

Date Created: 1/28/2004
Date Issued: 2/16/2004
PCN # 20040410

DESIGN/PROCESS CHANGE NOTIFICATION -- FINAL

This is to inform you that a design and/or process change will be made to the following product(s). This notification is for your information and concurrence.

If you require data or samples to qualify this change, please contact **Fairchild Semiconductor within 30 days of receipt of this notification.**

If you have any questions concerning this change, please contact:

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PCN Type: Packing Material Dimensions (Rails/Boxes)

Effectivity

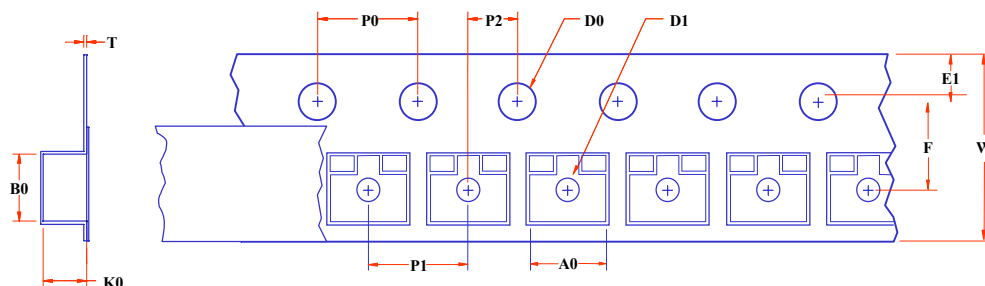
Expected 1st Device Shipment Date: 5/11/2004
Earliest Year/Work Week of Changed Product: 0420
(Note: Package marking may differ from this format)

Product ID (Description):

This change affects SOT-23 devices assembled at FSCP only.

Description of Change:

The difference in the alternative carrier tape for SOT-23 is on the thickness, T dimension from 0.229 +/- 0.013 mm to 0.30 +/- 0.05 mm and the material type from polycarbonate to polystyrene.



SOT-23 CARRIER TAPE DIMENSIONS

SPECIFICATION	EXISTING	ALTERNATIVE	RESULTS
Material	Polycarbonate	Polystyrene	different
A ₀	3.15 ± 0.10 mm	3.15 ± 0.10 mm	same
B ₀	2.77 ± 0.10 mm	2.77 ± 0.10 mm	same
K ₀	1.25 ± 0.15 mm	1.25 ± 0.15 mm	same
T	0.229 ± 0.013 mm	0.30 ± 0.05 mm	different
W	8.00 ± 0.30 mm	8.00 ± 0.30 mm	same
P ₁	4.00 ± 0.10 mm	4.00 ± 0.10 mm	same
P ₀	4.00 ± 0.10 mm	4.00 ± 0.10 mm	same
P ₂	2.00 ± 0.10 mm	2.00 ± 0.10 mm	same
E ₁	1.75 ± 0.10 mm	1.75 ± 0.10 mm	same
F	3.50 ± 0.05 mm	3.50 ± 0.05 mm	same
D ₀	1.55 ± 0.05 mm	1.55 ± 0.05 mm	same
D ₁	1.00 ± 0.10 mm	1.00 ± 0.10 mm	same

Effect of Change:

This change does not affect the functionality of the device / units.

Qualification:

1.0 QUALIFICATION RESULTS

1.1 Carrier Tape

1.1.1 Visual / Physical

1.1.1.1 Carrier tape must be either Polystyrene or Polycarbonate.

Remarks: Carrier tape is Polystyrene (PS). Passed.

1.1.1.2 The tape cavity must be embossed and it must be black.

Remarks: It is embossed and the color is black. Passed.

1.1.1.3 The centerline of the component cavity must be located midway between a pair of sprocket holes in the lengthwise direction of the tape.

Remarks: Passed.

1.1.1.4 No contamination or dirt should be located within 1/16 inch from both sides of the component cavity in the lengthwise direction or any solid contaminant inside the component cavity.

Remarks: No contamination found. Passed.

1.1.1.5 There shall be no deformation of any kind that will materially defect the tape and cause failure of dimensional requirements.

Remarks: No deformation noted. Passed.

1.1.1.6 Camber must be within 1/100 mm non-cumulative over 250mm.
Remarks: Camber is within specifications. Passed.

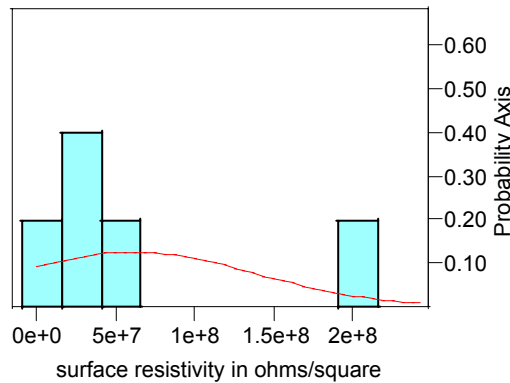
1.1.2 Surface Resistivity

1.1.2.1 Carrier tape must be conductive or static dissipative in property with surface resistivity value of not more than 1.0×10^9 ohms per square.

Remarks: Tape is conductive. Passed.

Reference IQC Lot No. is CE03-0038-51.

Normal Distribution of Carrier Tape Surface Resistivity



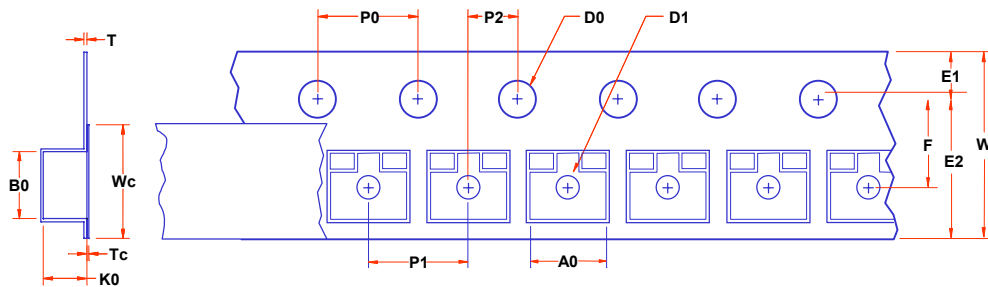
Moments

Mean	61400000
Std Dev	78423848
Std Err Mean	35072211
upper 95% Mean	158776069
lower 95% Mean	-35976069
N	5
Sum Wgt	5
Sum	307000000
Variance	6.1503e15
Skewness	2.1090015
Kurtosis	4.501962
CV	127.72614
N Missing	0

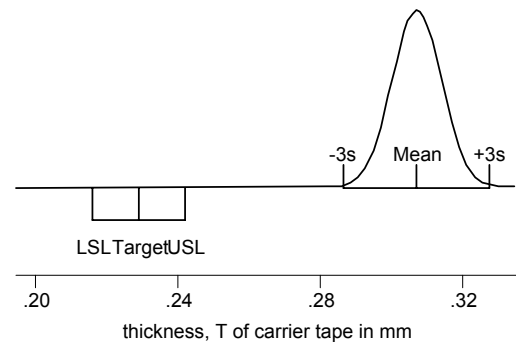
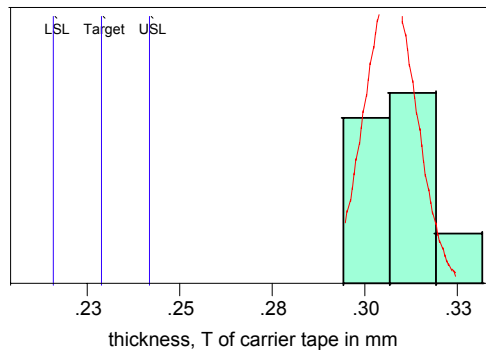
1.1.3 Dimensional Result

1.1.3.1 Carrier tape shall be measured and must comply with all the specifications found in EIA-481-1-A standard and the specified drawing found in (CB)MPS-8-022.

Remarks: Passed except for thickness, T specification which is 0.30 ± 0.05 mm. Reference IQC Lot No. is CE03-0038-51.



Normal Distribution of Carrier Tape Thickness, T

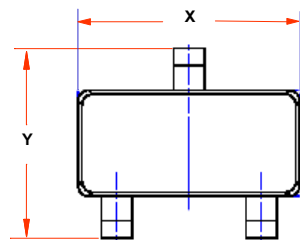


	A0	B0	K0	D0	D1	P0	P1	E1	F	W	T
LSL	3.05	2.67	1.15	1.50	0.90	3.90	3.90	1.65	3.45	7.70	0.216
Nom	3.15	2.77	1.25	1.55	1.00	4.00	4.00	1.75	3.50	8.00	0.229
USL	3.25	2.87	1.35	1.60	1.10	4.10	4.10	1.85	3.55	8.30	0.242
Min	3.18	2.82	1.16	1.51	0.96	3.99	3.95	1.70	3.45	8.10	0.300
Max	3.21	2.87	1.24	1.56	0.99	4.05	4.03	1.78	3.51	8.23	0.320
Ave	3.19	2.84	1.20	1.53	0.98	4.01	3.99	1.74	3.48	8.20	0.310
SDev	0.011	0.013	0.020	0.014	0.008	0.015	0.022	0.017	0.017	0.026	0.007

Note: All dimensions are in mm unless otherwise specified.

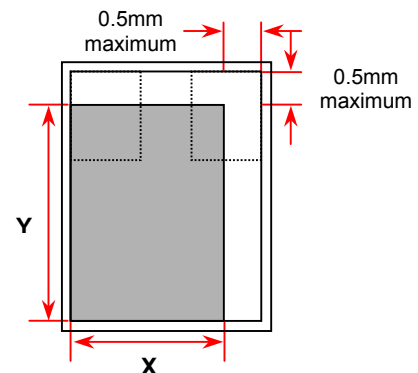
1.1.3.2 Lateral movement of the component is restricted to 0.5 mm maximum (see figure below).

Remarks: Passed. There is a foot in the design to minimize the lateral movement of the unit.



unit dimension	MIN mm	AVE mm	MAX mm
X (package width)	2.82	2.92	3.02
Y (leads spread)	2.21	2.31	2.41

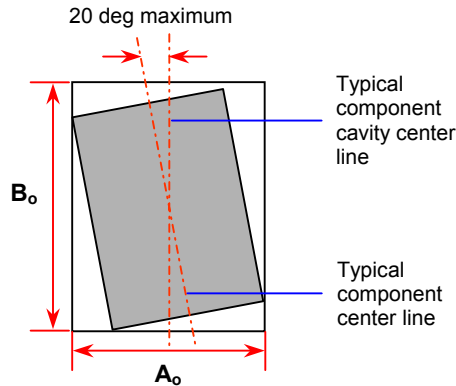
X minimum lateral movement,
 • max unit dimension, min pocket size
 = 3.05 – 3.02 = 0.03 mm
 X average lateral movement,
 • ave unit dimension, ave pocket size
 = 3.15 – 2.92 = 0.23 mm



Component lateral movement

Y minimum lateral movement,
 • max unit dimension, min pocket size
 = 2.67 – 2.41 = 0.26 mm
 Y average lateral movement,
 • ave unit dimension, ave pocket size
 = 2.77 – 2.31 = 0.46 mm

1.1.3.3 Rotation of the component is limited to 20° maximum
Remarks: Passed. There is a foot in the design to also minimize the rotation of the component.



Minimum component rotation,
 • max unit dimension, min pocket size
 $3.05 = 2.41 \sin \theta + 3.02 \cos \theta$
 $\theta \approx 1^\circ$
 Maximum component rotation,
 • min unit dimension, max pocket size
 $3.25 = 2.21 \sin \theta + 2.82 \cos \theta$
 $\theta \approx 13^\circ$
 Average component rotation,
 • ave unit dimension, ave pocket size
 $3.15 = 2.31 \sin \theta + 2.92 \cos \theta$
 $\theta \approx 6^\circ$

1.2 Cover Tape

1.2.3 Visual / Physical

1.2.3.1 No visible contamination or jagged edges shall exist on the cover tape.

Remarks: Passed. No jagged edges found.

1.2.3.3 Transparency of the tape must be clear enough to let a laser or an ink marking on the unit inside a sealed carrier tape visible enough to be identified.

Remarks: Passed. Marking of the unit inside is visible .

1.2.3.4 No splicing of tape is allowed.

Remarks: Passed. No splicing observed.

1.2.4 Surface Resistivity

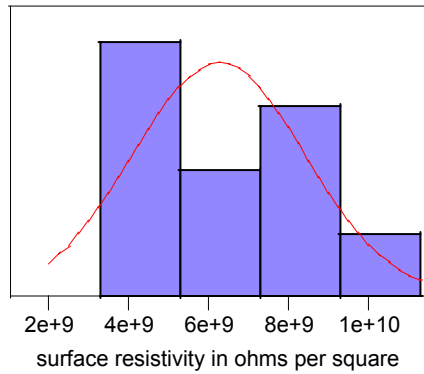
1.2.4.1 Cover tape must be static dissipative in property with surface resistivity shall be at a maximum of 1.0×10^{10} ohms per square.

Remarks: Tape is static dissipative in property. Passed.

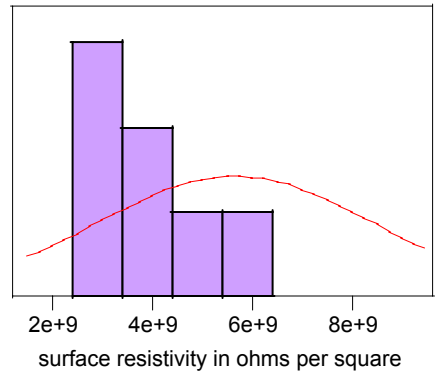
Testing Conditions: 23 °C at 46% Relative humidity

Normal Distribution of Cover Tape Surface Resistivity

Inner / Adhesive Side



Outer / Non-adhesive Side



Moments

Mean 6.269e+9
 Std Dev 2.1688e+9
 Std Err Mean 685835176
 upper 95% Mean 7.82047e9
 lower 95% Mean 4.71753e9
 N 10

Moments

Mean 5.635e+9
 Std Dev 2.80186e9
 Std Err Mean 886025144
 upper 95% Mean 7.63933e9
 lower 95% Mean 3.63067e9
 N 10

1.3 Peel Strength Test Result

1.3.1 The sealed tape shall undergo peel strength testing using the KOEI peel back force tester to check the sealing performance. The cover tape shall be pulled with a velocity of 300+/- 10mm per minute with an angle of 165 degrees above the carrier tape.

Full Tape Test (20 – 60 gram force)						
Leg	Min	Max	Ave	SDev	Cpk	Remarks
1	26.18	42.69	35.24	3.00	1.69	Passed
2	25.45	42.39	34.38	2.81	1.71	Passed
3	23.88	41.71	34.35	2.93	1.63	Passed
4	27.94	43.13	35.92	2.78	1.91	Passed
5	25.25	39.90	33.77	2.64	1.74	Passed
6	26.32	43.57	35.89	2.86	1.85	Passed
7	26.76	43.47	35.59	2.86	1.82	Passed
8	27.35	44.84	35.43	2.83	1.82	Passed
9	24.47	40.88	33.61	2.95	1.54	Passed
10	25.59	42.20	35.31	3.05	1.67	Passed

Remarks: The tape under qualification passed the peel strength test requirement. In addition, it also passed the industry standard of 1.33 Cpk requirement.

Note: The Cpk value is added for information purposes that the tape has gone beyond its required performance under EIA-481-1-A standard.

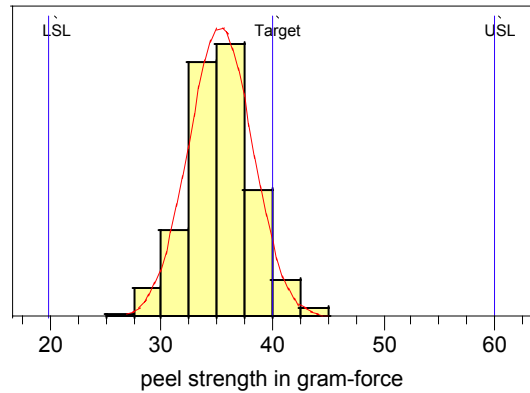
1.3.2 Peel Strength Distribution at Room / Ambient Test Condition

Moments

Mean 35.422149
 Std Dev 2.8337936
 Std Err Mean 0.1487356
 upper 95% Mean 35.714643
 lower 95% Mean 35.129654
 N 363

Goodness-of-Fit Test

Shapiro-Wilk W Test
 W Prob<W
 0.988146 0.8484



1.4 Aging / Integrity Test Result

1.4.1 Obtain a sealed tape of length enough for a total of twenty times peel strength testing. One part of the sealed tape shall be aged at a higher storage temperature of 52 °C and the other part at a lower temperature of 5-10 °C both for a minimum of three (3) days.

Leg	Full Tape Test at 52 °C (20-60 gram-force)						Full Tape Test at 5-10 °C (20-60 gram-force)					
	Min	Max	Ave	SDev	Cpk	Remarks	Min	Max	Ave	SDev	Cpk	Remarks
1	25.5	44.1	34.8	3.15	1.56	Passed	25.5	40.9	33.4	2.90	1.54	Passed
2	25.7	41.7	34.0	3.01	1.55	Passed	24.4	41.8	34.3	3.12	1.52	Passed
3	26.1	40.7	33.7	2.53	1.80	Passed	24.9	42.9	34.6	3.26	1.50	Passed
4	25.4	42.4	34.1	3.00	1.56	Passed	25.3	41.8	35.6	2.92	1.78	Passed
5	22.3	43.0	34.8	3.08	1.59	Passed	24.8	43.6	35.0	2.84	1.76	Passed
6	26.5	41.6	33.3	2.66	1.67	Passed	23.2	44.5	34.4	3.01	1.59	Passed
7	23.4	40.2	33.5	2.93	1.54	Passed	24.8	41.7	33.9	2.78	1.67	Passed
8	23.8	40.6	33.4	2.84	1.57	Passed	24.6	41.0	34.6	2.97	1.64	Passed
9	23.4	40.1	33.8	2.74	1.68	Passed	24.4	41.1	33.9	2.91	1.59	Passed
10	25.1	41.1	34.0	2.90	1.61	Passed	23.2	38.7	32.1	2.53	1.60	Passed

Remarks: The tape under qualification passed the peel strength test requirement. In addition, it also passed the industry standard of 1.33 Cpk requirement.

Note: The Cpk value is added for information purposes that the tape has gone beyond its required performance under EIA-481-1-A standard.

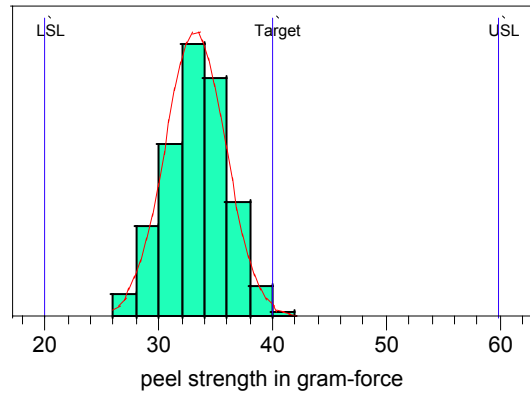
1.4.2 Peel Strength Distribution at Hot Test Condition

Moments

Mean	33.317741
Std Dev	2.6596126
Std Err Mean	0.1395935
upper 95% Mean	33.592257
lower 95% Mean	33.043225
N	363

Goodness-of-Fit Test

Shapiro-Wilk W Test	
W	Prob<W
0.983310	0.4057



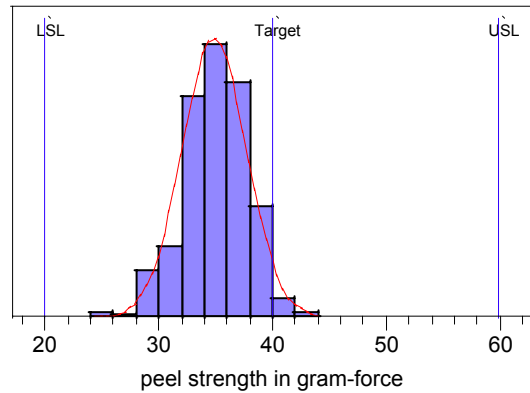
1.4.3 Peel Strength Distribution at Cold Test Condition

Moments

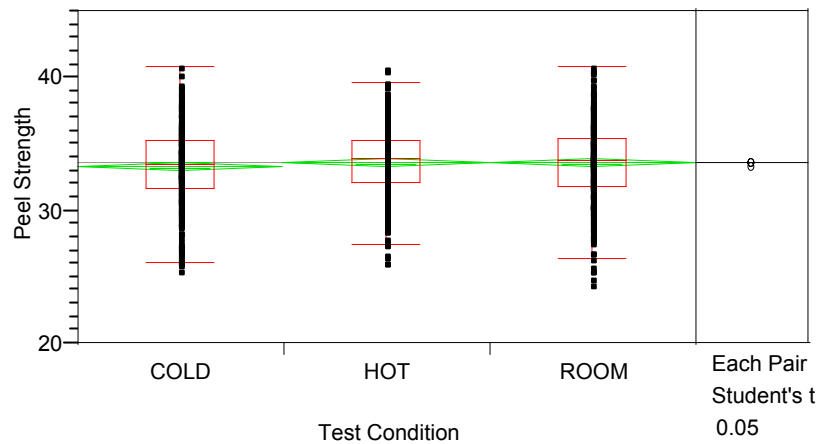
Mean	34.975978
Std Dev	2.8412709
Std Err Mean	0.149128
upper 95% Mean	35.269244
lower 95% Mean	34.682712
N	363

Goodness-of-Fit Test

Shapiro-Wilk W Test	
W	Prob<W
0.986413	0.7132



1.4.4 Box Plot of the Peel Strength Results at Different Test Conditions



Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Test Condition	2	18.1816	9.09078	1.1607	0.3136
Error	1086	8505.5253	7.83198		
C. Total	1088	8523.7069			

Remarks: Analysis of variance showed that the means of the peel strength results at different test conditions are not significantly different.

Qual/REL Plan Numbers

Additional Qualification Data

Reliability is NOT required for this type of change.

Affected FSIDs

1P49_B1P010B	1P49_NB1P002A	1P49_SB1P001A
2N7002	4X49_BM5006B	9G49_B9G004A
9G49_BG9014B	9U49_B9U001A	9V49_B9V002A
BAR43	BAR43C	BAR43S
BAS16	BAS19	BAS20
BAS21	BAS29	BAS31
BAS35	BAT54	BAT54A
BAT54C	BAT54S	BAV23S
BAV70	BAV74	BAV99
BAW56	BAW74	BC80740
BC817	BC846B	BC856B
BCV26	BCV27	BCV71
BCV72	BCW30	BCW31
BCW32	BCW33	BCW60A
BCW60B	BCW60C	BCW60D
BCW65C	BCW66G	BCW68G
BCW69	BCW71	BCW89
BCX17	BCX19	BCX20
BCX70G	BCX70H	BCX70J
BCX70K	BCX71G	BCX71J
BCX71K	BSR13	BSR14
BSR15	BSR16	BSR17A
BSR18A	BSR18B	BSR56
BSR57	BSR58	BSS123
BSS138	BSS63	BSS64
BSS79C	BSS84	BSV52
BZX84C10	BZX84C11	BZX84C12
BZX84C13	BZX84C15	BZX84C16
BZX84C18	BZX84C20	BZX84C22
BZX84C24	BZX84C27	BZX84C30
BZX84C33	BZX84C3V3	BZX84C3V6
BZX84C3V9	BZX84C4V3	BZX84C4V7
BZX84C5V1	BZX84C5V6	BZX84C6V2
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FDV303N	FDV304P	FDV305N
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