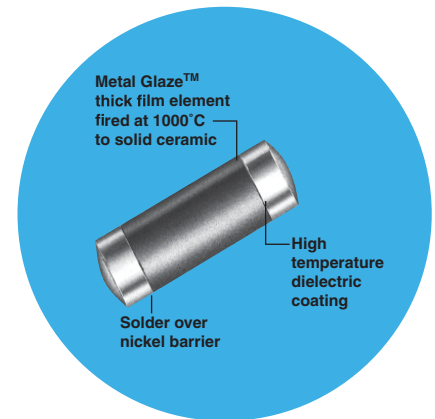


High Surge Film Surface Mount Metal Glaze™

HSF Series

- 150°C maximum operating temperature
- RoHS - compatible components available
- Up to triple the surge rating of the rugged CHP1
- Replaces costly surface-mount wirewound resistors



OBSOLETE

 All Pb-free parts comply with EU Directive 2011/65/EU amended by (EU) 2015/863 (RoHS3)

Electrical Data

| Industry Footprint | Type | Maximum Power Rating | Working Voltage | Resistance Range (Ω) | Tolerance (±%) | TCR (ppm/°C) | Product Category |
|--------------------|-------|----------------------|-----------------|------------------------------------|----------------|-------------------|------------------|
| 2512 | HSF-1 | 1W @ 70°C | 350 | 5R9, 6R8, 11R, 27R, 12R, 68R, 270R | 10 | ±200 ¹ | High Surge |
| 3612 | HSF-2 | 2W @ 25°C | 500 | 8R2, 22R, 300R | 10 | ±200 ¹ | High Surge |

Note 1 – Standard TCR is ±200ppm/°C. TCR of ±100ppm/°C is available at selected values on request.

Environmental Data

| Characteristics | Maximum Change | Test Method |
|--------------------------------|---------------------------------------|--|
| Temperature Coefficient | As specified | MIL-R-55342H Par 4.7.9 (-55°C +125°C) |
| Thermal Shock | ±0.5% +0.01 ohm | MIL-R-55342H Par 4.7.3 (-65°C +150°C, 5 cycles) |
| Low Temperature Operation | ±0.25% +0.01 ohm | MIL-R-55342H Par 4.7.4 (-65°C @ working voltage) |
| Short Time Overload | ±0.5% +0.01 ohm | MIL-R-55342H Par 4.7.5 2.5 x $\sqrt{P \times R}$ for 5 seconds |
| High Temperature Exposure | ±0.5% +0.01 ohm | MIL-R-55342H Par 4.7.6 (+150°C for 100 hours) |
| Resistance to Bonding Exposure | ±0.25% +0.01 ohm | MIL-R-55342H Par 4.7.7 (reflow soldered to board at 260°C for 10 seconds) |
| Solderability | 95% min. coverage | MIL-STD-202, Method 208 (245°C for 5 seconds) |
| Moisture Resistance | ±0.5% +0.01 ohm | MIL-R-55342H Par 4.7.8 (10 cycles, total 240 hours) |
| Life Test | ±0.5% +0.01 ohm | MIL-R-55342H Par 4.7.10 (2000 hours at 70°C intermittent) |
| Terminal Adhesion Strength | ±1% +0.01 ohm no mechanical damage | 1200 gram push from underside of mounted chip for 60 seconds |
| Resistance to Board bending | ±1% +0.01 ohm no mechanical damage | Chip mounted in center of 90mm long board, deflected 5mm so as to exert pull on chip contacts for 10 seconds |

General Note

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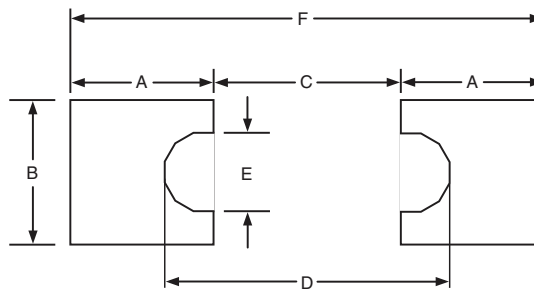
Physical Data



Dimensions (Inches and (mm))

| Industry Footprint | Type | L (Length) | W (Width/Diameter) | C (Termination Width) |
|--------------------|-------|--------------------------------|--------------------------------|--------------------------------|
| 2512 | HSF-1 | 0.251 ± 0.010 (6.38 ± 0.25) | 0.079 ± 0.006 (2.01 ± 0.15) | 0.040 ± 0.010 (1.02 ± 0.25) |
| 3612 | HSF-2 | 0.367 ± 0.010 (9.32 ± 0.25) | 0.105 ± 0.006 (2.67 ± 0.15) | 0.050 ± 0.010 (1.27 ± 0.25) |

Recommended Solder Pad Dimensions (Reflow):



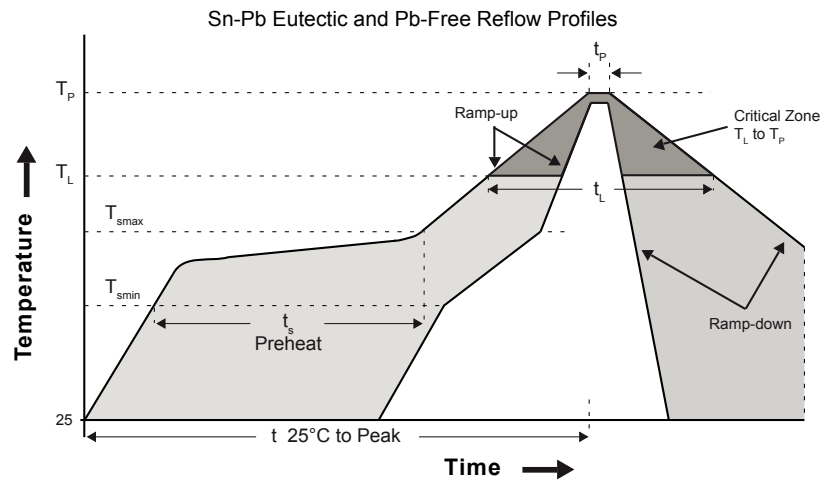
Dimensions (Inches and (mm))

| Industry Footprint | Dimensions (Inches and (mm)) | | | | | |
|--------------------|------------------------------|-----------------|-----------------|-----------------|-----------------|------------------|
| | A | B | C | D | E | F |
| HSF 1 2512 | 0.121 (3.07) | 0.126 (3.20) | 0.127 (3.23) | 0.183 (4.65) | 0.040 (1.02) | 0.369 (9.37) |
| HSF 2 3610 | 0.17 (4.32) | 0.16 (4.06) | 0.213 (5.41) | 0.273 (6.93) | 0.044 (1.12) | 0.553 (14.05) |

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IRC Solder Reflow Recommendations



* Based on Industry Standards and IPC recommendations

| Profile Feature | Sn-Pb Eutectic Assembly | Pb-Free Assembly |
|---|-------------------------|-------------------|
| Average Ramp-up rate (T _{smax} to T _p) | 3°C / second max. | 3°C / second max. |
| Preheat | | |
| - 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 - 180 seconds |
| Time maintained above | | |
| - Temperature (T _L) | 183°C | 217°C |
| - Time (t _L) | 60 - 150 seconds | 60 - 150 seconds |
| Peak Temperature (T _p) | See Table 1 | See Table 2 |
| Time within 5°C of actual Peak Temperature (t _p) ² | 10 - 30 seconds | 20 - 40 seconds |
| Ramp-down Rate | 6°C / second max. | 6°C / second max. |
| Time 25°C to Peak Temperature | 6 minutes max. | 8 minutes max. |

Note 1: All temperatures refer to topside of the package, measured on the package body surface.

Note 2: Time within 5 °C of actual peak temperature (t_p) specified for the reflow profiles is a “supplier” minimum and a “user” maximum.

| Package Thickness | Volume mm ³ < 350 | Volume mm ³ ≥ 350 |
|-------------------|------------------------------|------------------------------|
| < 2.5 mm | 240 +0/-5°C | 225 +0/-5°C |
| ≥ 2.5 mm | 225 +0/-5°C | 225 +0/-5°C |

Note 1: Package volume excludes external terminals (balls, bumps, lands, leads) and/or non-integral heat sinks.

| 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 * |

Note 2: The maximum component temperature reached during reflow depends on package thickness and volume. The use of convection reflow processes reduces the thermal gradients between packages. However, thermal gradients due to differences in thermal mass of SMD packages may still exist.

Note 3: Components intended for use in “lead-free” assembly process shall be evaluated using the “lead-free” peak temperature and profiles defined in Table 1, 2 and reflow profile whether or not lead-free.

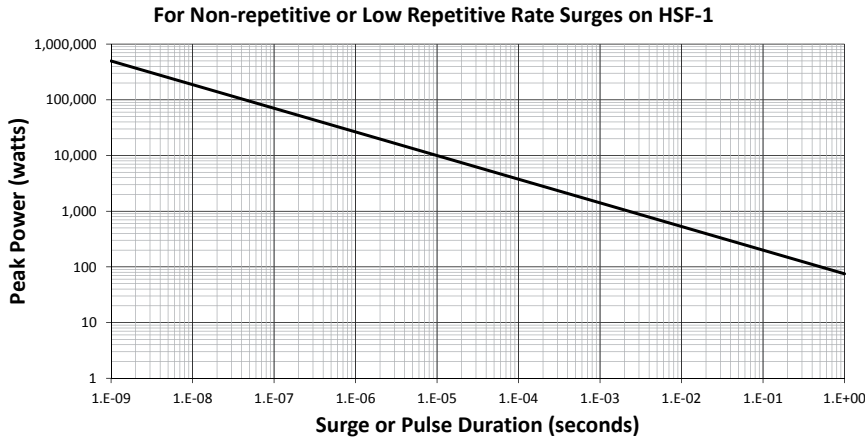
* Tolerance: The device manufacturer/supplier shall assure process compatibility up to and including the stated classification temperature at the rated MSL level.

General Note

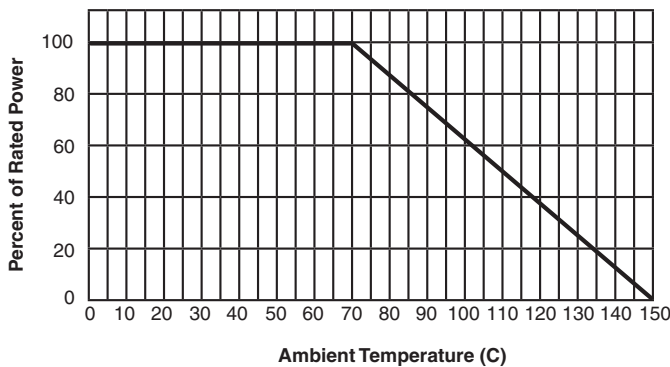
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OBSOLETE

Surge Capability Data



Power Derating Curve



Ordering Data

| | | | | | | |
|-------------------------------|---|-----|------|---|----|----|
| Sample Part No..... | HSF-1 | 200 | 11R0 | K | LF | 13 |
| Type | HSF-1 or HSF-2 | | | | | |
| Temperature Coefficient | 200 = ±200ppm/°C (standard) Note – Standard TCR is ±200ppm/°C. TCR of ±100ppm/°C is available at selected values on request. | | | | | |
| Resistance Value | Standard 4-digit resistance code. | | | | | |
| Tolerance | K = 10% | | | | | |
| Lead-Free Construction | Omit for SnPb. | | | | | |
| Packaging Code | BLK = Bulk, 7 = 7" Reel, 13 = 13" Reel | | | | | |

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