



Tape & Reel Packaging Standards

To learn more about PANJIT International Inc., please visit our website at
www.panjit.com

In Brief

The document is designed to align packaging specifications alignment with assembly line requirements. This comprehensive guide offers TNR (Tape and Reel) unit orientation guidelines, package orientation information, and details on reflow profile standards. This document serves as an indispensable resource for optimizing packaging practices and ensuring efficient assembly processes.

Table of Contents

| | |
|---|-----------|
| 1. Revision History | 2 |
| 2. TNR Unit Orientation Guidelines | 3 |
| 3. Package Orientation | 7 |
| 4. Reflow Profile | 12 |
| 5. Lead Free Wave solder Profile | 13 |

Revision History

| Rev. | Revision Description | Edit by | Date |
|------------|--|-----------|------------|
| Rev.00 | Document release | Raina Lin | 2024/04/22 |
| Rev.01 | Added TOLL package and note 2 | Raina Lin | 2024/10/21 |
| Rev.02 | Added SC-89 package | Raina Lin | 2025/2/13 |
| Rev.03 | Added DFN5060S-8L, DFN3333S-8L and TOLLK package | Raina Lin | 2025/3/10 |
| Rev.04 | Added packages include DFN1010B-6L, DFN2510A-10L, SOD-323S, QUADRO-MELF, TO-252AA-2LD, TO-263AB, TO-263AB-L, TO-263-7L; removed packages include TO-277 and DFN2020-8L | Raina Lin | 2025/8/12 |
| Rev.05 | Added packages include DFN5060XC-8L and M6 | Raina Lin | 2025/12/26 |
| Y26-Rev.01 | Added S1 and S2 packaging specifications, packages include SOT-353/SOT-363/SOT-563/SOT-23 6L/SOT-23 6L-1/TO-277B/TO-277C/DFN1006-2L/DFN1006-3L | Raina Lin | 2026/2/12 |
| Y26-Rev.02 | Modified SMA/ SMA(W)/ SMC/ SOT-89 Pitch Dimension(P1), tape width and figure 14 | Raina Lin | 2026/3/10 |

TNR Unit Orientation Guidelines

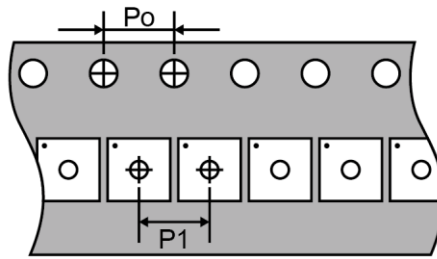
| Package | Reel Size | | Tape Width mm | Pitch Dimension(Po) | | Pitch Dimension(P1) | | Reel Q'ty | Figure No |
|--------------|-----------|-----|------------------|---------------------|----------|---------------------|----------|-----------|-----------|
| | inch | mm | | inch(±0.004) | mm(±0.1) | inch(±0.004) | mm(±0.1) | PCS | |
| DFN0603-2L | 7 | 178 | 8 | 0.157 | 4 | 0.079 | 2 | 10,000 | 5-1/5-2 |
| DFN1006-2L | 7 | 178 | 8 | 0.157 | 4 | 0.079 | 2 | 10,000 | 5-1/5-2 |
| DFN1006-3L | 7 | 178 | 8 | 0.157 | 4 | 0.079 | 2 | 10,000 | 6-1/6-2 |
| DFN1010-6L | 7 | 178 | 8 | 0.157 | 4 | 0.079 | 2 | 5,000 | 3 |
| DFN1010B-6L | 7 | 178 | 8 | 0.157 | 4 | 0.079 | 2 | 5,000 | 3 |
| DFN1610-2L | 7 | 178 | 8 | 0.157 | 4 | 0.157 | 4 | 3,000 | 4 |
| DFN2020-6L | 7 | 178 | 8 | 0.157 | 4 | 0.157 | 4 | 3,000 | 2 |
| DFN2020B-6L | 7 | 178 | 8 | 0.157 | 4 | 0.157 | 4 | 3,000 | 2 |
| DFN3030B-8L | 7 | 178 | 8 | 0.157 | 4 | 0.157 | 4 | 3,000 | 2 |
| DFN3810-9L | 7 | 178 | 8 | 0.157 | 4 | 0.157 | 4 | 3,000 | 2 |
| DFN2510-10L | 7 | 178 | 8 | 0.157 | 4 | 0.157 | 4 | 5,000 | 7 |
| DFN2510-10L | 13 | 330 | 8 | 0.157 | 4 | 0.157 | 4 | 12,000 | 7 |
| DFN2510A-10L | 7 | 178 | 8 | 0.157 | 4 | 0.157 | 4 | 3,000 | 7 |
| DFN3333-8L | 13 | 330 | 12 | 0.157 | 4 | 0.315 | 8 | 5,000 | 1 |
| DFN3333B-8L | 13 | 330 | 12 | 0.157 | 4 | 0.315 | 8 | 5,000 | 1 |
| DFN3333S-8L | 13 | 330 | 12 | 0.157 | 4 | 0.315 | 8 | 5,000 | 1 |
| DFN5060-8L | 13 | 330 | 12 | 0.157 | 4 | 0.315 | 8 | 3,000 | 1 |
| DFN5060B-8L | 13 | 330 | 12 | 0.157 | 4 | 0.315 | 8 | 3,000 | 1 |
| DFN5060S-8L | 13 | 330 | 12 | 0.157 | 4 | 0.315 | 8 | 3,000 | 1 |
| DFN5060X-8L | 13 | 330 | 12 | 0.157 | 4 | 0.315 | 8 | 3,000 | 1 |
| DFN5060XC-8L | 13 | 330 | 12 | 0.157 | 4 | 0.315 | 8 | 3,000 | 1 |
| SOD-923 | 7 | 178 | 8 | 0.157 | 4 | 0.079 | 2 | 8,000 | 23 |
| SOD-123 | 7 | 178 | 8 | 0.157 | 4 | 0.157 | 4 | 3,000 | 22 |
| SOD-123FL | 7 | 178 | 8 | 0.157 | 4 | 0.157 | 4 | 3,000 | 22 |
| SOD-123HE | 7 | 178 | 8 | 0.157 | 4 | 0.157 | 4 | 3,000 | 22 |
| SOD-123HE | 13 | 330 | 8 | 0.157 | 4 | 0.157 | 4 | 10,000 | 22 |
| SOD-323 | 7 | 178 | 8 | 0.157 | 4 | 0.157 | 4 | 5,000 | 22 |
| SOD-323 | 13 | 330 | 8 | 0.157 | 4 | 0.157 | 4 | 12,000 | 22 |
| SOD-323S | 7 | 178 | 8 | 0.157 | 4 | 0.157 | 4 | 3,000 | 22 |
| SOD-323HE | 7 | 178 | 8 | 0.157 | 4 | 0.157 | 4 | 5,000 | 22 |
| SOD-323HE | 13 | 330 | 8 | 0.157 | 4 | 0.157 | 4 | 12,000 | 22 |

TNR Unit Orientation Guidelines

| Package | Reel Size | | Tape Width mm | Pitch Dimension(Po) | | Pitch Dimension(P1) | | Reel Q'ty | Figure No |
|-------------|-----------|-----|------------------|---------------------|----------|---------------------|----------|-----------|-----------|
| | inch | mm | | inch(±0.004) | mm(±0.1) | inch(±0.004) | mm(±0.1) | PCS | |
| SOD-523 | 7 | 178 | 8 | 0.157 | 4 | 0.157 | 4 | 5,000 | 22 |
| SOD-523 | 13 | 330 | 8 | 0.157 | 4 | 0.157 | 4 | 12,000 | 22 |
| SOT-723 | 7 | 178 | 8 | 0.157 | 4 | 0.079 | 2 | 8,000 | 21 |
| SOT-523 | 7 | 178 | 8 | 0.157 | 4 | 0.157 | 4 | 4,000 | 19 |
| SC-89 | 7 | 178 | 8 | 0.157 | 4 | 0.157 | 4 | 4,000 | 19 |
| SOT-23 | 7 | 178 | 8 | 0.157 | 4 | 0.157 | 4 | 3,000 | 16 |
| SOT-23 | 13 | 330 | 8 | 0.157 | 4 | 0.157 | 4 | 12,000 | 16 |
| SOT-323 | 7 | 178 | 8 | 0.157 | 4 | 0.157 | 4 | 3,000 | 16 |
| SOT-323 | 13 | 330 | 8 | 0.157 | 4 | 0.157 | 4 | 12,000 | 16 |
| SOT-563 | 7 | 178 | 8 | 0.157 | 4 | 0.157 | 4 | 4,000 | 20-1/20-2 |
| SOT-563 | 13 | 330 | 8 | 0.157 | 4 | 0.157 | 4 | 10,000 | 20-1/20-2 |
| SOT-353 | 7 | 178 | 8 | 0.157 | 4 | 0.157 | 4 | 3,000 | 17-1/17-2 |
| SOT-353 | 13 | 330 | 8 | 0.157 | 4 | 0.157 | 4 | 10,000 | 17-1/17-2 |
| SOT-363 | 7 | 178 | 8 | 0.157 | 4 | 0.157 | 4 | 3,000 | 18-1/18-2 |
| SOT-363 | 13 | 330 | 8 | 0.157 | 4 | 0.157 | 4 | 10,000 | 18-1/18-2 |
| SOT-23 6L | 7 | 178 | 8 | 0.157 | 4 | 0.157 | 4 | 3,000 | 15-1/15-2 |
| SOT-23 6L | 13 | 330 | 8 | 0.157 | 4 | 0.157 | 4 | 10,000 | 15-1/15-2 |
| SOT-23 6L-1 | 7 | 178 | 8 | 0.157 | 4 | 0.157 | 4 | 3,000 | 15-1/15-2 |
| SOT-89 | 7 | 178 | 12 | 0.157 | 4 | 0.315 | 8 | 1,000 | 14 |
| SMA | 7 | 178 | 12 | 0.157 | 4 | 0.157 | 4 | 1,800 | 11 |
| SMA | 13 | 330 | 12 | 0.157 | 4 | 0.157 | 4 | 7,500 | 11 |
| SMA(W) | 7 | 178 | 12 | 0.157 | 4 | 0.157 | 4 | 1,800 | 11 |
| SMA(W) | 13 | 330 | 12 | 0.157 | 4 | 0.157 | 4 | 7,500 | 11 |
| SMAF-C | 7 | 178 | 12 | 0.157 | 4 | 0.157 | 4 | 3,000 | 11 |
| SMB | 7 | 178 | 12 | 0.157 | 4 | 0.315 | 8 | 800 | 10 |
| SMB | 13 | 330 | 12 | 0.157 | 4 | 0.315 | 8 | 3,000 | 10 |
| SMBF | 13 | 330 | 12 | 0.157 | 4 | 0.315 | 8 | 5,000 | 10 |
| SMAG | 7 | 178 | 12 | 0.157 | 4 | 0.315 | 8 | 800 | 10 |
| SMC | 7 | 178 | 16 | 0.157 | 4 | 0.315 | 8 | 800 | 9 |
| SMC | 13 | 330 | 16 | 0.157 | 4 | 0.315 | 8 | 3,000 | 9 |
| SOP-8 | 13 | 330 | 12 | 0.157 | 4 | 0.315 | 8 | 2,500 | 13 |
| SOT-223 | 13 | 330 | 12 | 0.157 | 4 | 0.315 | 8 | 2,500 | 12 |

TNR Unit Orientation Guidelines

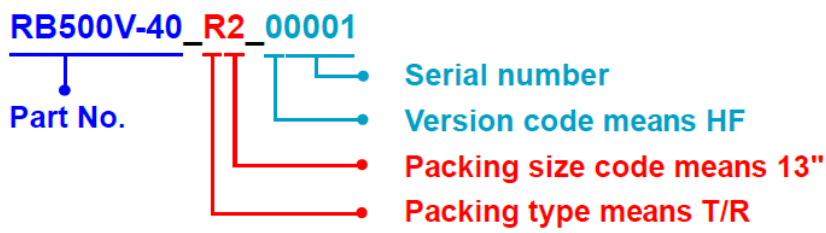
| Package | Reel Size | | Tape Width mm | Pitch Dimension (Po) | | Pitch Dimension(P1) | | Reel Q'ty | Figure No |
|---------------------|-----------|-----|------------------|----------------------|-----------|---------------------|-----------|-----------|-----------|
| | inch | mm | | Inch (±0.004) | mm (±0.1) | Inch (±0.004) | mm (±0.1) | PCS | |
| TO-277B | 13 | 330 | 16 | 0.157 | 4 | 0.315 | 8 | 5,000 | 31-1/31-2 |
| TO-277C | 13 | 330 | 12 | 0.157 | 4 | 0.315 | 8 | 5,000 | 30-1/30-2 |
| DO-218AB | 13 | 330 | 24 | 0.157 | 4 | 0.63 | 16 | 600 | 8 |
| MICRO-MELF | 7 | 178 | 8 | 0.157 | 4 | 0.157 | 4 | 3,000 | 32 |
| MICRO-MELF | 13 | 330 | 8 | 0.157 | 4 | 0.157 | 4 | 10,000 | 32 |
| MINI-MELF / LL34 | 7 | 178 | 8 | 0.157 | 4 | 0.157 | 4 | 2,500 | 32 |
| MINI-MELF / LL34 | 13 | 330 | 8 | 0.157 | 4 | 0.157 | 4 | 10,000 | 32 |
| QUADRO-MELF | 7 | 178 | 8 | 0.157 | 4 | 0.157 | 4 | 2,500 | 32 |
| QUADRO-MELF | 13 | 330 | 8 | 0.157 | 4 | 0.157 | 4 | 10,000 | 32 |
| ABS | 13 | 330 | 12 | 0.157 | 4 | 0.63 | 16 | 4,000 | 27 |
| MSBL | 13 | 330 | 16 | 0.157 | 4 | 0.472 | 12 | 3,000 | 26 |
| SDIP | 13 | 330 | 16 | 0.157 | 4 | 0.472 | 12 | 1,500 | 26 |
| M4 | 13 | 330 | 16 | 0.157 | 4 | 0.472 | 12 | 3,000 | 25 |
| M6 | 13 | 330 | 24 | 0.157 | 4 | 0.63 | 16 | 3,600 | 24 |
| M8 | 13 | 330 | 24 | 0.157 | 4 | 0.63 | 16 | 2,000 | 24 |
| MDI | 13 | 330 | 12 | 0.157 | 4 | 0.315 | 8 | 3,000 | 27 |
| MICRO DIP / TDI | 7 | 178 | 12 | 0.157 | 4 | 0.315 | 8 | 1,000 | 27 |
| MICRO DIP / TDI | 13 | 330 | 12 | 0.157 | 4 | 0.315 | 8 | 4,000 | 27 |
| TO-252AA | 13 | 330 | 16 | 0.157 | 4 | 0.315 | 8 | 3,000 | 29 |
| TO-252AA-2LD | 13 | 330 | 16 | 0.157 | 4 | 0.315 | 8 | 3,000 | 29 |
| TO-263(D2PAK) | 13 | 330 | 24 | 0.157 | 4 | 0.63 | 16 | 800 | 28 |
| TO-263AB | 13 | 330 | 24 | 0.157 | 4 | 0.63 | 16 | 800 | 28 |
| TO-263AB-L | 13 | 330 | 16 | 0.157 | 4 | 0.315 | 8 | 800 | 29 |
| TO-263-7L | 13 | 330 | 24 | 0.157 | 4 | 0.63 | 16 | 800 | 28 |
| TOLL | 13 | 330 | 24 | 0.157 | 4 | 0.472 | 12 | 2,000 | 33 |
| TOLLK | 13 | 330 | 24 | 0.157 | 4 | 0.472 | 12 | 2,000 | 33 |



Note 1: Tape and reel dimensions and orientation

Note 2: Packing code rule

For example:



| Packing type | 1 st Code | Packing size code | 2 nd Code |
|--------------------------------------|----------------------|-------------------|----------------------|
| Tape and Reel (T/R) | R | 7" | 1 |
| Tape and Reel (Right Oriented) (TRR) | S | 13" | 2 |

Package Orientation

Direction of Feed

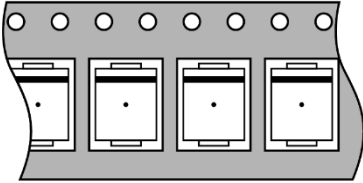
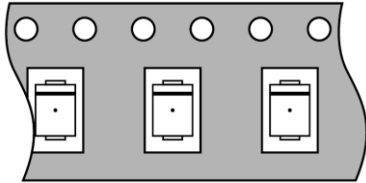
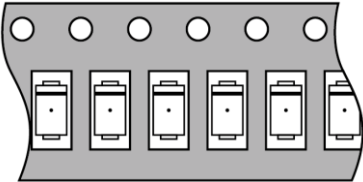
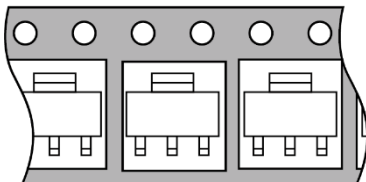
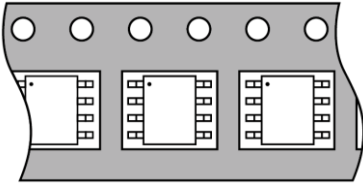
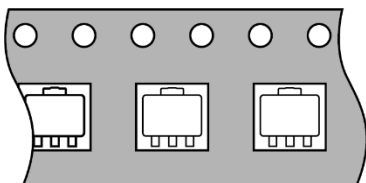
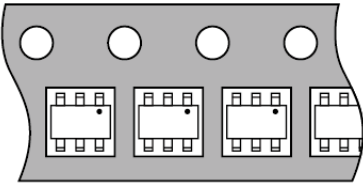
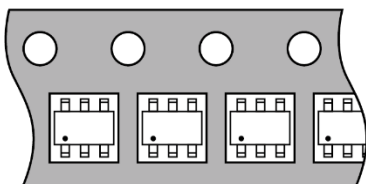
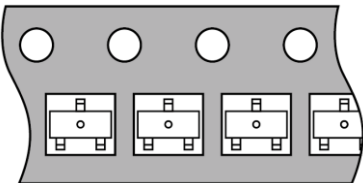
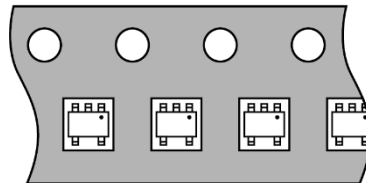


| | |
|--|---|
| <p>Figure 1. DFN3333-8L/ DFN-3333B-8L/ DFN-3333S-8L/ DFN5060-8L/ DFN5060B-8L/ FN5060S-8L/ DFN5060X-8L/ DFN5060XC-8L 12 mm (Tape Width, Typical)</p> | <p>Figure 2. DFN2020-6L/ DFN2020B-6L/ DFN3030B-8L/ DFN3810-9L 8 mm (Tape Width, Typical)</p> |
| <p>Figure 3. DFN1010-6L/ DFN1010B-6L 8 mm (Tape Width, Typical)</p> | <p>Figure 4. DFN1610-2L 8 mm (Tape Width, Typical)</p> |
| <p>Figure 5-1. DFN0603-2L/ DFN1006-2L 8 mm (Tape Width, Typical) / R1 or R2 (TR)</p> | <p>Figure 5-2. DFN0603-2L/ DFN1006-2L 8 mm (Tape Width, Typical) / S1 or S2 (TRR)</p> |
| <p>Figure 6-1. DFN1006-3L 8 mm (Tape Width, Typical) / R1 or R2 (TR)</p> | <p>Figure 6-2. DFN1006-3L 8 mm (Tape Width, Typical) / S1 or S2 (TRR)</p> |
| <p>Figure 7. DFN2510-10L/ DFN2510A-10L 8 mm (Tape Width, Typical)</p> | <p>Figure 8. DO-218AB 24 mm (Tape Width, Typical)</p> |

Package Orientation

Direction of Feed



| | |
|--|--|
| <p>Figure 9. SMC 16 mm (Tape Width, Typical)</p>  | <p>Figure 10. SMB/ SMBF/ SMAG 12 mm (Tape Width, Typical)</p>  |
| <p>Figure 11. SMA/ SMA(W)/ SMAF-C 12 mm (Tape Width, Typical)</p>  | <p>Figure 12. SOT-223 12 mm (Tape Width, Typical)</p>  |
| <p>Figure 13. SOP-8 12 mm (Tape Width, Typical)</p>  | <p>Figure 14. SOT-89 12 mm (Tape Width, Typical)</p>  |
| <p>Figure 15-1. SOT-23 6L/ SOT-23 6L-1 8 mm (Tape Width, Typical) / R1 or R2 (TR)</p>  | <p>Figure 15-2. SOT-23 6L/ SOT-23 6L-1 8 mm (Tape Width, Typical) / S1 or S2 (TRR)</p>  |
| <p>Figure 16. SOT-23/ SOT-323 8 mm (Tape Width, Typical)</p>  | <p>Figure 17-1. SOT-353 8 mm (Tape Width, Typical) / R1 or R2 (TR)</p>  |

Package Orientation

Direction of Feed

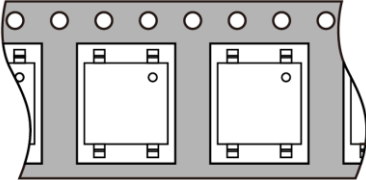
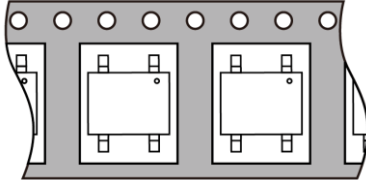
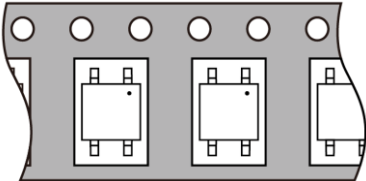
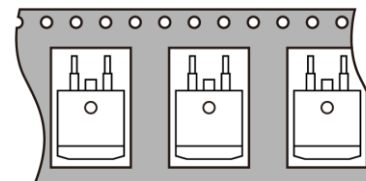
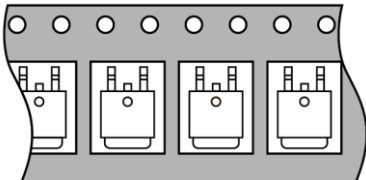
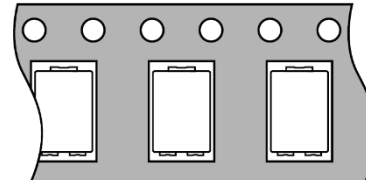
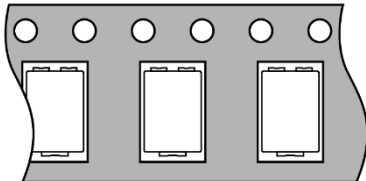
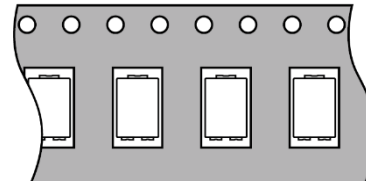
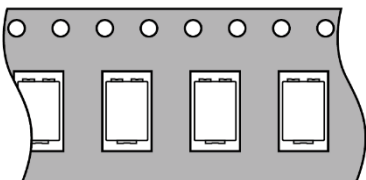
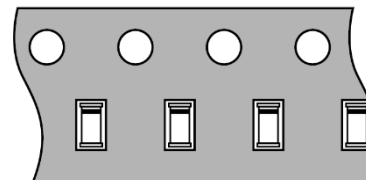


| | |
|--|--|
| <p>Figure 17-2. SOT-353 8 mm (Tape Width, Typical) / S1 or S2 (TRR)</p> | <p>Figure 18-1. SOT-363 8 mm (Tape Width, Typical) / R1 or R2 (TR)</p> |
| <p>Figure 18-2. SOT-363 8 mm (Tape Width, Typical) / S1 or S2 (TRR)</p> | <p>Figure 19. SOT-523/ SC-89 8 mm (Tape Width, Typical)</p> |
| <p>Figure 20-1. SOT-563 8 mm (Tape Width, Typical) / R1 or R2 (TR)</p> | <p>Figure 20-2. SOT-563 8 mm (Tape Width, Typical) / S1 or S2 (TRR)</p> |
| <p>Figure 21. SOT-723 8 mm (Tape Width, Typical)</p> | <p>Figure 22. SOD-123/ SOD-123FL/ SOD-123HE/ SOD-323/ SOD-323HE/ SOD-523/ SOD-323S 8 mm (Tape Width, Typical)</p> |
| <p>Figure 23. SOD-923 8 mm (Tape Width, Typical)</p> | <p>Figure 24. M6/ M8 24 mm (Tape Width, Typical)</p> |

Package Orientation

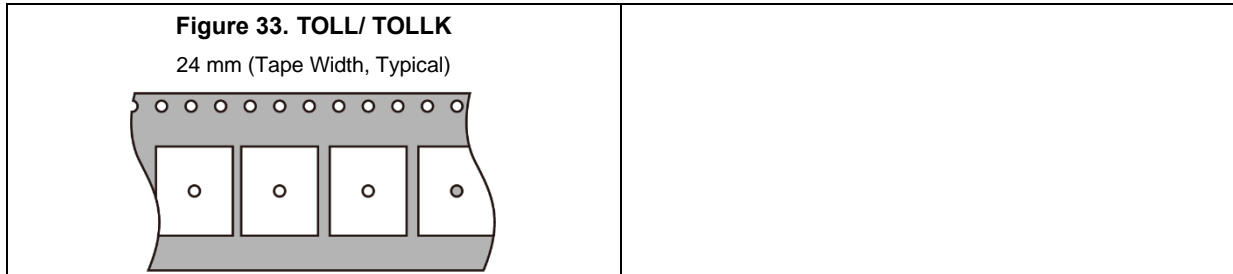
Direction of Feed



| | |
|---|--|
| <p>Figure 25. M4 16 mm (Tape Width, Typical)</p>  | <p>Figure 26. SDIP/ MSBL 16 mm (Tape Width, Typical)</p>  |
| <p>Figure 27. MDI/ MICRO DIP/ ABS 12 mm (Tape Width, Typical)</p>  | <p>Figure 28. TO-263/ TO-263AB/ TO-263-7L 24 mm (Tape Width, Typical)</p>  |
| <p>Figure 29. TO-252AA/ TO-252AA-2LD/ TO-263AB-L 16 mm (Tape Width, Typical)</p>  | <p>Figure 30-1. TO-277C 12 mm (Tape Width, Typical) / R1 or R2 (TR)</p>  |
| <p>Figure 30-2. TO-277C 12 mm (Tape Width, Typical) / S1 or S2 (TRR)</p>  | <p>Figure 31-1. TO-277B 16 mm (Tape Width, Typical) / R1 or R2 (TR)</p>  |
| <p>Figure 31-2. TO-277B 16 mm (Tape Width, Typical) / S1 or S2 (TRR)</p>  | <p>Figure 32. MICRO-MELF/ MINI-MELF (LL34)/ QUADRO-MELF 8 mm (Tape Width, Typical)</p>  |

Package Orientation

Direction of Feed



Reflow Profile

Base on current research, we propose using SnAg3Cu0.5 eutectic solder for lead free products and using Sn63 Pb37 eutectic solder for Sn-Pb products. Our temperature profile for product testing is based on experiment and JEDEC J-STD-020E specification.

| Profile Feature | Sn-Pb Eutectic Assembly | Pb-Free Assembly |
|--|---|---|
| Preheat/Soak | | |
| Temperature Min (T_{smin}) | 100 °C | 150 °C |
| Temperature Max (T_{smax}) | 150 °C | 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 package body temperature (T_p) | For users T_p must not exceed the Classification temp in Table 4-1. For suppliers T_p must equal or exceed the Classification temp in Table 4-1. | For users T_p must not exceed the Classification temp in Table 4-2. For suppliers T_p must equal or exceed the Classification temp in Table 4-2. |
| Time (t_p)* within 5 °C of the specified classification temperature (T_c), see Figure 5-1. | 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. |

* Tolerance for peak profile temperature (T_p) is defined as a supplier minimum and a user maximum.

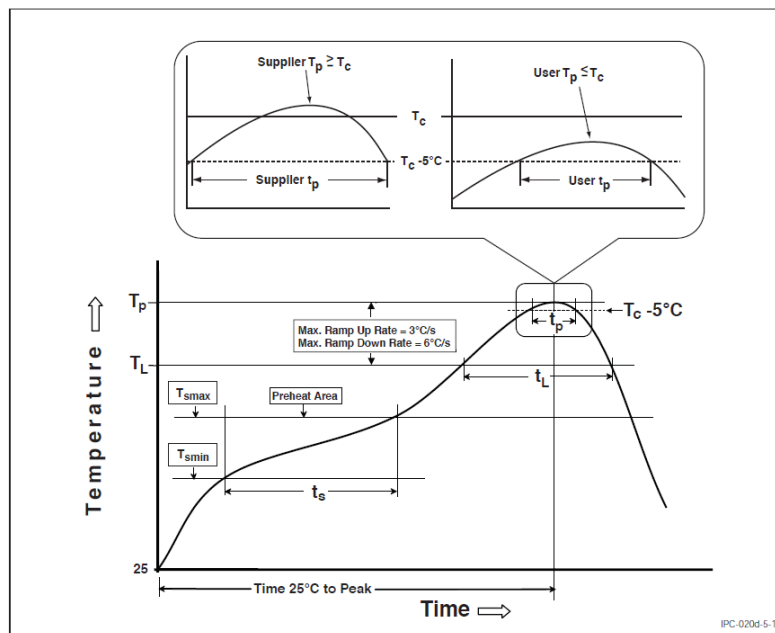


Table 4-1 SnPb Eutectic Process - Classification Temperatures (T_c)

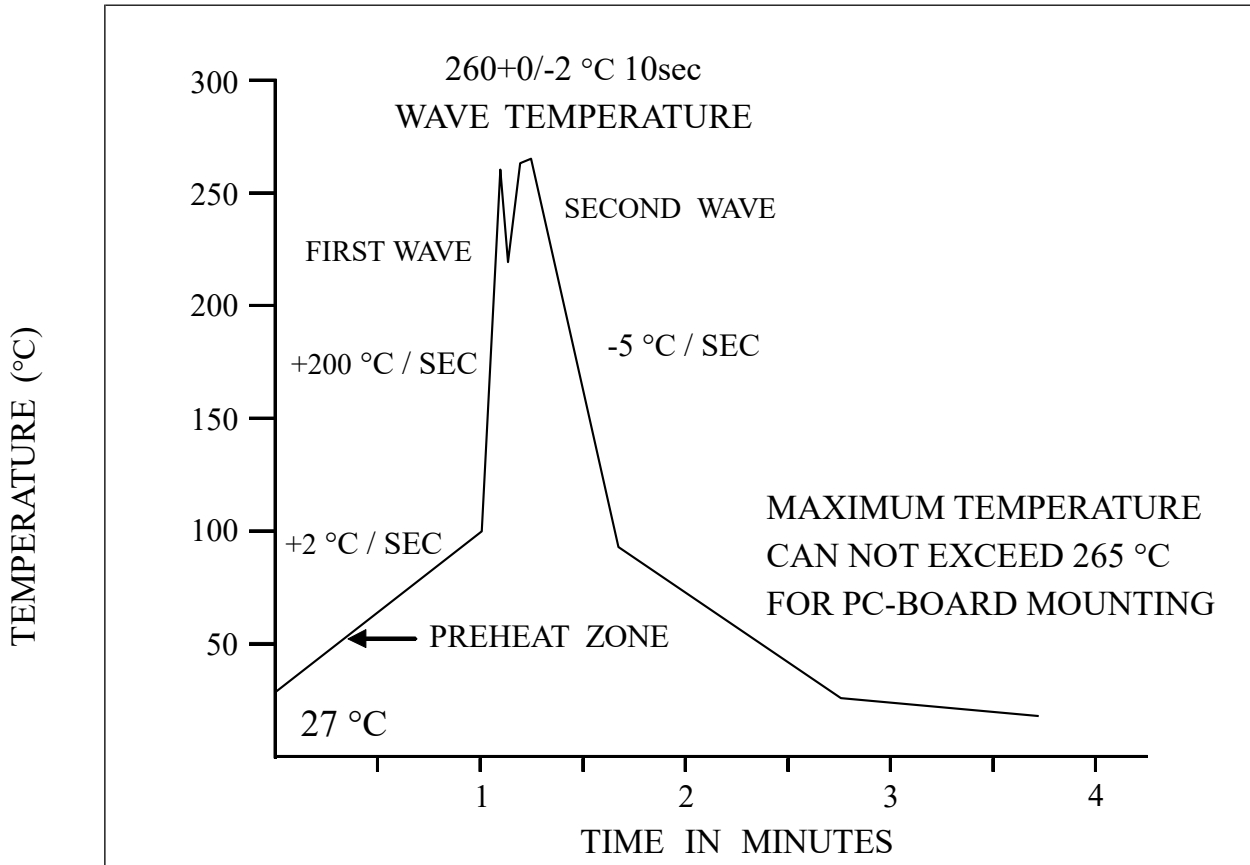
| Package Thickness | Volume mm ³ <350 | Volume mm ³ ≥350 |
|-------------------|-----------------------------|-----------------------------|
| <2.5 mm | 235 °C | 220 °C |
| ≥2.5 mm | 220 °C | 220 °C |

Table 4-2 Pb-Free Process - Classification Temperatures (T_c)

| Package Thickness | Volume mm ³ <350 | Volume mm ³ 350 - 2000 | Volume mm ³ >2000 |
|-------------------|-----------------------------|-----------------------------------|------------------------------|
| <1.6 mm | 260 °C | 260 °C | 260 °C |
| 1.6 mm - 2.5 mm | 260 °C | 250 °C | 245 °C |
| >2.5 mm | 250 °C | 245 °C | 245 °C |

Lead Free Wave solder Profile

Wave soldering involves using the highest solder temperature and heat transfer rates, which particularly affect small resin-molded components such as transistors, integrated circuits, and surface mount components. This process includes a profile with a short dwell time in the solder pot and preheating to address thermal shock for ceramic components and temperature issues with resin-molded parts. Below is a typical temperature profile utilizing a 96.5/3.0/0.5 solder alloy.



DISCLAIMER

PANJIT International Inc. Reserves the right to make changes, corrections, enhancements, modifications, and improvements to PANJIT products and/or to this document without further notice. The recipient of this document must verify any function described herein in the real application. PANJIT assumes no liability for customers' product design or applications.

Products are not authorized for use as critical components in life support devices/systems, devices/systems requiring extraordinarily high level quality and/or reliability and/or a malfunction/failure may cause loss of human life, serious public impact. PANJIT assumes no liability for product if use in these situations.

COMMENTS

Your feedback will help us to continuously improve the quality of this document. Any information that you feel wrong or unclear, please send your proposal to: sales@panjit.com.tw