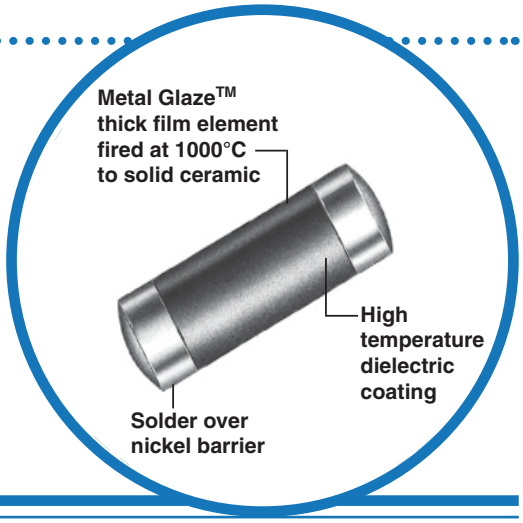
High Surge Film Surface Mount Metal Glaze™

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**



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, 12R, 68R, 270R	10	±200	High Surge
3612	HSF-2	2W @ 25°C	500	8R2, 22R, 300R	10	±200	High Surge

Environmental Data

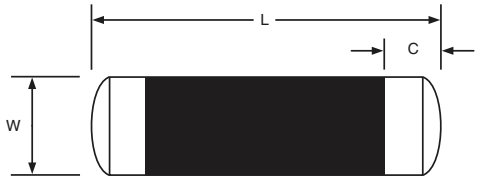
Characteristics	Maximum Change	Test Method
Temperature Coefficient	As specified	MIL-R-55342H Par 4.7.9 (-55°C +125°C)
Thermal Shock	±0.5% +0.01 ohm	MIL-R-55342H Par 4.7.3 (-65°C +150°C, 5 cycles)
Low Temperature Operation	±0.25% +0.01 ohm	MIL-R-55342H Par 4.7.4 (-65°C @ working voltage)
Short Time Overload	±0.5% +0.01 ohm	MIL-R-55342H Par 4.7.5 $2.5 \times \sqrt{P \times R}$ 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

TT electronics reserves the right to make changes in product specification without notice or liability.
All information is subject to TT electronics' own data and is considered accurate at time of going to print.

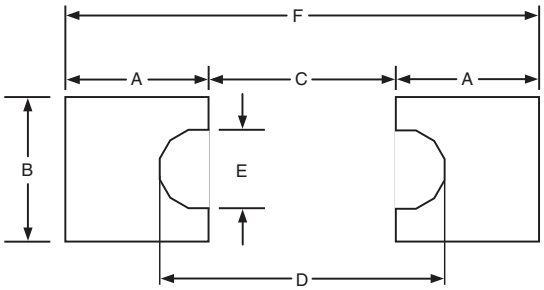
www.bitechnologies.com www.irctt.com www.welwyn-tt.com

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)

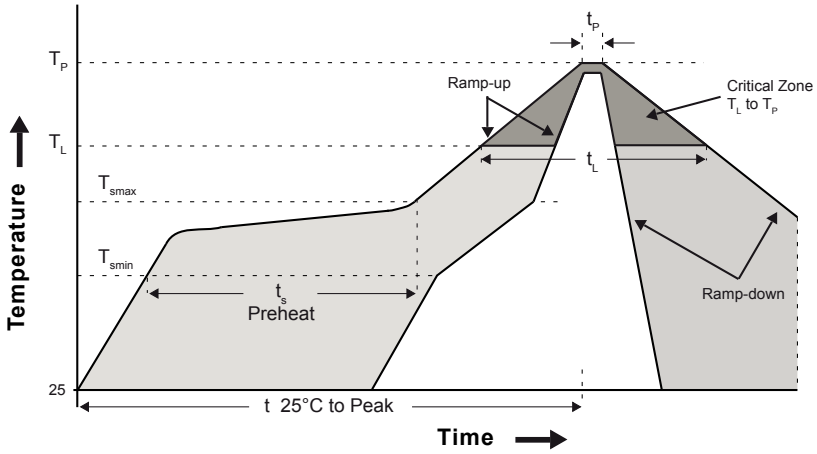
Recommended Solder Pad Dimensions (Reflow):



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)

IRC Solder Reflow Recommendations

Sn-Pb Eutectic and Pb-Free Reflow Profiles



* 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}) - Temperature Max (T_{smax}) - Time (T_{smin} to T_{smax}) (ts)	100°C 150°C 60 -120 seconds	150°C 200°C 60 -180 seconds
Time maintained above - Temperature (T_L) - Time (t_L)	183°C 60 - 150 seconds	217°C 60 - 150 seconds
Peak Temperature (T_P)	See Table 1	See Table 2
Time within 5°C of actual Peak Temperature (tp)[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 (tp) specified for the reflow profiles is a "supplier" minimum and a "user" maximum.

Tabel 1: SnPb Eutectic Process - Package Peak Reflow Temperatures		
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

Tabel 2: Pb-free Process - Package Peak Reflow Temperatures			
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 *

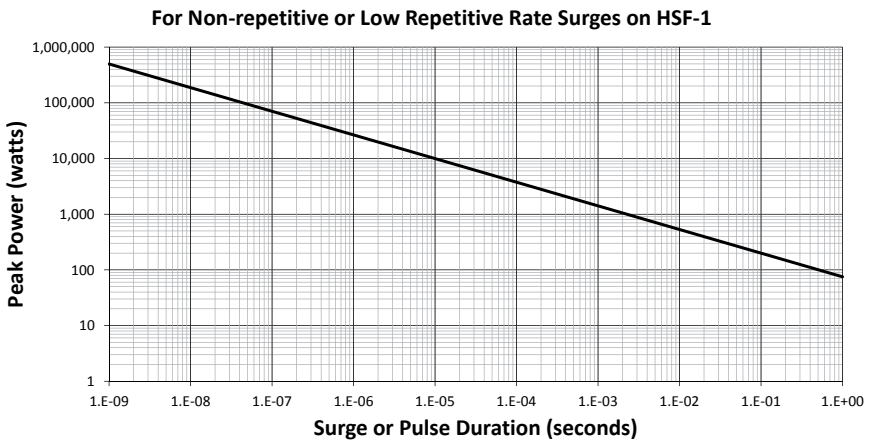
* Tolerance: The device manufacturer/supplier shall assure process compatibility up to and including the stated classification temperature at the rated MSL level.

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

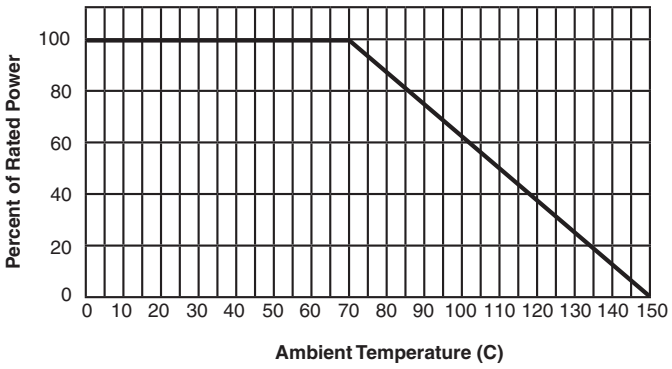
Note 2: The maximum component temperature reached during reflow depends on package thickness and volume. The use of convection reflow processess reduces the thermal gradients between packages. However, thermal gradients due to differences in thermal mass of SMD packages may still exist.

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.

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

Resistance Value
Standard 4-digit resistance code.

Tolerance
K = 10%

Lead-Free Construction

Packaging Code
BLK = Bulk, 7 = 7" Reel, 13 = 13" Reel