

## Description

The TLP291-4x series combine an AlGaAs infrared emitting diode as the emitter which is optically coupled to a silicon planar phototransistor detector in a plastic SO16 package with different lead forming options. With the robust coplanar double mold structure, TLP291-4x series provide the most stable isolation feature.

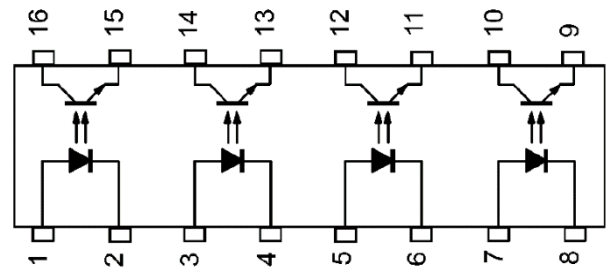
## Features

- 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

## Applications

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

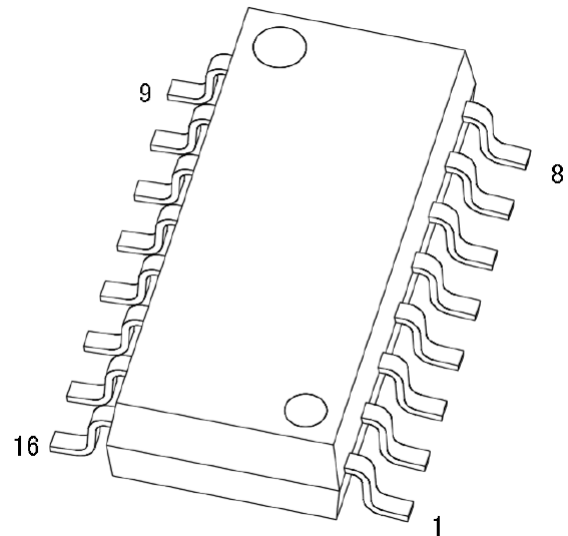
## SCHEMATIC

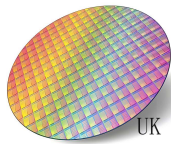


## PIN DEFINITION

**1,3,5,7 :** Anode  
**2,4,6,8 :** Cathode  
**9,11,13,15:** Emitter  
**10,12,14,16:** Collector

## PACKAGE OUTLINE



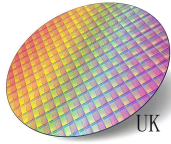


**ABSOLUTE MAXIMUM RATINGS**

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	V <sub>rms</sub>	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

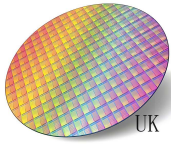
Note 2. AC For 1 Minute, R.H. = 40 ~ 60%



ELECTRICAL OPTICAL CHARACTERISTICS at Ta=25°C							
PARAMETER	SYMBOL	MIN	TYP.	MAX.	UNIT	TEST CONDITION	NOTE
INPUT							
Forward Voltage	V <sub>F</sub>	-	-	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	TLP291-4GB	CTR	100	-	400	%	IF=5mA, VCE=5V
	TLP291-4		50	-	400		
Collector-Emitter Saturation Voltage	V <sub>CE(sat)</sub>	-	0.1	0.2	V	IF=10mA, 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	
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
Cut-off Frequency	f <sub>c</sub>	-	80	-	kHz	VCE=2V, IC=2mA RL=100Ω,-3dB	4

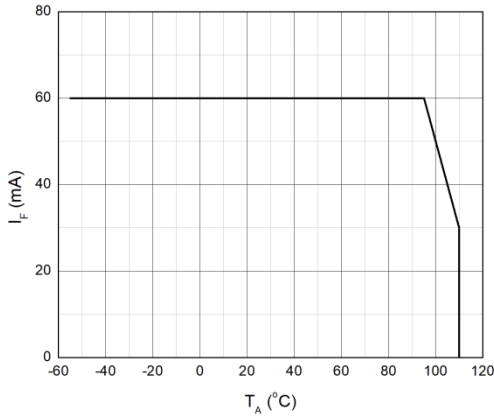
Note 3. Fig.12&13

Note 4. Fig.14

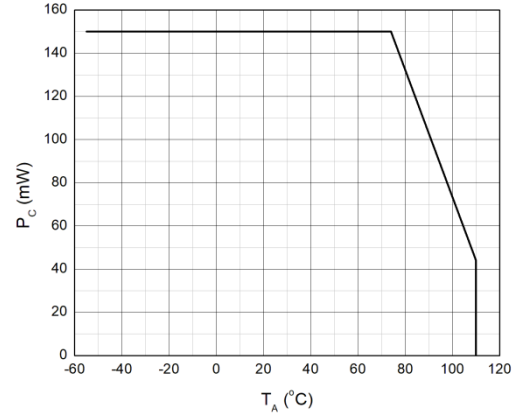


### CHARACTERISTIC CURVES

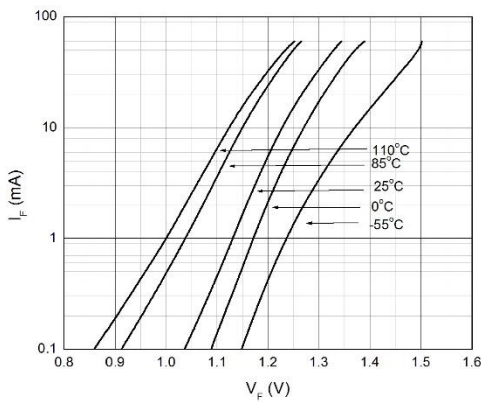
**Fig.1 Forward Current vs. Ambient Temperature**



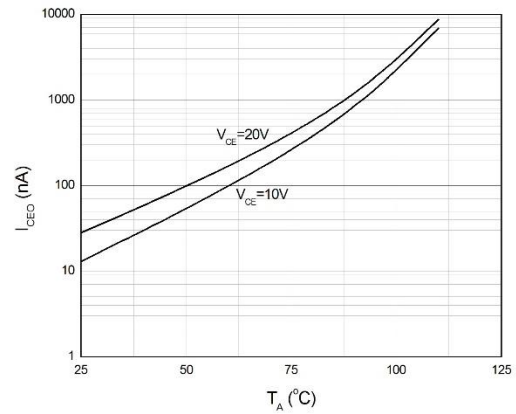
**Fig.2 Collector Power Dissipation vs. Ambient Temperature**



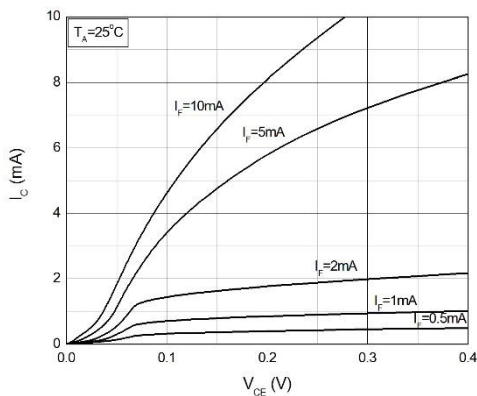
**Fig.3 Forward Current vs. Forward Voltage**



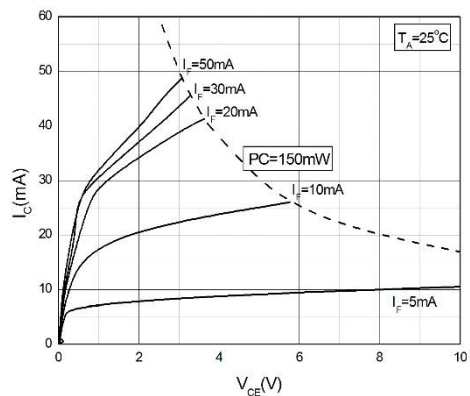
**Fig.4 Collector Dark Current vs. Ambient Temperature**

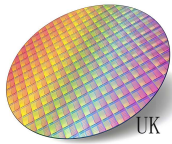


**Fig.5 Collector Current vs. Collector-emitter Voltage**



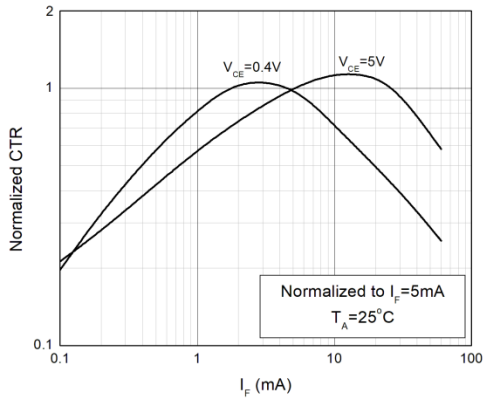
**Fig.6 Collector Current vs. Collector-emitter Voltage**



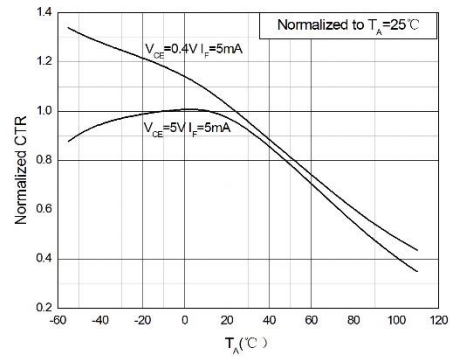


### CHARACTERISTIC CURVES

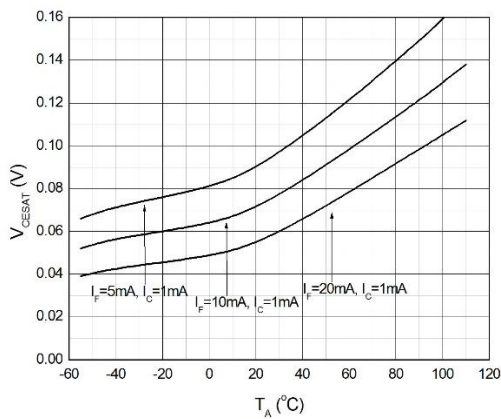
**Fig.7 Normalized Current Transfer Ratio vs. Forward Current**



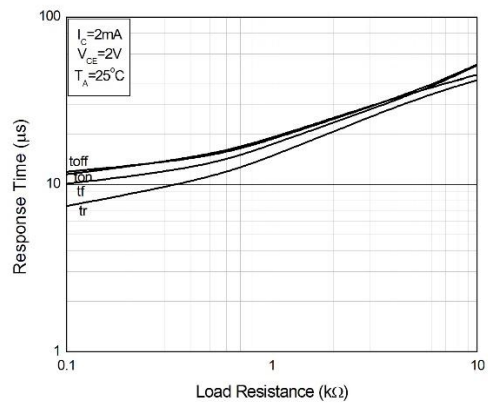
**Fig.8 Normalized Current Transfer Ratio vs. Ambient Temperature**



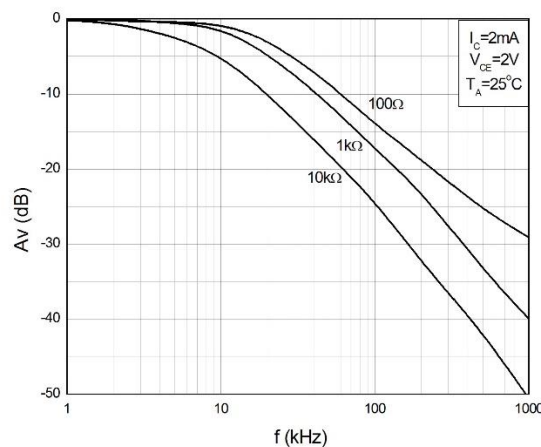
**Fig.9 Collector-emitter Saturation Voltage vs. Ambient Temperature**

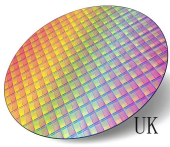


**Fig.10 Switching Time vs. Load Resistance**



**Fig.11 Frequency Response**





TEST CIRCUITS

Fig.12 Test Circuits of Response Time

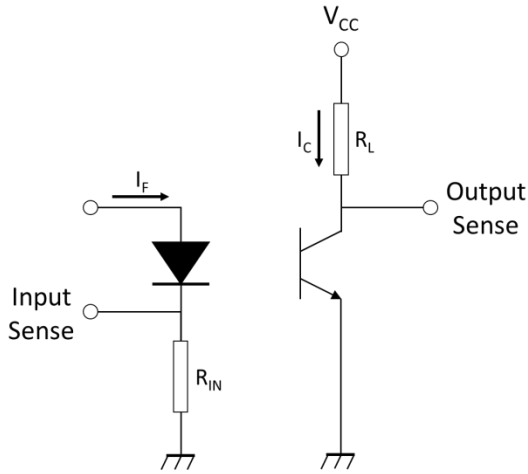


Fig.13 Curves of Response Time

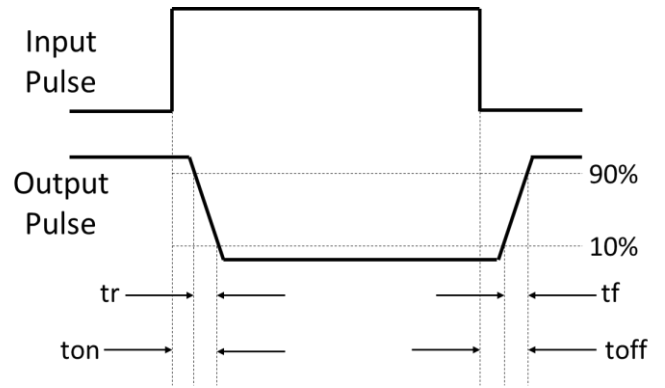
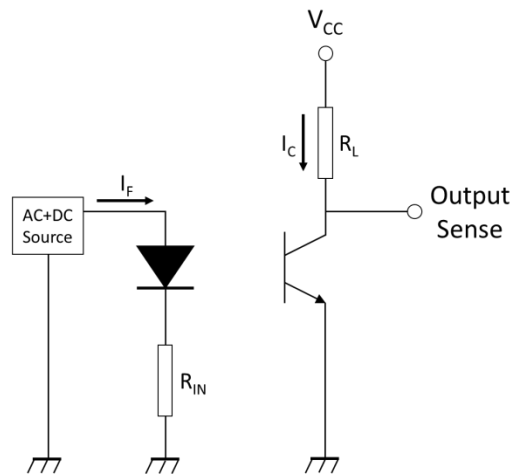
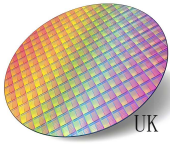
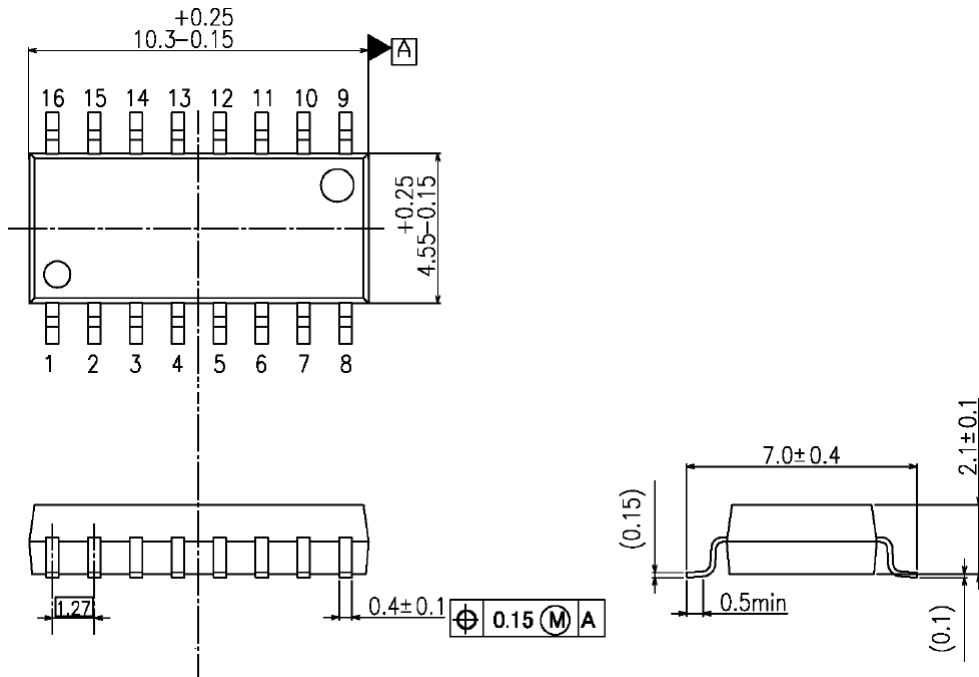


Fig.14 Test Circuits of Frequency Response

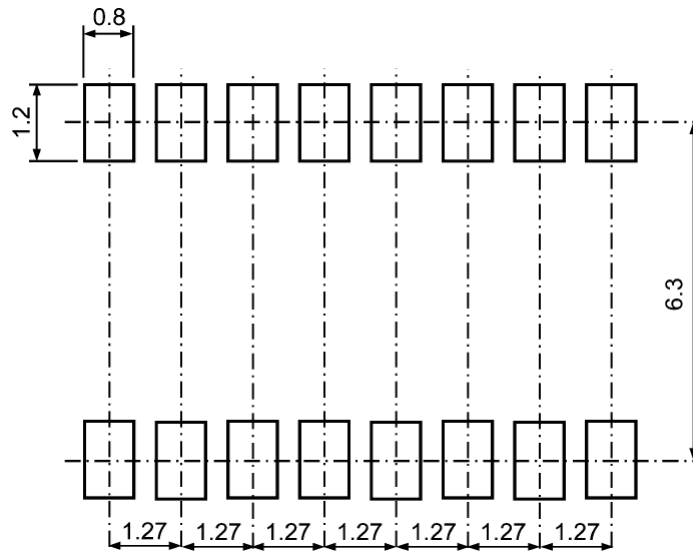


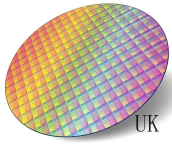


**PACKAGE DIMENSIONS (Dimensions in mm unless otherwise stated)**



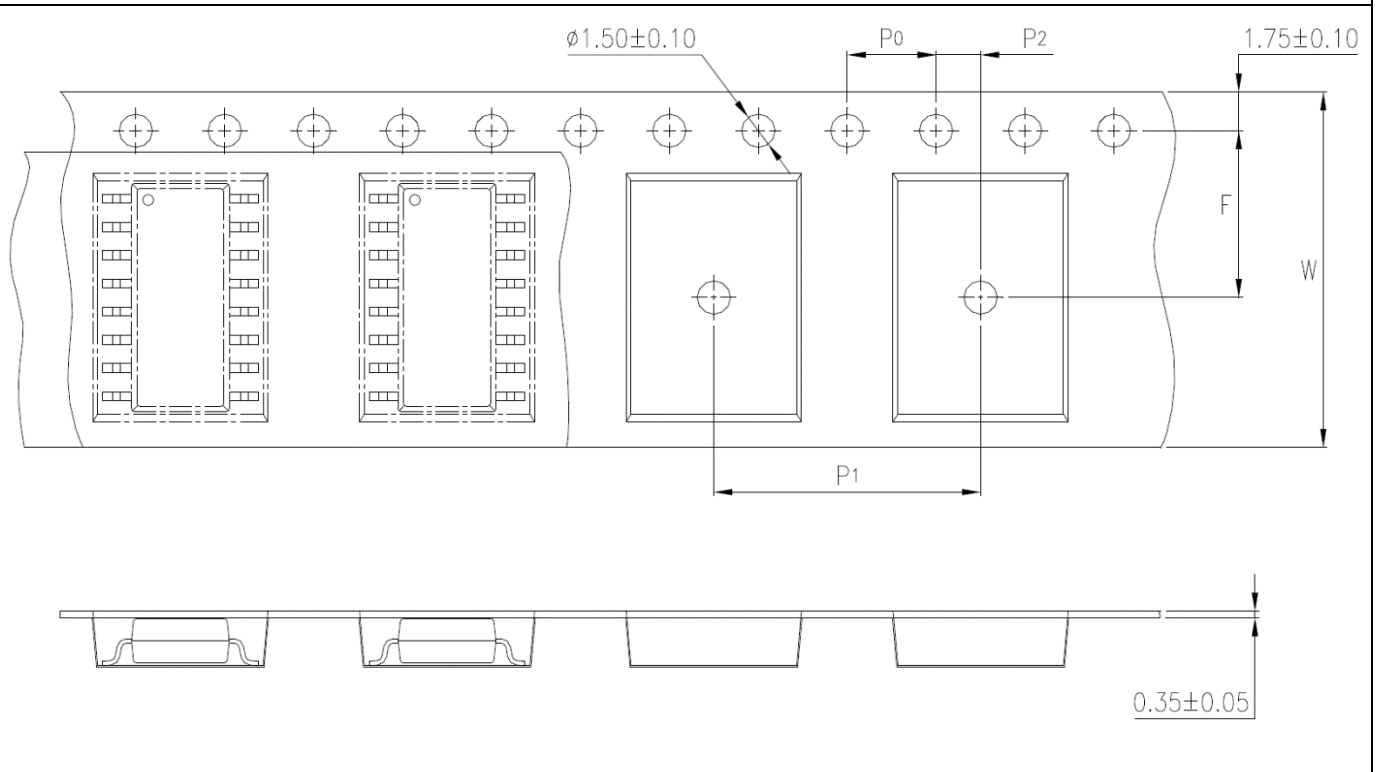
**Recommended Solder Mask (Dimensions in mm unless otherwise stated)**





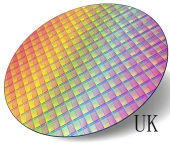
**CARRIER TAPE SPECIFICATIONS (Dimensions in mm unless otherwise stated)**

**Option T1**



Description	Symbol	Dimension mm (inch)
Tape Width	W	16 ± 0.3 (0.63)
Pitch of Sprocket Holes	P <sub>0</sub>	4 ± 0.1 (0.15)
Distance of Compartment to Sprocket Holes	F	7.5 ± 0.1 (0.295)
	P <sub>2</sub>	2 ± 0.1 (0.079)
Distance of Compartment to Compartment	P <sub>1</sub>	12 ± 0.1 (0.47)





**ORDERING AND MARKING INFORMATION**

**MARKING INFORMATION**



**TLP291-4X: Part Number**  
**I: Company Abbr.**  
**Y: denotes 1 digit Year code**  
**WW: denotes 2 digit Week code**

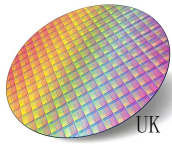
**ORDERING INFORMATION**

**TLP291-4x**

TLP – Company Abbr.  
291-4 – Part Number  
X – CTR Rank (GB/None)

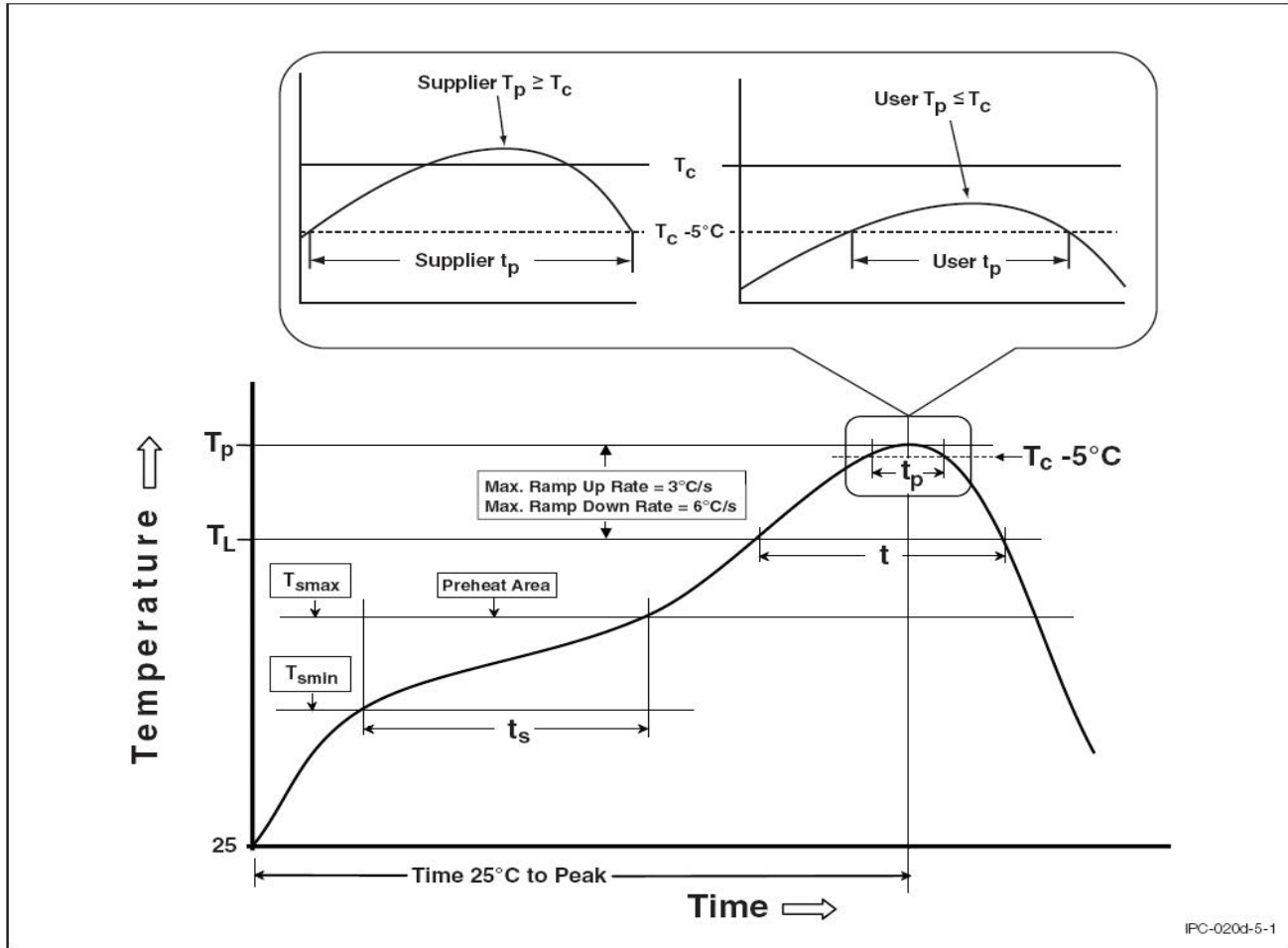
**PACKING QUANTITY**

Option	Quantity	Quantity – Inner box	Quantity – Outer box
T1	2000 Units/Reel	1 Reels/Inner box	5 Inner box/Outer box = 10k Units



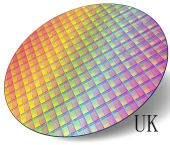
## REFLOW INFORMATION

### REFLOW PROFILE



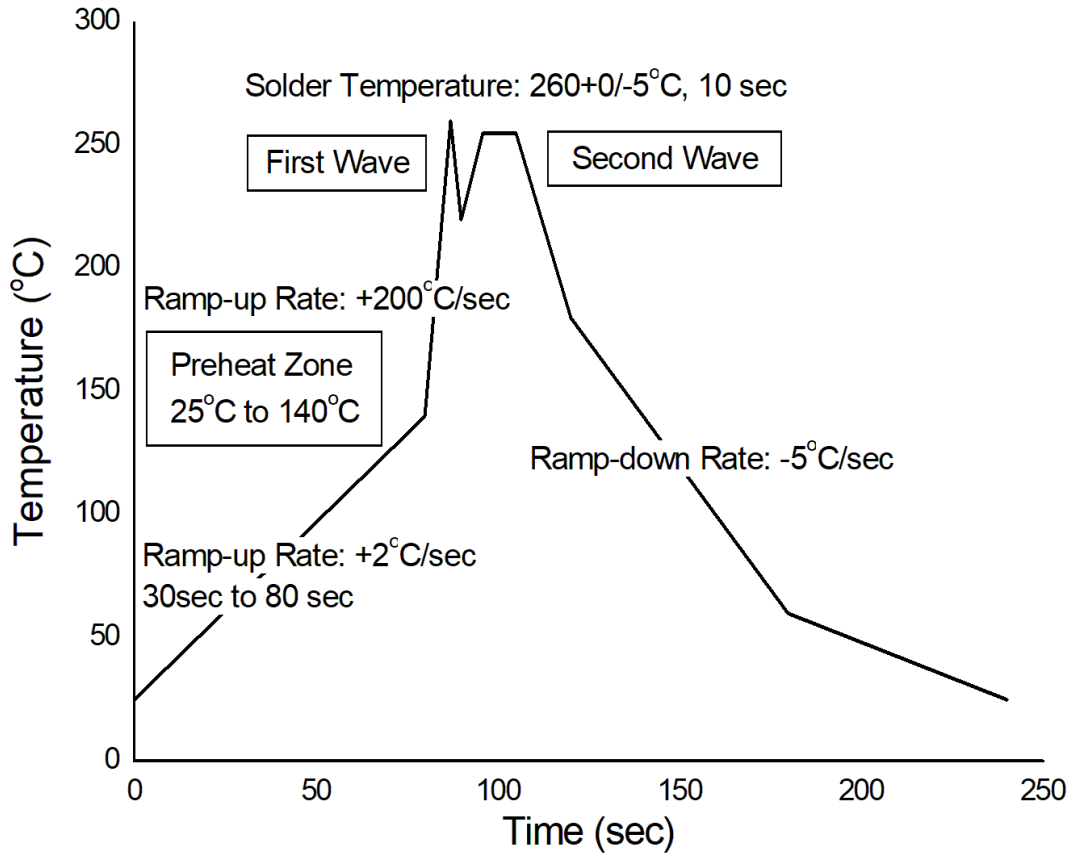
IPC-020d-5-1

Profile Feature	Sn-Pb Assembly Profile	Pb-Free Assembly Profile
Temperature Min. ( $T_{smin}$ )	100	150°C
Temperature Max. ( $T_{smax}$ )	150	200°C
Time ( $t_s$ ) from ( $T_{smin}$ to $T_{smax}$ )	60-120 seconds	60-120 seconds
Ramp-up Rate ( $t_L$ to $t_P$ )	3°C/second max.	3°C/second max.
Liquidous Temperature ( $T_L$ )	183°C	217°C
Time ( $t_L$ ) Maintained Above ( $T_L$ )	60 – 150 seconds	60 – 150 seconds
Peak Body Package Temperature	235°C +0°C / -5°C	260°C +0°C / -5°C
Time ( $t_P$ ) within 5°C of 260°C	20 seconds	30 seconds
Ramp-down Rate ( $T_P$ to $T_L$ )	6°C/second max	6°C/second max
Time 25°C to Peak Temperature	6 minutes max.	8 minutes max.



### TEMPERATURE PROFILE OF SOLDERING

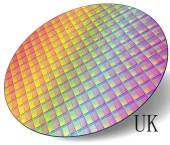
#### WAVE SOLDERING (JESD22-A111 COMPLIANT)



#### HAND SOLDERING BY SOLDERING IRON

Soldering Temperature	380±5°C
Soldering Time	3 sec max.

- One time soldering is recommended for all soldering method.
- Do not solder more than three times for IR reflow soldering.



## DISCLAIMER

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- Discoloration might be occurred on the package surface after soldering, reflow or long-time use. It neither impacts the performance nor reliability.