

DRQ

Dual winding, high power density, shielded drum core power inductors



Product features

- Dual winding inductors that can be used as either a single inductor, or in coupled inductor/transformer applications (1:1 turns ratio)
- Four sizes of shielded drum core inductors
- Windings can be connected in series or parallel, offering a broad range of inductance and current ratings
- Peak current ratings from 0.13 A to 56 A
- RMS current ratings from 0.128 A to 17.9 A
- Inductance ratings from 0.33 μ H to 4.02 mH
- 200 Vac Isolation between windings
- Ferrite core material

Applications

- Desktop and servers
- DVD and media players
- Portable and handheld devices
- LCD panels
- As a transformer: SEPIC, flyback
- As an inductor: buck, boost, coupled inductor
- DC-DC Converters
- VRM inductor for CPU and DDR power supplies
- Input and output filter chokes

Environmental data

- Storage temperature range (component): -40 °C to +125 °C
- Operating temperature range: -40 °C to +125 °C (ambient plus self-temperature rise)
- Solder reflow temperature: J-STD-020 (latest revision) compliant



Product specifications

| Part Number | Rated Inductance (μH) | Parallel Ratings | | | | | Series Ratings | | | | |
|-------------|-----------------------|----------------------------|-----------------------------------|--|-------------------------|-------------------------|----------------------------|-----------------------------------|--|-------------------------|-------------------------|
| | | OCL ¹ ±20% (μH) | I _{rms} ² (A) | I _{sat} ³ (A) Peak | DCR Ω ⁴ typ. | Volt ⁵ μ-sec | OCL ¹ ±20% (μH) | I _{rms} ² (A) | I _{sat} ³ (A) Peak | DCR Ω ⁴ typ. | Volt ⁵ μ-sec |
| DRQ73-R33-R | 0.33 | 0.306 | 6.19 | 14.4 | 0.0074 | 1.98 | 1.224 | 3.10 | 7.18 | 0.0296 | 3.96 |
| DRQ73-1R0-R | 1.00 | 0.992 | 5.25 | 7.97 | 0.0103 | 3.56 | 3.968 | 2.63 | 3.99 | 0.0411 | 7.12 |
| DRQ73-1R5-R | 1.50 | 1.482 | 4.64 | 6.52 | 0.0132 | 4.36 | 5.928 | 2.32 | 3.26 | 0.0527 | 8.72 |
| DRQ73-2R2-R | 2.20 | 2.070 | 4.11 | 5.52 | 0.0167 | 5.15 | 8.280 | 2.06 | 2.76 | 0.0669 | 10.3 |
| DRQ73-3R3-R | 3.30 | 3.540 | 3.31 | 4.22 | 0.0259 | 6.73 | 14.16 | 1.66 | 2.11 | 0.1035 | 13.5 |
| DRQ73-4R7-R | 4.70 | 4.422 | 3.09 | 3.78 | 0.0297 | 7.52 | 17.69 | 1.55 | 1.89 | 0.1188 | 15.0 |
| DRQ73-6R8-R | 6.80 | 6.480 | 2.55 | 3.12 | 0.0435 | 9.11 | 25.92 | 1.28 | 1.56 | 0.1742 | 18.2 |
| DRQ73-8R2-R | 8.20 | 8.930 | 2.19 | 2.66 | 0.0592 | 10.7 | 35.72 | 1.10 | 1.33 | 0.2368 | 21.4 |
| DRQ73-100-R | 10.0 | 10.30 | 2.08 | 2.47 | 0.0656 | 11.5 | 41.20 | 1.04 | 1.24 | 0.2623 | 23.0 |
| DRQ73-150-R | 15.0 | 15.01 | 1.83 | 2.05 | 0.0844 | 13.9 | 60.04 | 0.916 | 1.03 | 0.339 | 27.8 |
| DRQ73-220-R | 22.0 | 22.65 | 1.62 | 1.67 | 0.107 | 17.0 | 90.60 | 0.811 | 0.83 | 0.429 | 34.0 |
| DRQ73-330-R | 33.0 | 34.41 | 1.31 | 1.35 | 0.166 | 21.0 | 137.6 | 0.653 | 0.68 | 0.665 | 42.0 |
| DRQ73-470-R | 47.0 | 48.62 | 1.08 | 1.14 | 0.241 | 24.9 | 194.5 | 0.542 | 0.57 | 0.965 | 49.8 |
| DRQ73-680-R | 68.0 | 68.91 | 0.89 | 0.96 | 0.358 | 29.7 | 275.6 | 0.444 | 0.48 | 1.43 | 59.4 |
| DRQ73-820-R | 82.0 | 80.37 | 0.86 | 0.89 | 0.384 | 32.1 | 321.5 | 0.430 | 0.44 | 1.54 | 64.2 |
| DRQ73-101-R | 100 | 101.4 | 0.73 | 0.79 | 0.527 | 36.0 | 405.6 | 0.367 | 0.39 | 2.11 | 72.0 |
| DRQ73-151-R | 150 | 150.9 | 0.58 | 0.65 | 0.851 | 44.0 | 603.6 | 0.289 | 0.32 | 3.41 | 88.0 |
| DRQ73-221-R | 220 | 223.3 | 0.52 | 0.53 | 1.05 | 53.5 | 893.2 | 0.260 | 0.27 | 4.20 | 107 |
| DRQ73-331-R | 330 | 325.5 | 0.42 | 0.44 | 1.59 | 64.5 | 1302 | 0.211 | 0.22 | 6.36 | 129 |
| DRQ73-471-R | 470 | 465.8 | 0.35 | 0.37 | 2.36 | 77.2 | 1863 | 0.173 | 0.18 | 9.44 | 154 |
| DRQ73-681-R | 680 | 676.5 | 0.29 | 0.31 | 3.47 | 93.1 | 2706 | 0.143 | 0.15 | 13.88 | 186 |
| DRQ73-821-R | 820 | 821.7 | 0.27 | 0.28 | 3.93 | 103 | 3287 | 0.134 | 0.14 | 15.72 | 206 |
| DRQ73-102-R | 1000 | 995.0 | 0.26 | 0.25 | 4.34 | 113 | 3980 | 0.128 | 0.13 | 17.36 | 226 |

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It is recommended that the temperature of the part not exceed +125 °C.
- Peak current for approximately 30% roll-off at +20 °C
- DCR limits @ +20 °C
- Applied Volt-Time product (V-μs) across the inductor. This value represents the applied V-μs at 100 kHz necessary to generate a core loss equal to 10% of the total losses for a 40 °C temperature rise.

- Turns Ratio (1:3):(2-4) 1:1
- Part number definition: DRQxxx-yyy-
- DRQxxx = product code and size,
- yyy = inductance value in μH,
- R = decimal point. If no R is present, third character = # of zeros
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| | | OCL ¹ ±20% (μH) | I _{rms} ² (A) | I _{sat} ³ (A) Peak | DCR Ω ⁴ Typ. | Volt ⁵ μ-sec | OCL ¹ ±20% (μH) | I _{rms} ² (A) | I _{sat} ³ (A) Peak | DCR Ω ⁴ Typ. | Volt ⁵ μ-sec |
| DRQ74-R33-R | 0.33 | 0.294 | 6.20 | 18.4 | 0.0074 | 1.71 | 1.176 | 3.10 | 9.18 | 0.0295 | 3.42 |
| DRQ74-1R0-R | 1.00 | 0.952 | 5.33 | 10.2 | 0.0100 | 3.08 | 3.808 | 2.66 | 5.10 | 0.0400 | 6.16 |
| DRQ74-1R5-R | 1.50 | 1.422 | 4.96 | 8.35 | 0.0115 | 3.76 | 5.688 | 2.48 | 4.17 | 0.0461 | 7.52 |
| DRQ74-2R2-R | 2.20 | 1.986 | 4.66 | 7.06 | 0.0130 | 4.45 | 7.944 | 2.33 | 3.53 | 0.0521 | 8.9 |
| DRQ74-3R3-R | 3.30 | 3.396 | 3.94 | 5.40 | 0.0183 | 5.81 | 13.58 | 1.97 | 2.70 | 0.0732 | 11.6 |
| DRQ74-4R7-R | 4.70 | 5.182 | 3.34 | 4.37 | 0.0254 | 7.18 | 20.73 | 1.67 | 2.19 | 0.102 | 14.4 |
| DRQ74-6R8-R | 6.80 | 7.344 | 2.60 | 3.67 | 0.0418 | 8.55 | 29.38 | 1.30 | 1.84 | 0.167 | 17.1 |
| DRQ74-8R2-R | 8.20 | 8.566 | 2.53 | 3.40 | 0.0441 | 9.23 | 34.26 | 1.27 | 1.70 | 0.177 | 18.5 |
| DRQ74-100-R | 10.0 | 9.882 | 2.41 | 3.17 | 0.0489 | 9.92 | 39.53 | 1.20 | 1.58 | 0.196 | 19.8 |
| DRQ74-150-R | 15.0 | 16.09 | 2.11 | 2.48 | 0.0637 | 12.7 | 64.36 | 1.05 | 1.24 | 0.255 | 25.4 |
| DRQ74-220-R | 22.0 | 21.73 | 1.75 | 2.13 | 0.0925 | 14.7 | 86.92 | 0.874 | 1.07 | 0.371 | 29.4 |
| DRQ74-330-R | 33.0 | 33.01 | 1.41 | 1.73 | 0.143 | 18.1 | 132.0 | 0.702 | 0.87 | 0.574 | 36.2 |
| DRQ74-470-R | 47.0 | 49.64 | 1.15 | 1.41 | 0.216 | 22.2 | 198.6 | 0.573 | 0.71 | 0.865 | 44.4 |
| DRQ74-680-R | 68.0 | 69.67 | 1.03 | 1.19 | 0.265 | 26.3 | 278.7 | 0.517 | 0.60 | 1.06 | 52.6 |
| DRQ74-820-R | 82.0 | 80.95 | 0.91 | 1.11 | 0.345 | 28.4 | 323.8 | 0.453 | 0.55 | 1.38 | 56.8 |
| DRQ74-101-R | 100 | 101.6 | 0.86 | 0.99 | 0.383 | 31.8 | 406.4 | 0.430 | 0.49 | 1.53 | 63.6 |
| DRQ74-151-R | 150 | 150.0 | 0.69 | 0.81 | 0.591 | 38.6 | 600.0 | 0.346 | 0.41 | 2.37 | 77.2 |
| DRQ74-221-R | 220 | 227.0 | 0.56 | 0.66 | 0.907 | 47.5 | 908.0 | 0.279 | 0.33 | 3.63 | 95 |
| DRQ74-331-R | 330 | 335.6 | 0.45 | 0.54 | 1.41 | 57.8 | 1342 | 0.224 | 0.27 | 5.66 | 116 |
| DRQ74-471-R | 470 | 465.3 | 0.40 | 0.46 | 1.74 | 68.1 | 1861 | 0.202 | 0.23 | 6.97 | 136 |
| DRQ74-681-R | 680 | 671.2 | 0.33 | 0.38 | 2.58 | 81.7 | 2685 | 0.166 | 0.19 | 10.3 | 163 |
| DRQ74-821-R | 820 | 812.7 | 0.31 | 0.35 | 2.93 | 89.9 | 3251 | 0.156 | 0.17 | 11.7 | 180 |
| DRQ74-102-R | 1000 | 1009 | 0.27 | 0.31 | 3.89 | 100 | 4036 | 0.135 | 0.16 | 15.6 | 200 |

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It is recommended that the temperature of the part not exceed +125 °C.
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| Part Number | Rated Inductance (μH) | Parallel Ratings | | | | | Series Ratings | | | | |
|--------------|-----------------------|----------------------------|-----------------------------------|--|-------------------------|-------------------------|----------------------------|-----------------------------------|--|-------------------------|-------------------------|
| | | OCL ¹ ±20% (μH) | I _{rms} ² (A) | I _{sat} ³ (A) Peak | DCR Ω ⁴ typ. | Volt ⁵ μ-sec | OCL ¹ ±20% (μH) | I _{rms} ² (A) | I _{sat} ³ (A) Peak | DCR Ω ⁴ typ. | Volt ⁵ μ-sec |
| DRQ125-R47-R | 0.47 | 0.456 | 17.6 | 33.0 | 0.0018 | 3.17 | 1.824 | 8.80 | 16.5 | 0.0078 | 6.34 |
| DRQ125-1R0-R | 1.00 | 0.894 | 15.0 | 23.6 | 0.0024 | 4.43 | 3.576 | 7.51 | 11.8 | 0.0096 | 8.86 |
| DRQ125-1R5-R | 1.50 | 1.478 | 13.8 | 18.3 | 0.0029 | 5.70 | 5.912 | 6.89 | 9.15 | 0.0114 | 11.40 |
| DRQ125-2R2-R | 2.20 | 2.208 | 10.9 | 15.0 | 0.0045 | 6.97 | 8.832 | 5.46 | 7.50 | 0.0182 | 13.9 |
| DRQ125-3R3-R | 3.30 | 3.084 | 9.26 | 12.7 | 0.0063 | 8.23 | 12.34 | 4.63 | 6.35 | 0.0253 | 16.5 |
| DRQ125-4R7-R | 4.70 | 5.274 | 7.18 | 9.71 | 0.0105 | 10.8 | 21.10 | 3.59 | 4.86 | 0.0420 | 21.6 |
| DRQ125-6R8-R | 6.80 | 6.588 | 6.64 | 8.68 | 0.0123 | 12.0 | 26.35 | 3.32 | 4.34 | 0.0492 | 24.0 |
| DRQ125-8R2-R | 8.20 | 8.048 | 5.54 | 7.86 | 0.0176 | 13.3 | 32.19 | 2.77 | 3.93 | 0.0705 | 26.6 |
| DRQ125-100-R | 10.0 | 9.654 | 5.35 | 7.17 | 0.0189 | 14.6 | 38.62 | 2.67 | 3.59 | 0.0757 | 29.2 |
| DRQ125-150-R | 15.0 | 15.35 | 4.27 | 5.69 | 0.0298 | 18.4 | 61.40 | 2.13 | 2.85 | 0.120 | 36.8 |
| DRQ125-220-R | 22.0 | 22.36 | 3.70 | 4.71 | 0.0396 | 22.2 | 89.44 | 1.84 | 2.36 | 0.159 | 44.4 |
| DRQ125-330-R | 33.0 | 33.74 | 3.28 | 3.84 | 0.0505 | 27.2 | 135.0 | 1.64 | 1.92 | 0.203 | 54.4 |
| DRQ125-470-R | 47.0 | 47.47 | 2.71 | 3.24 | 0.0740 | 32.3 | 189.9 | 1.35 | 1.62 | 0.297 | 64.6 |
| DRQ125-680-R | 68.0 | 67.91 | 2.22 | 2.70 | 0.101 | 38.6 | 271.6 | 1.11 | 1.35 | 0.440 | 77.2 |
| DRQ125-820-R | 82.0 | 86.89 | 2.05 | 2.39 | 0.128 | 43.7 | 347.6 | 1.03 | 1.20 | 0.515 | 87.4 |
| DRQ125-101-R | 100 | 102.7 | 1.78 | 2.20 | 0.170 | 47.5 | 410.8 | 0.892 | 1.10 | 0.682 | 95.0 |
| DRQ125-151-R | 150 | 151.1 | 1.48 | 1.81 | 0.248 | 57.6 | 604.4 | 0.739 | 0.905 | 0.991 | 115.2 |
| DRQ125-221-R | 220 | 216.8 | 1.19 | 1.51 | 0.384 | 69.0 | 867.2 | 0.594 | 0.755 | 1.54 | 138 |
| DRQ125-331-R | 330 | 332.6 | 1.06 | 1.22 | 0.482 | 85.5 | 1330 | 0.530 | 0.610 | 1.93 | 171 |
| DRQ125-471-R | 470 | 473.1 | 0.87 | 1.02 | 0.718 | 102 | 1892 | 0.434 | 0.510 | 2.87 | 204 |
| DRQ125-681-R | 680 | 679.8 | 0.70 | 0.85 | 1.10 | 122 | 2719 | 0.350 | 0.425 | 4.42 | 244 |
| DRQ125-821-R | 820 | 828.0 | 0.60 | 0.77 | 1.49 | 135 | 3312 | 0.301 | 0.385 | 5.96 | 270 |
| DRQ125-102-R | 1000 | 1008 | 0.57 | 0.70 | 1.69 | 149 | 4032 | 0.283 | 0.350 | 6.76 | 298 |

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It is recommended that the temperature of the part not exceed +125 °C.
- Peak current for approximately 30% roll-off at +20 °C
- DCR limits @ +20 °C
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- Turns Ratio (1:3):(2-4) 1:1
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|--------------|-----------------------|----------------------------|-----------------------------------|--|-------------------------|-------------------------|----------------------------|-----------------------------------|--|-------------------------|-------------------------|
| | | OCL ¹ ±20% (μH) | I _{rms} ² (A) | I _{sat} ³ (A) Peak | DCR Ω ⁴ typ. | Volt ⁵ μ-sec | OCL ¹ ±20% (μH) | I _{rms} ² (A) | I _{sat} ³ (A) Peak | DCR Ω ⁴ typ. | Volt ⁵ μ-sec |
| DRQ127-R47-R | 0.47 | 0.419 | 17.9 | 56.0 | 0.00195 | 3.50 | 1.676 | 8.94 | 28 | 0.0078 | 7.00 |
| DRQ127-1R0-R | 1.00 | 0.821 | 15.5 | 40.0 | 0.00261 | 4.90 | 3.284 | 7.74 | 20 | 0.0104 | 9.80 |
| DRQ127-1R5-R | 1.50 | 1.357 | 13.5 | 31.1 | 0.00341 | 6.30 | 5.428 | 6.77 | 15.6 | 0.0137 | 12.60 |
| DRQ127-2R2-R | 2.20 | 2.027 | 12.5 | 25.5 | 0.00373 | 7.70 | 8.108 | 6.23 | 12.7 | 0.0161 | 15.4 |
| DRQ127-3R3-R | 3.30 | 2.831 | 10.4 | 21.5 | 0.00567 | 9.10 | 11.32 | 5.23 | 10.8 | 0.0229 | 18.2 |
| DRQ127-4R7-R | 4.70 | 4.841 | 8.25 | 16.5 | 0.00917 | 11.9 | 19.36 | 4.13 | 8.24 | 0.0367 | 23.8 |
| DRQ127-6R8-R | 6.80 | 7.387 | 7.34 | 13.3 | 0.0116 | 14.7 | 29.55 | 3.67 | 6.67 | 0.0465 | 29.4 |
| DRQ127-8R2-R | 8.20 | 8.861 | 6.32 | 12.2 | 0.0157 | 16.1 | 35.44 | 3.16 | 6.09 | 0.0627 | 32.2 |
| DRQ127-100-R | 10.0 | 10.47 | 6.04 | 11.2 | 0.0172 | 17.5 | 41.88 | 3.02 | 5.60 | 0.0686 | 35.0 |
| DRQ127-150-R | 15.0 | 14.09 | 5.03 | 9.66 | 0.0247 | 20.3 | 56.36 | 2.51 | 4.83 | 0.0990 | 40.6 |
| DRQ127-220-R | 22.0 | 22.93 | 4.00 | 7.57 | 0.0391 | 25.9 | 91.72 | 2.00 | 3.78 | 0.157 | 51.8 |
| DRQ127-330-R | 33.0 | 33.92 | 3.23 | 6.22 | 0.0600 | 31.5 | 135.7 | 1.61 | 3.11 | 0.241 | 63.0 |
| DRQ127-470-R | 47.0 | 47.05 | 2.95 | 5.28 | 0.0719 | 37.1 | 188.2 | 1.47 | 2.64 | 0.288 | 74.2 |
| DRQ127-680-R | 68.0 | 66.48 | 2.44 | 4.44 | 0.105 | 44.1 | 265.9 | 1.22 | 2.22 | 0.421 | 88.2 |
| DRQ127-820-R | 82.0 | 79.75 | 2.09 | 4.06 | 0.143 | 48.3 | 319.0 | 1.04 | 2.03 | 0.573 | 96.6 |
| DRQ127-101-R | 100 | 99.31 | 1.96 | 3.64 | 0.163 | 53.9 | 397.2 | 0.980 | 1.82 | 0.653 | 107.8 |
| DRQ127-151-R | 150 | 144.9 | 1.59 | 3.01 | 0.247 | 65.1 | 579.6 | 0.796 | 1.51 | 0.989 | 130.2 |
| DRQ127-221-R | 220 | 221.5 | 1.29 | 2.43 | 0.376 | 80.5 | 886.0 | 0.645 | 1.22 | 1.50 | 161 |
| DRQ127-331-R | 330 | 323.6 | 1.04 | 2.01 | 0.574 | 97.3 | 1294 | 0.522 | 1.01 | 2.30 | 195 |
| DRQ127-471-R | 470 | 467.1 | 0.85 | 1.68 | 0.861 | 117 | 1868 | 0.427 | 0.838 | 3.44 | 234 |
| DRQ127-681-R | 680 | 676.7 | 0.76 | 1.39 | 1.08 | 141 | 2707 | 0.380 | 0.697 | 4.32 | 282 |
| DRQ127-821-R | 820 | 818.1 | 0.65 | 1.27 | 1.47 | 155 | 3272 | 0.325 | 0.633 | 5.88 | 310 |
| DRQ127-102-R | 1000 | 1005 | 0.61 | 1.14 | 1.66 | 172 | 4020 | 0.307 | 0.571 | 6.64 | 344 |

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Dimensions - mm

DRQ73

Top View



Side View



Recommended Pad Layout



Bottom View



Schematic



DRQ74

Top View



Side View



Recommended Pad Layout



Bottom View



Schematic



= Inductance value per family chart
wlyy = Date code
R = Revision level
Dot indicates pin #1
Do not route traces or vias underneath the inductor

Dimensions - mm

DRQ125



DRQ127



= Inductance value per family chart
wwllyy = (date code)
R = revision level
Dot indicates pin #1
Do not route traces or vias underneath the inductor

Packaging information- mm

DRQ73

Supplied in tape and reel packaging,
1350 parts per reel, 13" diameter reel.

Ao=7.90mm
Bo=7.90mm
Ko=3.80mm



DRQ74

Supplied in tape and reel packaging,
1100 parts per reel, 13" diameter reel.

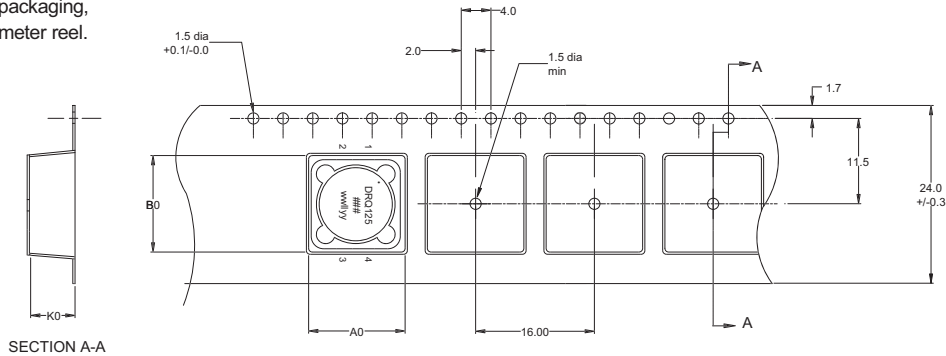
Ao=7.90mm
Bo=7.90mm
Ko=4.70mm



DRQ125

Supplied in tape and reel packaging,
600 parts per reel, 13" diameter reel.

Ao=13.00mm
Bo=13.00mm
Ko=6.30mm



DRQ127

Supplied in tape and reel packaging,
350 parts per reel, 13" diameter reel.

Ao=13.00mm
Bo=13.00mm
Ko=8.30mm



Dimensions are in millimeters.

Core loss



Inductance characteristics

DRQ73



DRQ74



DRQ125



DRQ127



Solder Reflow Profile



Table 1 - Standard SnPb Solder (T_c)

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

Table 2 - Lead (Pb) Free Solder (T_c)

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

Reference JDEC J-STD-020

| Profile Feature | Standard SnPb Solder | Lead (Pb) Free Solder |
|--|----------------------|-----------------------|
| Preheat and Soak | | |
| • Temperature min. (T_{smin}) | 100°C | 150°C |
| • Temperature max. (T_{smax}) | 150°C | 200°C |
| • Time (T_{smin} to T_{smax}) (t_s) | 60-120 Seconds | 60-120 Seconds |
| Average ramp up rate T_{smax} to T_p | 3°C/ Second Max. | 3°C/ Second Max. |
| Liquidous temperature (T_L) | 183°C | 217°C |
| Time at liquidous (t_L) | 60-150 Seconds | 60-150 Seconds |
| Peak package body temperature (T_p)* | Table 1 | Table 2 |
| Time (t_p)** within 5 °C of the specified classification temperature (T_c) | 20 Seconds** | 30 Seconds** |
| Average ramp-down rate (T_p to T_{smax}) | 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.

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

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