SFR16S, SFR25, SFR25H

Vishay BCcomponents

Standard Metal Film Leaded Resistors



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A homogeneous film of metal alloy is deposited on a high grade ceramic body. After a helical groove has been cut in the resistive layer, tinned connecting leads of electrolytic copper are welded to the end-caps.

The resistors are coated with a colored lacquer (light-blue for type SFR16S; light-green for type SFR25 and red-brown for type SFR25H) which provides electrical, mechanical, and climatic protection. The encapsulation is resistant to all cleaning solvents in accordance with IEC 60068-2-45.

- Small size (SFR16S: 0204, SFR25 / SFR25H: 0207)
- Low noise (max. 1.5 μ V/V for R > 1 M Ω)
- Compatible to both lead (Pb)-free and lead containing soldering processes
- Material categorization: for definitions of compliance please see <u>www.vishay.com/doc?99912</u>

APPLICATIONS

General purpose resistors

TECHNICAL SPECIFICATIONS						
DESCRIPTION	SFR16S	SFR25	SFR25H			
DIN size	0204	0207	0207			
Resistance range	1 Ω to 3 M Ω ; jumper (0 $\Omega)$	0.22 Ω to 10 M Ω ; jumper (0 $\Omega)$	0.22 Ω to 10 $M\Omega$			
Resistance tolerance	± 5 %; ± 1 %					
Temperature coefficient	± 250 ppm/K; ± 100 ppm/K					
Rated dissipation, P70	0.5 W	0.4 W	0.5 W			
Thermal resistance	170 K/W	200 K/W	150 K/W			
Operating voltage, U _{max.} AC/DC	200 V	250 V	350 V			
Operating temperature range	-55 °C to 155 °C					
Permissible film temperature	155 °C					
Max. resistance change at rated dissipation $ \Delta R/R \text{ max.} $, after 1000 h		\pm (2 % R + 0.05 Ω)				

Note

• *R* value is measured with probe distance of 24 mm ± 1 mm using 4-terminal method.



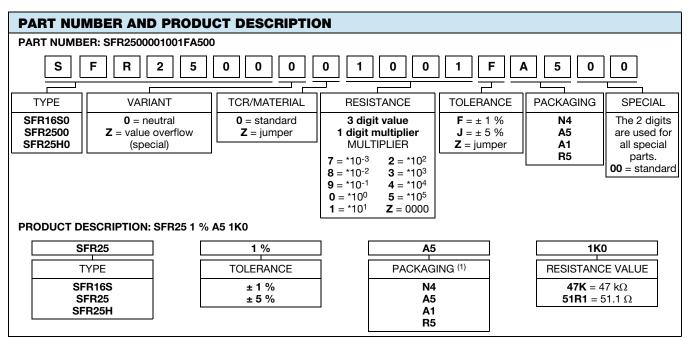




TEMPERATURE COEFFICIENT AND RESISTANCE RANGE					
ТҮРЕ	TOLERANCE	TCR	RESISTANCE	E-SERIES	
		± 250 ppm/K	1 Ω to \leq 4.7 Ω		
	± 5 %	± 100 ppm/K	4.7 Ω to 100 kΩ	E-SERIES E24 E24; E96 - E24 E24; E96	
SFR16S		± 250 ppm/K	$>$ 100 k Ω to 3 M Ω		
SFN103	± 1 %	± 100 ppm/K	5.6 Ω to 100 kΩ	E24: E06	
	± 1 70	± 250 ppm/K	$>$ 100 k Ω to 976 k Ω	E24, E90	
	Jumper (0 Ω)	-	\leq 30 mΩ; $I_{max.}$ = 3 A	-	
		± 250 ppm/K	0.22 Ω to 4.7 Ω		
	± 5 %	± 100 ppm/K	> 4.7 Ω to 1 MΩ	E24	
SFR25, SFR25H		± 250 ppm/K	$>$ 1 M Ω to 10 M Ω		
		± 250 ppm/K	1 Ω to 4.7 Ω		
	±1%	± 100 ppm/K	> 4.7 Ω to 1 MΩ	E24; E96	
		± 250 ppm/K	$>$ 1 M Ω to 10 M Ω		
	Jumper (0 Ω) ⁽¹⁾	-	≤ 30 mΩ; <i>I</i> _{max.} = 5 A	-	

Note

⁽¹⁾ Jumper is only available for SFR25.



Notes

• The products can be ordered using either the PRODUCT DESCRIPTION or the PART NUMBER.

⁽¹⁾ N4 packaging indicates SFR25 and SFR25H radial version.

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SFR16S, SFR25, SFR25H

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PACKAGING						
ТҮРЕ	CODE	QUANTITY	PACKAGING STYLE	WIDTH	PITCH	DIMENSIONS
	A5	5000	Taped acc. to IEC 60286-1 fan-folded in a box			75 mm x 73 mm x 270 mm
SFR16S	R5	5000	Taped acc. to IEC 60286-1 on a reel	52 mm	5 mm	92 mm x 278 mm x 278 mm
	A1 ⁽¹⁾	1000	Taped acc. to IEC 60286-1 fan-folded in a box			75 mm x 28 mm x 262 mm
	A5	5000	Taped acc. to IEC 60286-1 fan-folded in a box			75 mm x 98 mm x 270 mm
SFR25, SFR25H	R5	5000	Taped acc. to IEC 60286-1 on a reel	52 mm	5 mm	93 mm x 300 mm x 298 mm
3FN23, 3FN23N	A1 ⁽¹⁾	1000	Taped acc. to IEC 60286-1 fan-folded in a box			75 mm x 28 mm x 262 mm
	N4 ⁽²⁾	4000	Taped acc. to IEC 60286-2 fan-folded in a box	-	12.7 mm	45 mm x 262 mm x 330 mm

Notes

 $^{(1)}\,$ A1 packaging only available for resistors with \pm 5 % tolerance.

⁽²⁾ N4 packaging only available for SFR25 and SFR25H radial version.

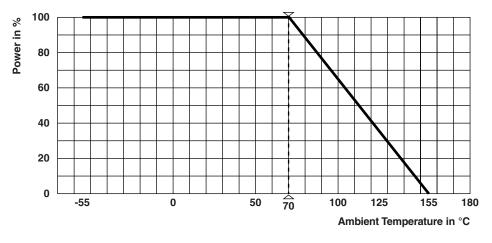
MARKING

The nominal resistance and tolerance are marked on the resistor using four or five colored bands in accordance with IEC 60062, marking codes for resistors and capacitors.



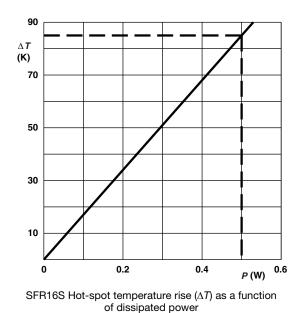


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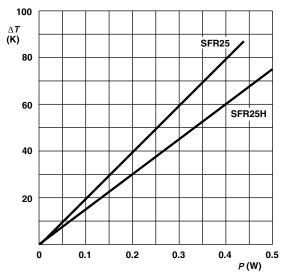
Derating

Maximum dissipation (P_{max}) in percentage of rated power as a function of the ambient temperature (T_{amb})





• The maximum permissible hot-spot temperature is 155 °C.



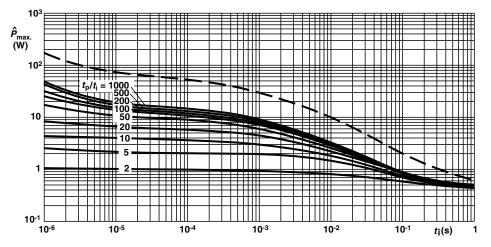
SFR25/SFR25H Hot-spot temperature rise (ΔT) as a function of dissipated power

4

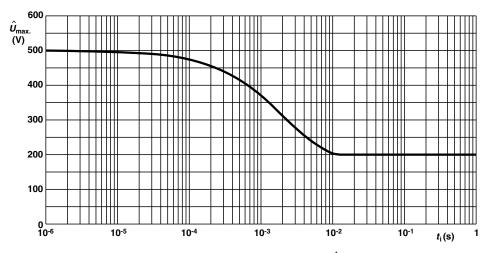


SFR16S, SFR25, SFR25H

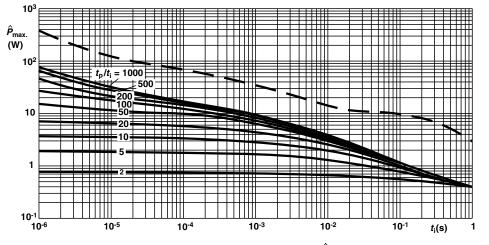
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SFR16S Pulse on a regular basis; maximum permissible peak pulse power (\hat{P}_{max}) as a function of pulse duration (t_i)



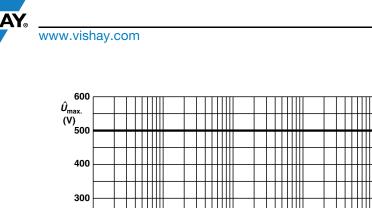
SFR16S Pulse on a regular basis; maximum permissible peak pulse voltage (\hat{U}_{max}) as a function of pulse duration (t_i)

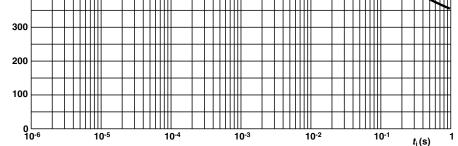


SFR25 Pulse on a regular basis; maximum permissible peak pulse power (\hat{P}_{max}) as a function of pulse duration (t_i)

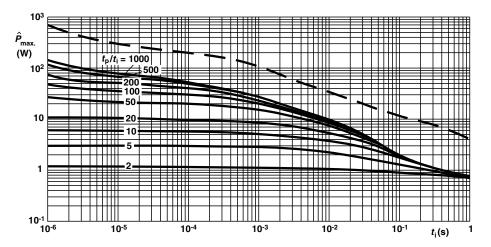
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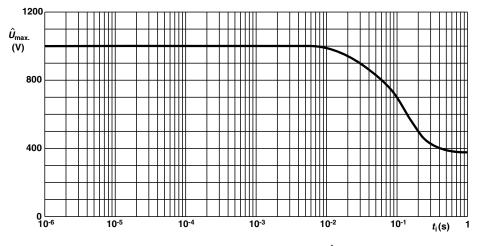




SFR25 Pulse on a regular basis; maximum permissible peak pulse voltage (\hat{U}_{max}) as a function of pulse duration (t_i)



SFR25H Pulse on a regular basis; maximum permissible peak pulse power (\hat{P}_{max}) as a function of pulse duration (t_i)



SFR25H Pulse on a regular basis; maximum permissible peak pulse voltage (\hat{U}_{max}) as a function of pulse duration (t_i)

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TESTS PROCEDURES AND REQUIREMENTS

All tests are carried out in accordance with the following specifications:

• EN 60115-1, generic specification (includes tests)

The test and requirements table contains only the most important tests. For the full test schedule refer to the documents listed above.

The tests are carried out in accordance with IEC 60068-2-xx test method and under standard atmospheric conditions in accordance with IEC 60068-1, 5.3.

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Unless otherwise specified the following values apply:

- Temperature: 15 °C to 35 °C
- Relative humidity: 45 % to 75 %
- Air pressure: 86 kPa to 106 kPa (860 mbar to 1060 mbar).

For performing some of the tests, the components are mounted on a test board in accordance with IEC 60115-1, 4.31. In test procedures and requirements table, only the tests and requirements are listed with reference to the relevant clauses of IEC 60115-1 and IEC 60068-2-xx test methods. A short description of the test procedure is also given.

TEST P	TEST PROCEDURES AND REQUIREMENTS								
IEC 60115-1 CLAUSE	IEC 60068-2 TEST METHOD	TEST	TEST PROCEDURE REQUIREMENTS PERMISSIBLE CHA			LE CHANGE (A	∆R _{max.})		
4.5	-	Resistance	-			±5%;±1%	%		
4.8	-	Temperature coefficient	At (20 / -55 / 20) °C and (20 / 155 / 20) °C		± 250	ppm/K; ± 10	0 ppm/K		
					< 68 kΩ	68 kΩ to 100 kΩ	> 100 kΩ to 1 MΩ	> 1 MΩ	
4.12	-	Noise	IEC 60195	SFR16S	\leq 0.1 μ V/V	\leq 0.5 μ V/V	\leq 1.5 μ V/V	\leq 1.5 μ V/V	
				SFR25, SFR25H	\leq 0.1 μ V/V	\leq 0.1 μ V/V	\leq 0.1 μ V/V	≤ 1.5 µV/V	
4.13	-	Short time overload	Room temperature; P = 6.25 x P _n ; (voltage not more than 2 x limiting voltage); 5 s		± (0.25 % <i>R</i> + 0.	.05 Ω)		
4.16	21 (Ua1) 21 (Ub) 21 (Uc)	Robustness of terminations	Tensile, bending, and torsion		± (0.25 % <i>R</i> + 0.	.05 Ω)		
4.17	20 (Ta)	Solderability	at +235 °C; 2 s; solder bath method; SnPb40	Good tinning (≥ 95 % covered); no damage					
4.17	20 (14)	Concerability	at +245 °C; 3 s; solder bath method; SnAg3Cu0.5			yc			
4.18	20 (Tb)	Resistance to soldering heat	Unmounted components (260 \pm 5) °C; (10 \pm 1) s		± (0.25 % <i>R</i> + 0.	.05 Ω)		
4.19	14 (Na)	Rapid change of temperature	30 min at -55 °C and 30 min at +155 °C; 5 cycles		± (0.25 % <i>R</i> + 0.	.05 Ω)		
4.20	29 (Eb)	Bump	3 x 1500 bumps in 3 directions; 40 g		± (0.25 %	% <i>R</i> + 0.05 Ω);	no damage		
4.22	6 (Fc)	Vibration	10 sweep cycles per direction; 10 Hz to 2000 Hz 1.5 mm or 200 m/s ²	± (0.25 % <i>R</i> + 0.05 Ω); no damage					
4.23		Climatic sequence:							
4.23.2	2 (Ba)	Dry heat	155 °C; 16 h						
4.23.3	30 (Db)	Damp heat, cyclic	55 °C; 24 h; 90 % to 100 % RH; 1 cycle						
4.23.4	1 (Aa)	Cold	-55 °C; 2 h						
4.23.5	13 (M)	Low air pressure	8.5 kPa; 2 h; 15 °C to 35 °C						
4.23.6	30 (Db)	Damp heat, cyclic	55 °C; 5 days; 95 % to 100 % RH; 5 cycles	SFR16S, SFR25,		% R + 0.05 Ω); no visible da); no visible da	mage	
4.23.7		DC load	apply rated power for 1 min	SFR25H		± 2 % R; no v	visible damage)	

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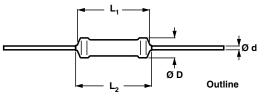
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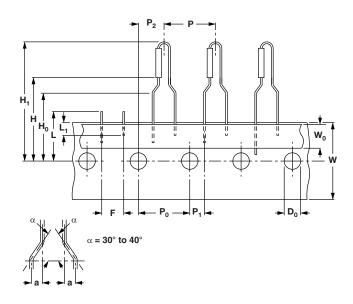
TEST P	TEST PROCEDURES AND REQUIREMENTS							
IEC 60115-1 CLAUSE	IEC 60068-2 TEST METHOD	TEST	PROCEDURE	REQUIREMENTS PERMISSIBLE CHANGE (∆R _{max.})				
4.24	78 (Cab)	Damp heat (steady state)	(40 ± 2) °C; 56 days; (93 ± 3) % RH	± (2 % <i>R</i> + 0.05 Ω)				
4.25.1	Endurance		$U = \sqrt{P_{70} \times R} \text{ or } U = U_{\text{max.}};$ 1.5 h on; 0.5 h off 70 °C; 1000 h	± (2 % <i>R</i> + 0.05 Ω)				

DIMENSIONS



DIMENSIONS - Leaded resistor types, mass and relevant physical dimensions							
TYPE Ø D _{max.} (mm) L _{1 max.} (mm) L _{2 max.} (mm) Ø d (mm) MASS (mg)							
SFR16S	1.9	3.5	4.1	0.45 ± 0.05	102		
SFR25	2.5	6.5	7.5	0.58 ± 0.05	205		
SFR25H	2.5	6.5	7.5	0.58 ± 0.05	205		

SFR25, SFR25H WITH RADIAL TAPING



DIMENSIONS in millimeters						
Pitch of components	Р	12.7 ± 1.0				
Feed-hole pitch	P ₀	12.7 ± 0.2				
Feed-hole center to lead at topside at the tape	P ₁	3.85 ± 0.5				
Feed-hole center to body center	P ₂	6.35 ± 1.0				
Lead-to-lead distance	F	4.8 + 0.7 / - 0				
Tape width	W	18.0 ± 0.5				
Minimum hold down tape width	W ₀	5.5				
Maximum component height	H1	29				
Lead wire clinch height	H ₀	16.5 ± 0.5				
Height of component from tape center	Н	19.5 ± 1				
Feed-hole diameter	D ₀	4.0 ± 0.2				
Maximum length of snipped lead	L	11.0				
Minimum lead wire (tape portion) shortest lead	L ₁	2.5				

Note

 Please refer to document "Packaging" for more detail (www.vishay.com/doc?28721).

SFR16S, SFR25, SFR25H





HISTORICAL 12NC INFORMATION

- The resistors had a 12-digit numeric code starting with 23.
- The subsequent 6 digits for 1 % or 7 digits for 5 % indicated the resistor type and packaging.
- The remaining digits indicated the resistance value:
 - The first 3 digits for 1 % or 2 digits for 5 % indicated the resistance value.
 - The last digit indicated the resistance decade.

Resistance Decade for ± 5 % Tolerance

RESISTANCE DECADE	LAST DIGIT
0.10 Ω to 0.91 Ω	7
1 Ω to 9.1 Ω	8
10 Ω ο 91 Ω	9
100 Ω to 910 Ω	1
1 kΩ to 9.1 kΩ	2
10 k Ω to 91 k Ω	3
100 k Ω to 910 k Ω	4
1 MΩ to 9.1 MΩ	5
= 10 MΩ	6

Resistance Decade for ± 1 % Tolerance

RESISTANCE DECADE	LAST DIGIT
1 Ω to 9.76 Ω	8
10 Ω to 97.6 Ω	9
100 Ω to 976 Ω	1
1 kΩ to 9.76 kΩ	2
10 kΩ to 97.6 kΩ	3
100 kΩ to 976 kΩ	4
1 MΩ to 9.76 MΩ	5
= 10 MΩ	6

12NC Example

The 12NC of a SFR25 resistor, value 5600 Ω \pm 5 %, taped on a bandolier of 5000 units in ammopack was: 2322 181 43562.

HISTORICAL 12NC - Resistor type and packaging								
			23					
TYPE	TOL.	В	ANDOLIER IN AMMOPAC	ж	BANDOLIER ON REEL			
TTPE	TOL.	RADIAL TAPED	STRAIGH	IT LEADS	STRAIGHT LEADS			
		4000 UNITS	1000 UNITS	5000 UNITS	5000 UNITS			
	± 5 %	-	22 187 73	22 187 53	06 187 23			
SFR16S	±1%	-	-	06 187 3	06 187 1			
	Jumper	-	-	06 187 90013	22 187 90346			
	± 5 %	06 184 03	22 181 53	22 181 43	22 181 63			
SFR25	±1%	-	-	22 188 2	06 181 8			
	Jumper	-	22 181 90018	22 181 90019	06 181 90011			
SFR25H	± 5 %	06 186 03	22 186 16	22 186 76	06 186 63			
354238	±1%	-	-	22 186 3	06 186 8			



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 MHR0844SA506F70
 MHR0317SA506F70
 MHR0844SA107F70
 MHR0317SA507F70
 MHR0844SA507F70

 MHR0844SA106F70
 MHR0844SA108G70
 MP821-7.5-1%
 MHR0422SA106F70
 MHR0422SA107F70

 MHR0424SA106F70
 MHR0424SA506F70
 MHR0424SA107F70
 MHR0422SA507F70