



# TSM600-250F Benchmarking Test Summary of Housing Modification

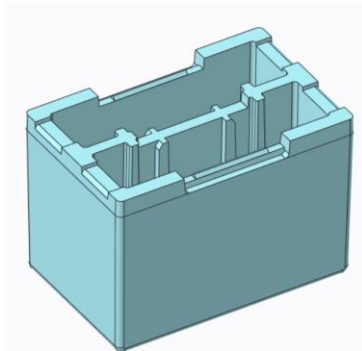


Product Manager: Dhatri Bhatt

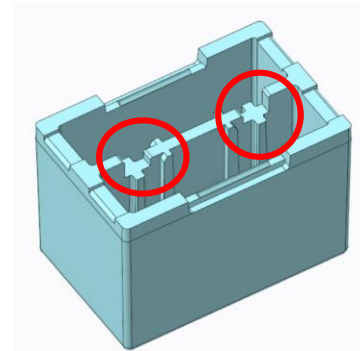
# Background

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- Potential for burrs at the bottom of TSM600-250F devices. This could cause device to be raised off surface and lead to a loose solder joint or electrical connection.
- As a preventative measure, the housing design was re-evaluated.




Current Design



New Design

# TSM600-250F SCD



**PolySwitch®**  
**PTC Devices**  
Overcurrent Protection Device

**PRODUCT: TSM600-250F**  
DOCUMENT: SCD26006  
REV LETTER: E  
REV DATE: JULY 26, 2016  
PAGE NO.: 1 OF 2

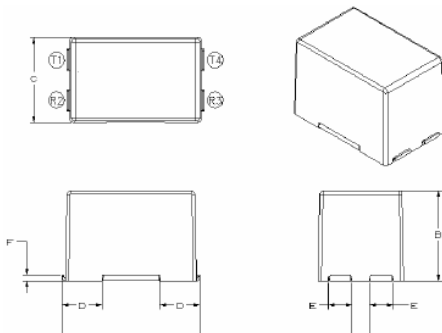
**Specification Status: RELEASED**

**Max Electrical Rating at 20°C**  
**Operating Voltage: 250V<sub>∞</sub>**  
**Interrupt Current: 3A<sub>RM</sub>**  
**Fault Voltage: 600V<sub>RM</sub>**

Lead Material: Tin plated brass  
 Configuration: Two PPTC devices per TSM600 part  
 Case Material: Nylon Resin (UL94 V-0) 1000V dielectric rating

**Marking:**  
 X Manufacturer's Mark  
 TSM600 Part Identification  
 □ □ □ Lot Identification

**Terminal Description:**  
 T1 = Tip In T4 = Tip Out  
 R2 = Ring In R3 = Ring Out



**TABLE I. DIMENSIONS:**

mm:	A		B		C		D		E		F		G	
	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX
	17.0	17.6	11.2	11.7	10.4	11.2	4.8	5.2	2.5	2.8	0.6	1.0	2.2	3.1
in:	(0.671)	(0.691)	(0.440)	(0.460)	(0.410)	(0.440)	(0.187)	(0.203)	(0.099)	(0.111)	(0.022)	(0.038)	(0.087)	(0.122)

**TABLE II. PERFORMANCE RATINGS @ 20°C (unless otherwise noted):**

IHOLD (A)	RESISTANCE (Ω)**			TIME TO TRIP @ 3A (Seconds)		OPERATING TEMPERATURE (°C)		Tripped state Power Dissipation @ 250V (Watts) TYPICAL	
	20°C	60°C	R MIN	R TYP	R MAX†	TYP	MAX		MIN
0.250	0.140	1.0	3.5	7.0	0.8	6	-40	85	2

\* Maximum device resistance, measured 1-hour post reflow or post trip.  
 \*\* Resistance per PPTC device.  
 † Resistance per PPTC device.  
 ‡ Resistance per PPTC device.  
 § Resistance per PPTC device.

Additional Ratings @ 20°C  
 Resistance Matched: 0.5 Ohm measured 24 hours after reflow installation  
 Line Balance: 0.5 Ohm, 59 dB @ 4k Hz minimum\*\*\*


\*\*\*Tested in accordance with IEEE 465 with a device having a series longitudinal balance value of at least 60dB

Agency Recognitions: UL, CSA  
 Reference Documents: PS300  
 Precedence: This specification takes precedence over documents referenced herein.  
 Effectivity: Reference documents shall be the issue in effect on the date of invitation for bid.

**MATERIALS INFORMATION**

ROHS Compliant      ELV Compliant      Pb-Free  
 Directive 2002/95/EC Compliant      Directive 2000/53/EC Compliant

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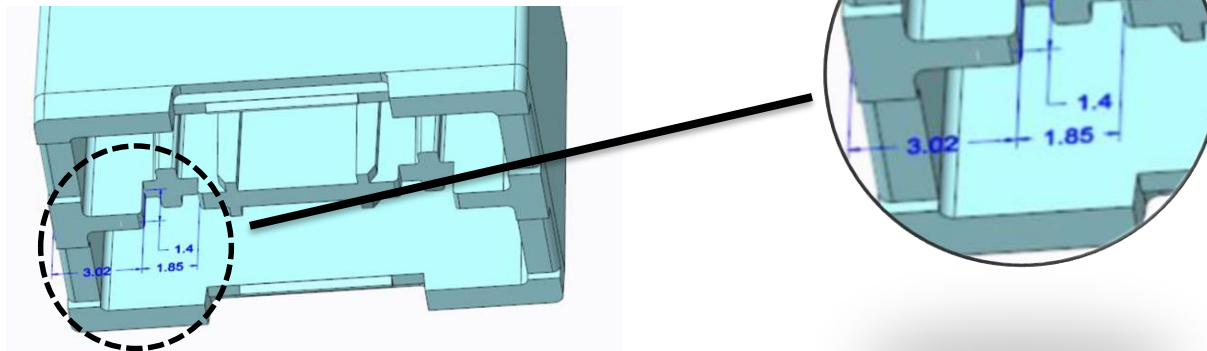
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# Samples Information

- 500pcs new housing were prepared for the evaluation
- 500pcs FG were built for the final evaluation, lot number: GXBM.

## Key Dimensions of New Design



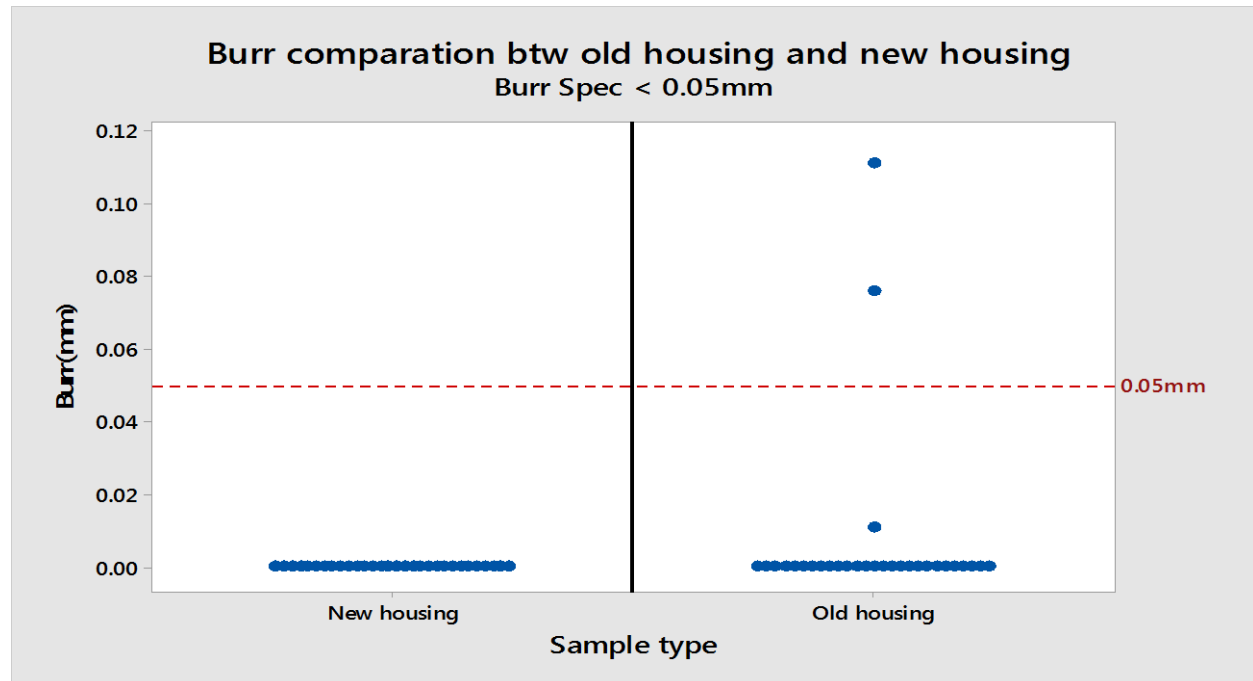
## Test Results of Key Dimensions

Specification	Instrument	Testing Location	Testing value			Result
1.4±0.1	Height Gauge	Left	1.370	1.383	1.408	ok
		Right	1.398	1.383	1.432	ok
3.02±0.1	Callipers	Left	3.04	3.03	3.01	ok
		Right	2.97	2.97	3.01	ok
1.85±0.1	Three dimensional imager	Left	1.809	1.834	1.800	ok
		Right	1.820	1.830	1.812	ok

# Test Result: Burr

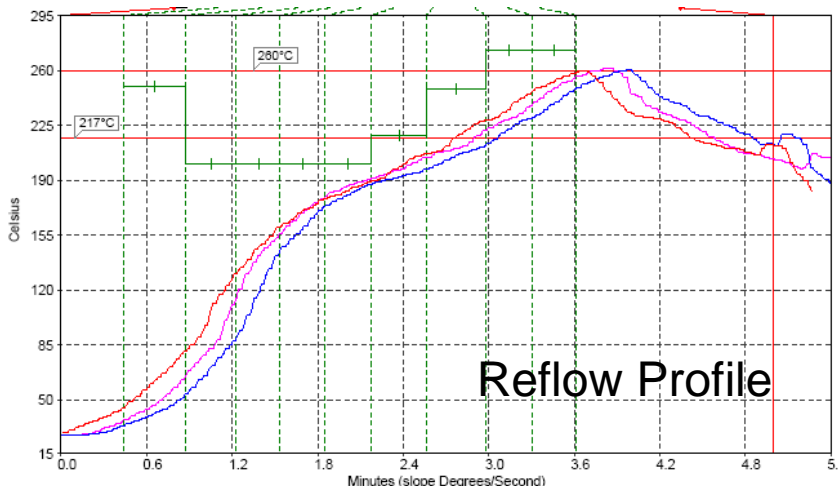
- Welding parameter:
  - Ultrasonic depth: 0.7 - 0.75mm
  - Hold time: 0.35 - 0.45s
- Burr Requirement:  $\leq 0.05\text{mm}$
- Test Result: No burr on all samples with new housing.

Sample size:  
20pcs



# Test Result: Aging

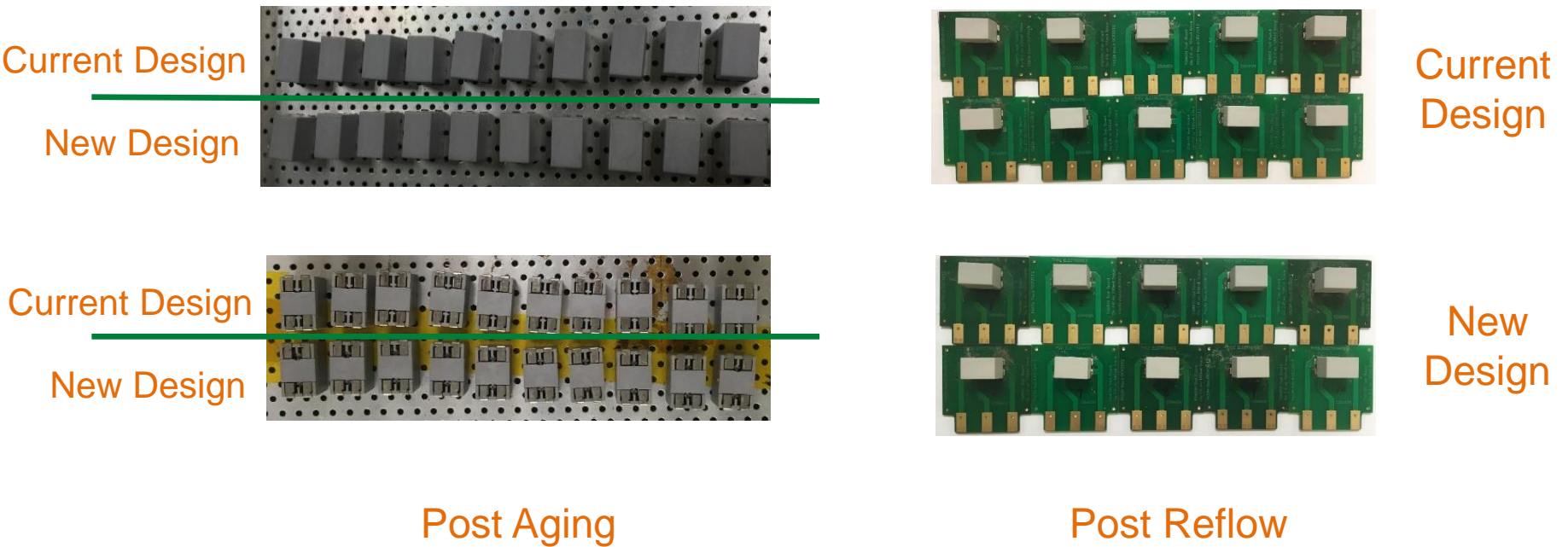
- The MSL of TSM600 devices are 2A (60°C/90%RH 168h)
- Test Condition: 60°C/90%RH for 168 hours, then Reflow on the test Board
- Sample Size: 15pcs/lot
- Acceptance Criteria: No bulb on the housing post aging and reflow tests.





# Test Result: Aging (Con.)

- Test Result: All samples passed the test and no bulb was found post aging and reflow



# Test Result: OQC

- The electrical performance were tested per QTR with double samples size
- Test Result: Pass.

The Summary Report of TSM600 QC Inspection				
Device Type	TSM600-25F-2			
Part No	A88766-000			
Work Order	201021891			
Batch No	GXBM			
Lot Qty	500			
Sampling Qty	200			
QTRC No	SH2-QE60-0025-B			
Inspection Duration	Jun.21-22.2017			
Accept	ALL			
Inspector	张林			
Approval	王喜伟			
Result	PASS			
Test Items	SS	A/R	Acceptance Criteria	Result
Visual	140	Q/1	Meets criteria board	Accept
Dimensions (mm)	140	Q/1	Dim A : 17min, 17.6max	Accept min 17.239 max 17.548
Resistance (Ω)	140	Q/1	2.25min, 5.6 max; Delta R: 0.45	Accept min 2.554 max 3.755 Delta R Max: 0.277
Post Reflow			R min 2.25,max 6.5	Accept min 2.888 max 4.453
Time to Trip	72	Q/1	250V,3A ,max test time 6.0s, at 20 deg C Max T1T 4s all parts must trip within a specific time R final /R initial less than or equal to 1.2	Accept min 0.771 max 1.167 R/R= 1.116
Cycle Life	72	Q/1	250V,3A,5s ON 60s OFF, 10cycle no evidence of burning of external surface R final /R initial less than or equal to 1.2 800V,2.2A,1Hour	Accept R/R= 0.9134
Trip Endurance	72	Q/1	no evidence of burning of external surface R final /R initial less than or equal to 1.4 Max Initial Res before PC in Cycle/ 6.8	Accept R/R= 1.3660
Power Cross	180	4/5	no evidence of burning of external surface or blowing of Bussman MDF 1.6A fuse	

The Summary Report of TSM600 QC Inspection				
Device Type	TSM600-25F-RA-2			
Part No	A88390-000			
Work Order	201021225			
Batch No	GXEM			
Lot Qty	200			
Sampling Qty	200			
QTRC No	SH2-QE60-0025-B			
Inspection Duration	Jun.17-19.2017			
Accept	ALL			
Inspector	张林			
Approval	刘红霞			
Result	PASS			
Test Items	SS	A/R	Acceptance Criteria	Result
Visual	70	Q/1	Meets criteria board	Accept
Dimensions (mm)	70	Q/1	Dim A : 17min, 17.6max	Accept min 17.210 max 17.514
Resistance (Ω)	70	Q/1	2.25min, 4.3 max; Delta R: 0.45	Accept min 2.689 max 4.066 Delta R Max: 0.319
Post Reflow			R min 2.25,max 4.8	Accept min 2.826 max 4.541
Time to Trip	36	Q/1	250V,3A ,max test time 6.0s, at 20 deg C Max T1T 4s all parts must trip within a specific time R final /R initial less than or equal to 1.2	Accept min 0.806 max 1.151 R/R= 1.129
Cycle Life	36	Q/1	250V,3A,5s ON 60s OFF, 10cycle no evidence of burning of external surface R final /R initial less than or equal to 1.2 800V,2.2A,1Hour	Accept R/R= 0.892
Trip Endurance	36	Q/1	no evidence of burning of external surface R final /R initial less than or equal to 1.4 Max Initial Res before PC in Cycle/ 5.1	Accept R/R= 1.329
Power Cross	90	4/5	no evidence of burning of external surface or blowing of Bussman MDF 1.6A fuse	



# Conclusion

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- All samples passed.
- The new housing meets all design requirements.