unit
Thermal Resistance, Junction to Ambient	R <sub>θJA</sub>	208	°C/W
		125 (Note 1)	
		62.5 (Note 2)	
Thermal Resistance, Junction to Case	R <sub>θJC</sub>	50	

Note : 1. When mounted on FR-4 PCB with area measuring 10×10×1 mm  
 2 . When mounted on ceramic with area measuring 40×40×1 mm

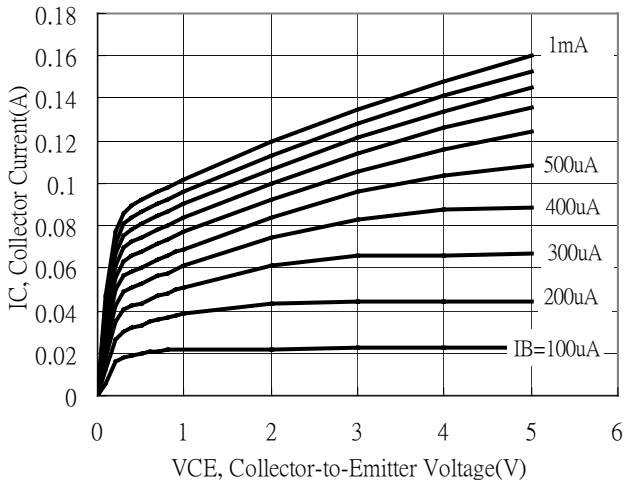
**Characteristics** (Ta=25°C)

Symbol	Min.	Typ.	Max.	Unit	Test Conditions
BV <sub>CB0</sub>	180	-	-	V	I <sub>C</sub> =1mA
BV <sub>CEO</sub>	160	-	-	V	I <sub>C</sub> =10mA
BV <sub>EBO</sub>	6	-	-	V	I <sub>E</sub> =1mA
I <sub>CB0</sub>	-	-	100	nA	V <sub>CB</sub> =180V
I <sub>EBO</sub>	-	-	100	nA	V <sub>EB</sub> =6V
*V <sub>CE(sat)</sub>	-	0.25	0.5	V	I <sub>C</sub> =500mA, I <sub>B</sub> =50mA
*V <sub>BE(sat)</sub>	-	0.87	1.2	V	I <sub>C</sub> =500mA, I <sub>B</sub> =50mA
*V <sub>BE(on)</sub>	-	0.73	1.5	V	V <sub>CE</sub> =5V, I <sub>C</sub> =150mA
*h <sub>FE 1</sub>	160	-	320	-	V <sub>CE</sub> =10V, I <sub>C</sub> =150mA
*h <sub>FE 2</sub>	30	-	-	-	V <sub>CE</sub> =10V, I <sub>C</sub> =500mA
f <sub>T</sub>	100	-	-	MHz	V <sub>CE</sub> =10V, I <sub>C</sub> =50mA, f=100MHz
Cob	-	6.3	15	pF	V <sub>CB</sub> =10V, I <sub>E</sub> =0A, f=1MHz

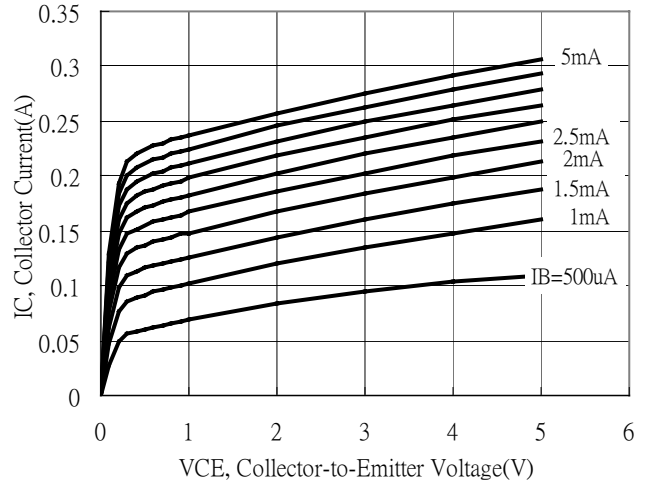
\*Pulse Test: Pulse Width ≤380μs, Duty Cycle≤2%

**Typical Characteristics**

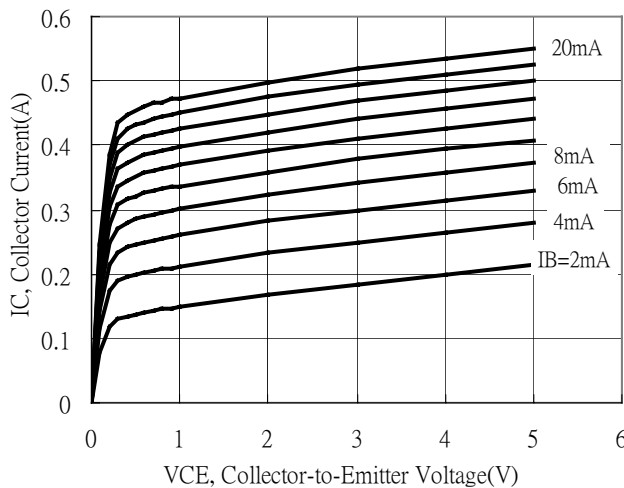
Emitter Grounded Output Characteristics



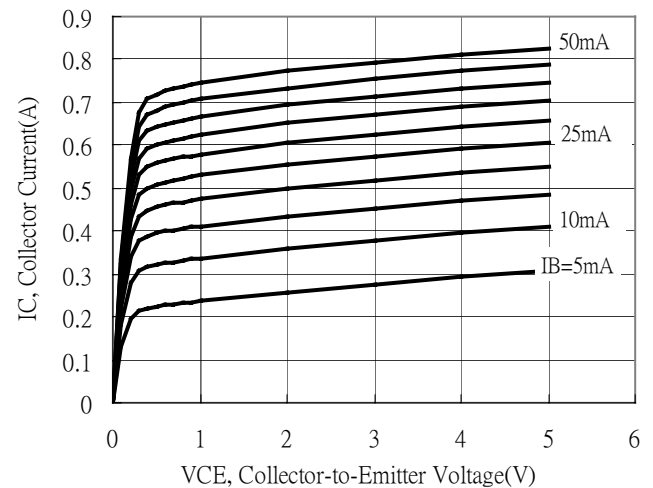
Emitter Grounded Output Characteristics



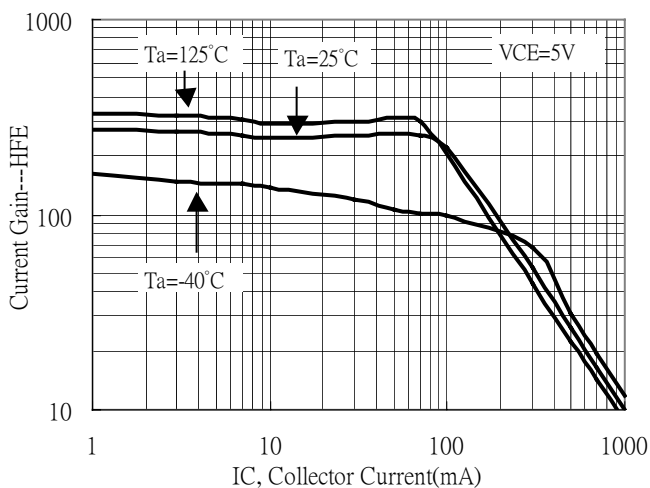
Emitter Grounded Output Characteristics



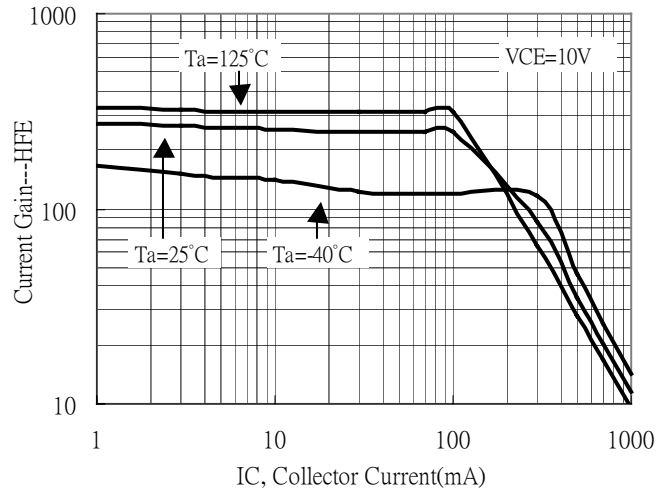
Emitter Grounded Output Characteristics



Current Gain vs Collector Current

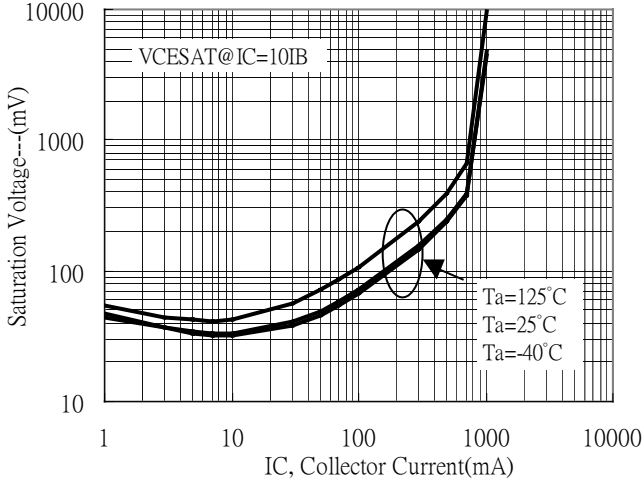


Current Gain vs Collector Current

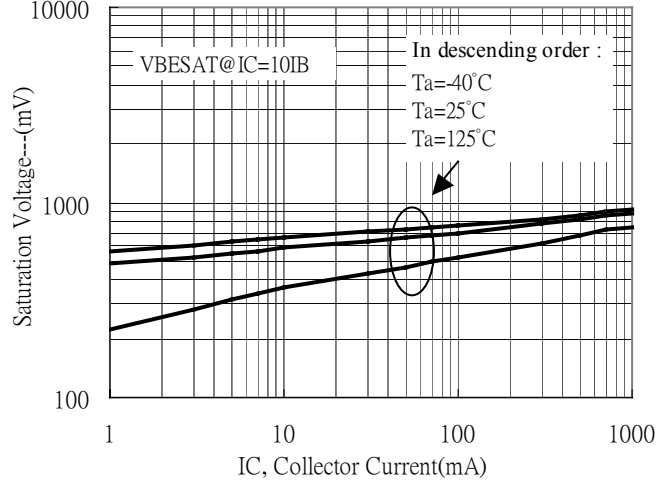


**Typical Characteristics(Cont.)**

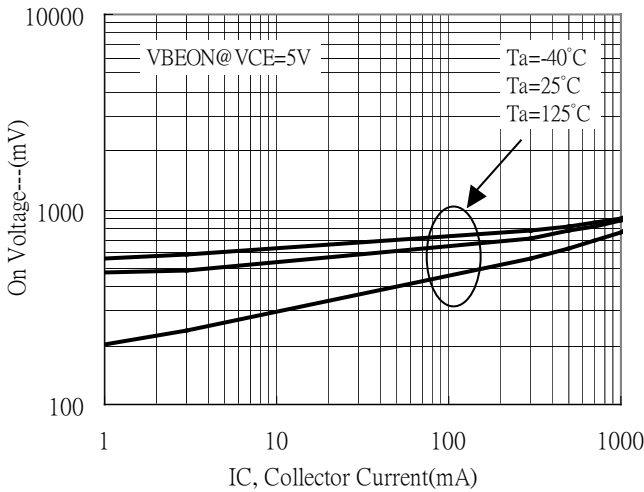
Saturation Voltage vs Collector Current



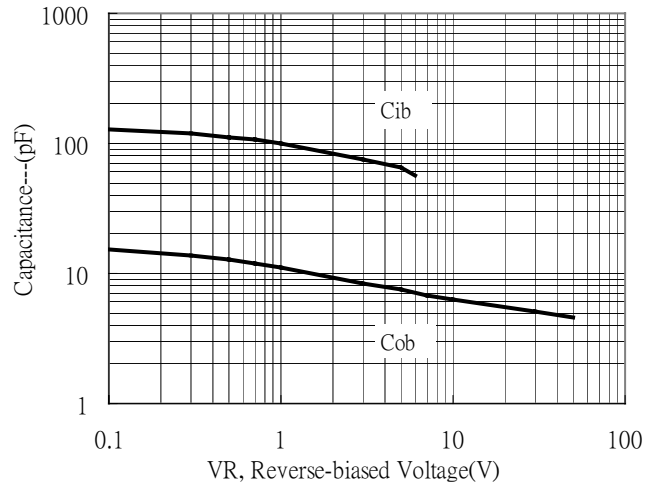
Saturation Voltage vs Collector Current



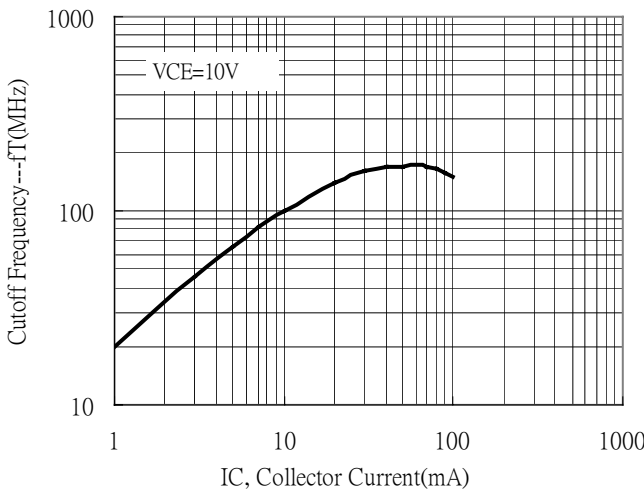
On Voltage vs Collector Current



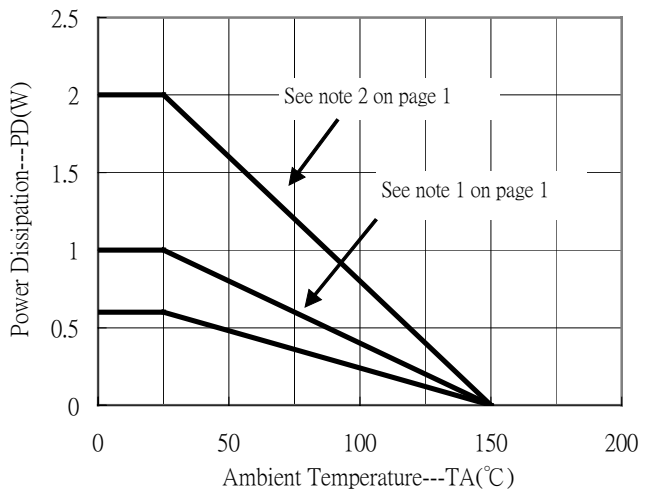
Capacitance vs Reverse-biased Voltage



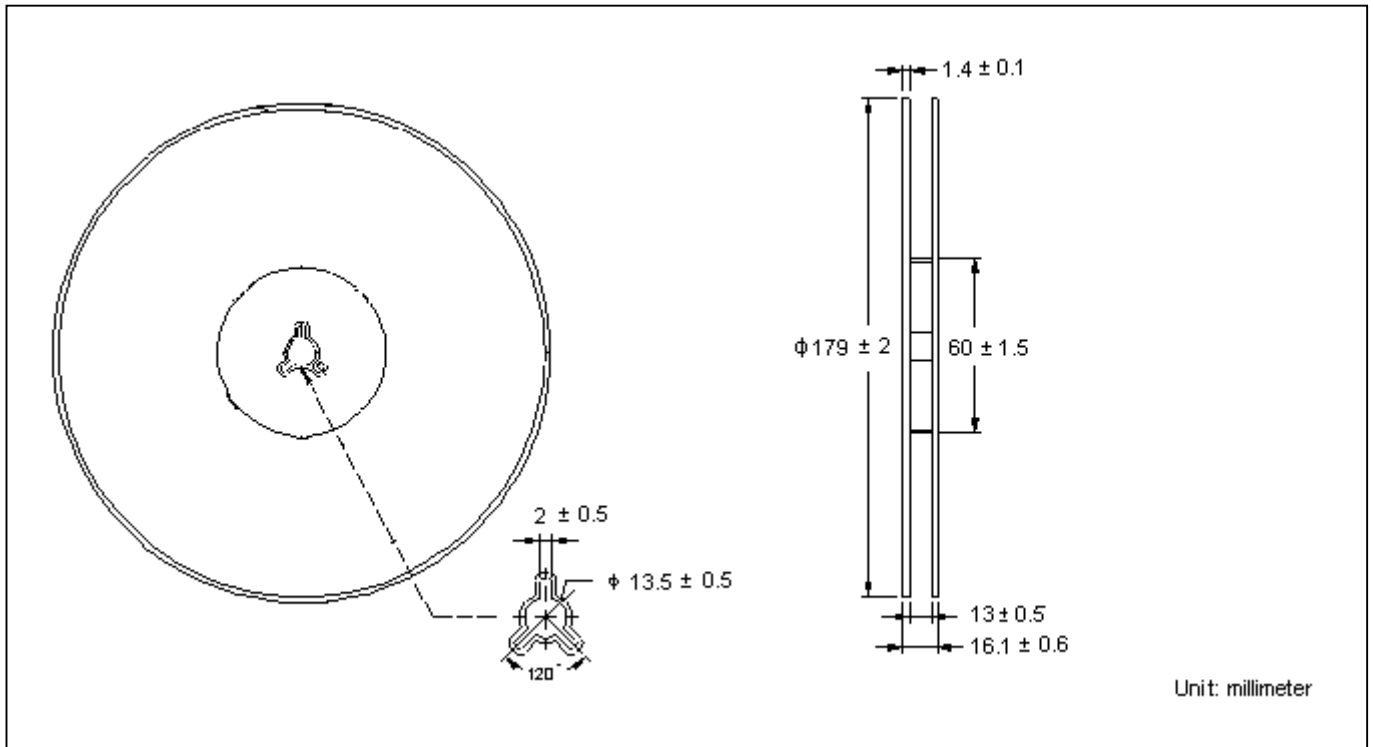
Cutoff Frequency vs Collector Current



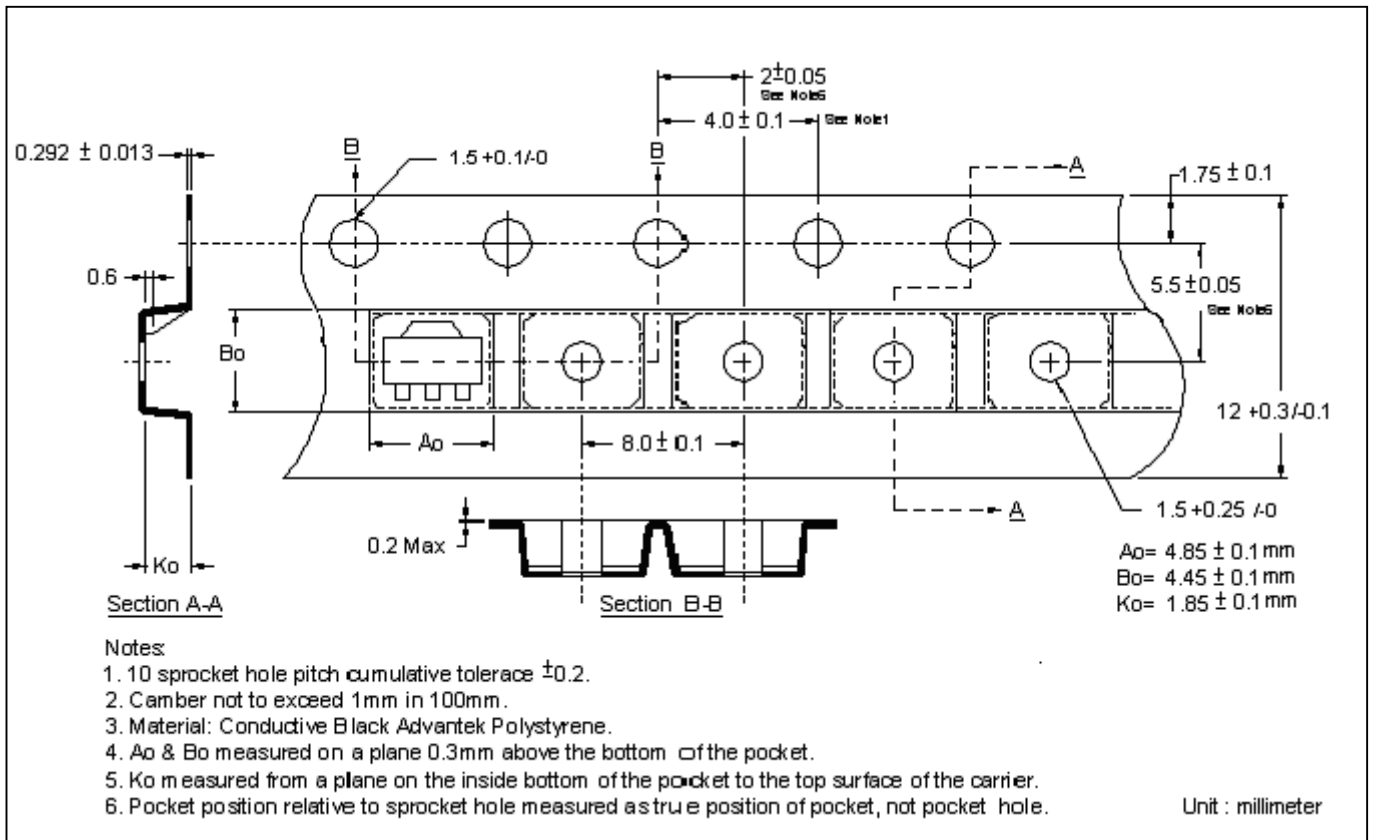
Power Derating Curves



### Reel Dimension



### Carrier Tape Dimension



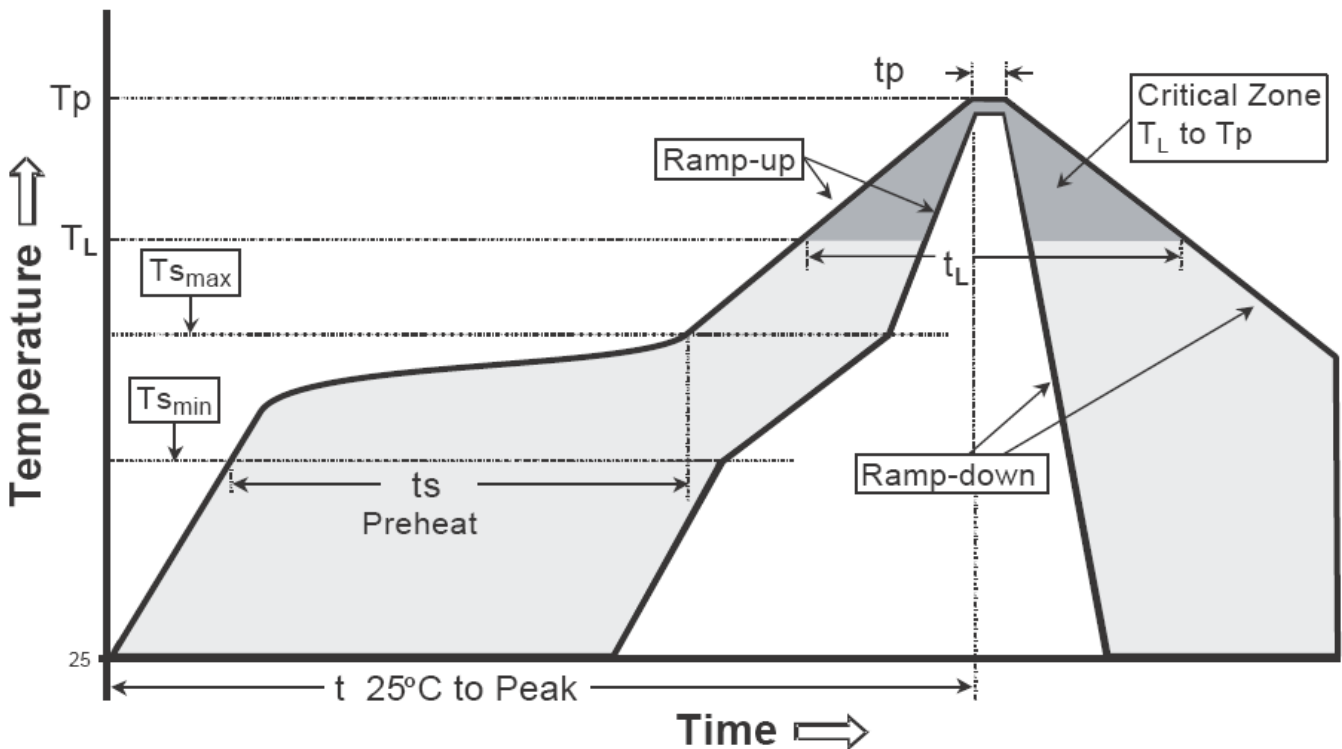
**Notes:**

1. 10 sprocket hole pitch cumulative tolerance  $\pm 0.2$ .
2. Camber not to exceed 1mm in 100mm.
3. Material: Conductive Black Advantek Polystyrene.
4.  $A_o$  &  $B_o$  measured on a plane 0.3mm above the bottom of the pocket.
5.  $K_o$  measured from a plane on the inside bottom of the pocket to the top surface of the carrier.
6. Pocket position relative to sprocket hole measured as true position of pocket, not pocket hole.

**Recommended wave soldering condition**

Product	Peak Temperature	Soldering Time
Pb-free devices	260 +0/-5 °C	5 +1/-1 seconds

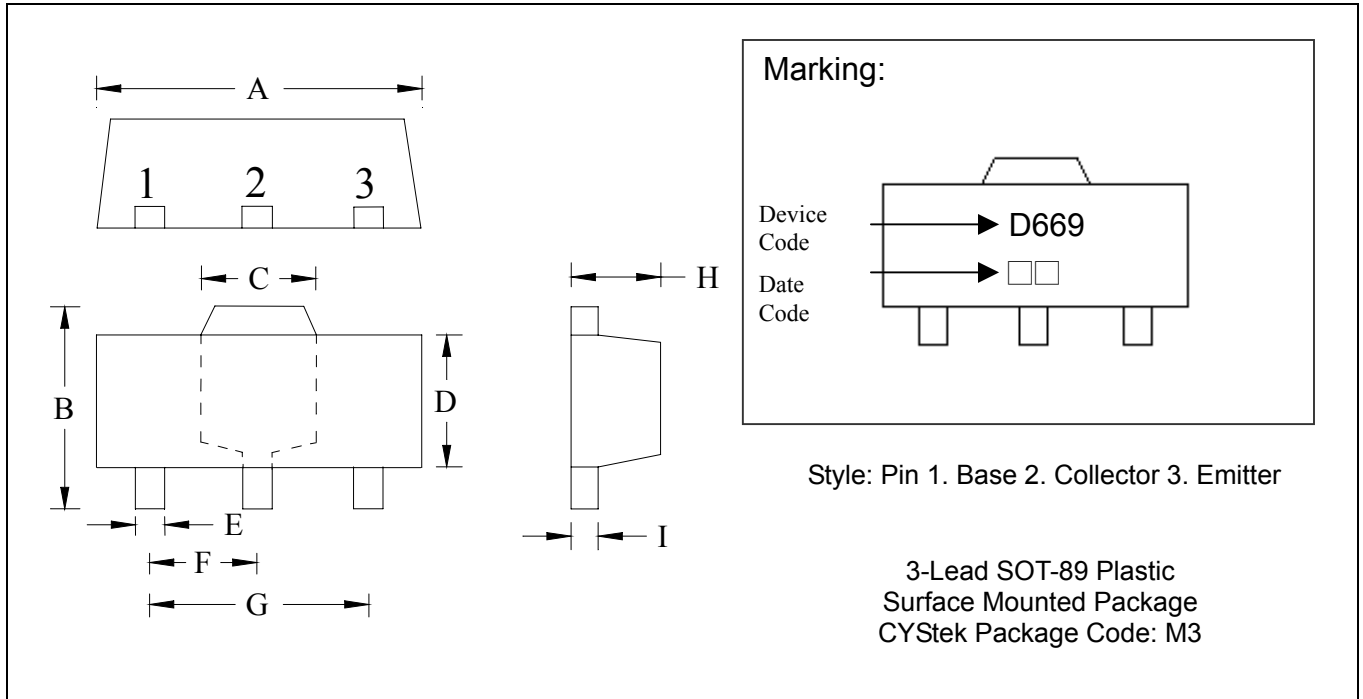
**Recommended temperature profile for IR reflow**



Profile feature	Sn-Pb eutectic Assembly	Pb-free Assembly
Average ramp-up rate (T <sub>smax</sub> to T <sub>p</sub> )	3°C/second max.	3°C/second max.
Preheat		
-Temperature Min(T <sub>s min</sub> )	100°C	150°C
-Temperature Max(T <sub>s max</sub> )	150°C	200°C
-Time(t <sub>s min</sub> to t <sub>s max</sub> )	60-120 seconds	60-180 seconds
Time maintained above:		
-Temperature (T <sub>L</sub> )	183°C	217°C
- Time (t <sub>L</sub> )	60-150 seconds	60-150 seconds
Peak Temperature(T <sub>p</sub> )	240 +0/-5 °C	260 +0/-5 °C
Time within 5°C of actual peak temperature(tp)	10-30 seconds	20-40 seconds
Ramp down rate	6°C/second max.	6°C/second max.
Time 25 °C to peak temperature	6 minutes max.	8 minutes max.

Note : All temperatures refer to topside of the package, measured on the package body surface.

**SOT-89 Dimension**



DIM	Inches		Millimeters		DIM	Inches		Millimeters	
	Min.	Max.	Min.	Max.		Min.	Max.	Min.	Max.
A	0.1732	0.1811	4.40	4.60	F	0.0591	TYP	1.50	TYP
B	0.1551	0.1673	3.94	4.25	G	0.1181	TYP	3.00	TYP
C	0.0610	REF	1.55	REF	H	0.0551	0.0630	1.40	1.60
D	0.0906	0.1024	2.30	2.60	I	0.0138	0.0173	0.35	0.44
E	0.0126	0.0205	0.32	0.52					

**Notes:** 1.Controlling dimension: millimeters.  
 2.Maximum lead thickness includes lead finish thickness, and minimum lead thickness is the minimum thickness of base material.  
 3.If there is any question with packing specification or packing method, please contact your local CYStek sales office.

**Material:**

- Lead: Pure tin plated.
- Mold Compound: Epoxy resin family, flammability solid burning class: UL94V-0.

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