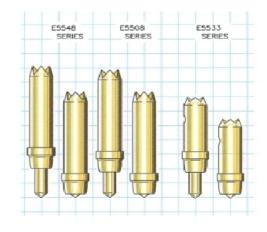


FEATURES

- <-1db insertion loss to 14.5GHz
- <2:1VSWR to 11.5GHz
- 20-39g operating spring force
- $Z0 = 35.7\Omega$
- <30ps risetime
- 25milliOhms contact resistance
- 7 Amps max. drive current



GENERAL DESCRIPTION

The E5548 spring probe from Signal Integrity Inc. is designed to meet the rigorous test requirements driven by the ultra fast risetimes in the digital domain, and high bandwidth, high frequency RF / microwave specifications for the wireless market. Along with speed and accuracy, these probes are designed to operate at pitches to 1.0mm, specifically for the fine pitch packaging these markets demand.

The very high bandwidth of these probes provides low insertion loss up to 14.5GHz. These probes will provide transparent operation on Bluetooth, 802.11b and 3G wireless protocol devices as well as exceed the test probe demands of proprietary microwave communications devices and systems.

With an impulse risetime of less than 30ps and a propagation delay of 25.5ps, the E5548 has more than enough performance for probe applications and interconnection solutions in broadband digital. These probes are ideal for building transparent test channels or interconnection solutions that must address data communication and source synchronous memory busses.

SERIES E5548 MODELS: ORDERING INFORMATION

	SERIES ESS46 MODELS. ORDERING INFORMATION							
	A Series 1.0mm (.0394) Pitch							
Model	Length Operating / initial	DUT Plunger and Plating	Spring	Operating Spring Force				
E5548-A1		Reduced Crown - Gold		28 Grams				
E5548-N5		Reduced Crown - Gold		36 Grams				
E5548-J1		Red Crown - Gold (Crown I'F)	Stainless Steel	28 Grams				
E5548-B2	1	Conical – Gold		28 Grams				
E5548-C3		Reduced Crown - Gold		20 Grams				
E5548-D4		Conical – Gold		20 Grams				
E5548-E5		Reduced Crown - Palladium		28 Grams				
E5548-F6	.156 [3.96] / .180 [4.57]	Reduced Crown - Gold		32 Grams				
E5548-G7	(inch [mm])	Red Crown - Gold (Crown I'F)		28 Grams				
E5548-K2		Conical - Gold		32 Grams				
Е5548-Н8		Conical – Gold (Crown I'F)		32 Grams				
E5548-M4		Reduced Crown - Palladium		36 Grams				
E5548-T2		Crown - Palladium		28 Grams				
E5548-U3		Crown - Gold		28 Grams				
E5548-V4		Reduced Crown - Palladium	Music Wire	39 Grams				
E5548-W5		Conical - Gold	Widsic Wife	39 Grams				



FUNCTIONAL SPECIFICATIONS

Model $EFS48-VV$ Max. Units TDT Risetime into 50Ω Jame and the proper of the prop	FUNCTIONAL S	PECIF	ICATI	UN2		
TDT Risetime into 50Ω 30.0 ps TDR Risetime open circuit 43.5 ps TDR Risetime short circuit 39.0 ps Signal Delay into 50Ω 25.5 ps Frequency Domain Insertion Loss <-1db 14.5 GHz $<-3db$ 39.6 GHz $<-3db$ 39.6 GHz $<-20db$ 3.0 GHz $<-20d$ $-20d$	Model					
TDT Risetime into 50Ω 30.0psTDR Risetime open circuit43.5psTDR Risetime short circuit39.0psSignal Delay into 50Ω 25.5psFrequency Domain39.6GHzInsertion Loss <-3db39.6GHz<-3db39.6GHzReturn Loss, S11 <-20db3.0GHz<-20db3.0GHzVSWR <2:111.56GHzEquivalent Circuit ParametersGHzPin Inductance Pin Capacitance to ground to ground Mutual Inductance1.04nHPin Inductance Pin Capacitance to ground Transmission Line Zo T10.23nHMutual Capacitance Transmission Line Zo T135.7 Ω 25.5psDC ParametersContact Resistance25m Ω Maximum Rating	Time Domain	Min.	Тур.	Max.	Units	
TDR Risetime open circuit TDR Risetime short circuit Signal Delay into 50Ω Torequency Domain Insertion Loss <-1db -1db -3db -3db -3db -20db -20db -20db -20db -20db -20db -21 -10db -11.0 -30 -20db -20db -20db -20db -3.0 VSWR -2:1 Fin Inductance -2:1 Fin Inductance -10db -2:1 Fin Inductance -332 Fin Inductance -335 Fin Inductance	TDT Risetime					
open circuit TDR Risetime short circuit Signal Delay into 50Ω 43.5 39.0psFrequency DomainInsertion Loss <-1db <-3db Return Loss, S11 <-10db <-20db VSWR <2:1	into 50Ω			30.0	ps	
TDR Risetime short circuit Signal Delay into 50Ω 25.5 ps Frequency Domain Insertion Loss <-1db 14.5 GHz	TDR Risetime					
short circuit Signal Delay into 50Ω 39.0psFrequency DomainInsertion Loss <-1db <-3db Return Loss, S11 <-10db <-20db VSWR <2:1				43.5	ps	
Signal Delay into 50Ω 25.5psFrequency DomainInsertion Loss <-1db <-3db Return Loss, S11 <-10db <-20db VSWR <2:1	15 5 5					
Into 50Ω 25.5 ps				39.0	ps	
Trequency Domain	Č ,					
Insertion Loss	into 50Ω		25.5		ps	
<-1db						
<-3db	Insertion Loss					
Return Loss, S11 <-10db11.0 GHz<-20db	<-1db				GHz	
<-10db	<-3db	39.6			GHz	
<-20db	Return Loss, S11					
VSWR <2:1 11.56 GHz Equivalent Circuit Parameters Pin Inductance Pin Capacitance to ground Inductance Ind	<-10db					
<2:1 11.56 GHz Equivalent Circuit Parameters Pin Inductance 1.04 nH Pin Capacitance 0.32 pF Mutual 0.23 nH Mutual 0.06 pF Transmission Line 35.7 Ω Zo 35.7 Ω Tl 25.5 ps DC Parameters Contact Resistance 25 mΩ Maximum Rating		3.0			GHz	
Equivalent Circuit Parameters Pin Inductance 1.04 nH Pin Capacitance 0.32 pF Mutual 0.23 nH Mutual 0.06 pF Transmission Line 0.06 pF To 35.7 Ω Tl 25.5 ps DC Parameters Contact Resistance 25 mΩ Maximum Rating	VSWR					
Pin Inductance 1.04 nH Pin Capacitance 0.32 pF Mutual 0.23 nH Inductance 0.23 nH Mutual 0.06 pF Transmission Line 0.06 pF Transmission Line 0.06 pS To 0.06 pS DC					GHz	
Pin Capacitance to ground 0.32 pF Mutual Inductance 0.23 nH Mutual Capacitance 0.06 pF Transmission Line Zo TI 35.7 Ω TI 25.5 ps DC Parameters 25 mΩ Maximum Rating Maximum Rating	Equivalent Circuit Pa	rameters	5			
$ \begin{array}{c cccc} to ground & 0.32 & pF \\ \hline Mutual & & & \\ Inductance & 0.23 & nH \\ Mutual & & & \\ Capacitance & 0.06 & pF \\ \hline Transmission Line & & & \\ Zo & 35.7 & \Omega \\ Tl & 25.5 & ps \\ \hline \textbf{DC Parameters} & & & \\ \hline Contact Resistance & 25 & m\Omega \\ \hline \textbf{Maximum Rating} & & & \\ \hline $			1.04		nΗ	
Mutual 0.23 nH Inductance 0.23 nH Mutual 0.06 pF Transmission Line 35.7 Ω To 25.5 ps DC Parameters 25 mΩ Maximum Rating Maximum Rating	Pin Capacitance					
$ \begin{array}{c cccc} Inductance & 0.23 & nH \\ Mutual & & & \\ Capacitance & 0.06 & pF \\ Transmission Line & & & \\ Zo & 35.7 & \Omega \\ Tl & 25.5 & ps \\ \hline \textbf{DC Parameters} & & & \\ Contact Resistance & 25 & m\Omega \\ \hline \textbf{Maximum Rating} & & & \\ \hline \end{array} $			0.32		pF	
Mutual Capacitance Transmission Line Zo Tl0.06 35.7 25.5pFDC Parameters Contact Resistance25mΩMaximum Rating						
Capacitance 0.06 pF Transmission Line 35.7 Ω Zo 35.7 Ω Tl 25.5 ps DC Parameters Contact Resistance 25 mΩ Maximum Rating			0.23		nΗ	
Transmission Line 35.7 Ω Zo 35.7 Ω Tl 25.5 ps DC Parameters Contact Resistance 25 mΩ Maximum Rating						
$egin{array}{c cccc} Zo & 35.7 & \Omega \\ Tl & 25.5 & ps \\ \hline \textbf{DC Parameters} \\ \hline \textbf{Contact Resistance} & 25 & mΩ \\ \hline \textbf{Maximum Rating} \\ \hline \end{array}$			0.06		pF	
Tl25.5psDC ParametersContact Resistance25mΩMaximum Rating						
DC Parameters Contact Resistance 25 mΩ Maximum Rating					Ω	
Contact Resistance 25 mΩ Maximum Rating			25.5		ps	
Maximum Rating	DC Parameters					
	Contact Resistance		25		mΏ	
Drive Current 7 A	Maximum Rating					
	Drive Current		7		A	

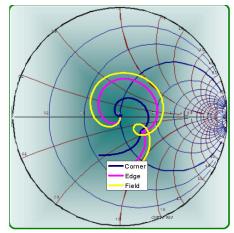


Figure 2: Measurement into 50Ω , E5548-V4

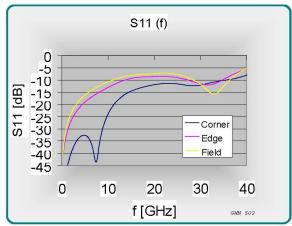


Figure 3: Return Loss, S11, E5548-V4

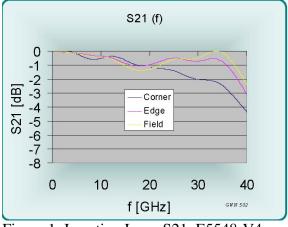


Figure 1: Insertion Loss, S21, E5548-V4

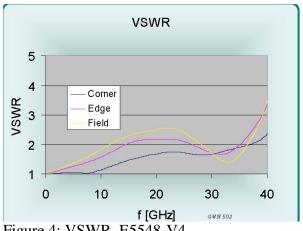


Figure 4: VSWR, E5548-V4



EQUIVALENT CIRCUITS / SPICE MODELS

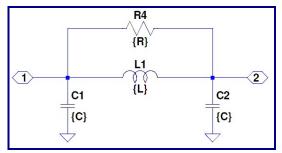


Figure 5 : Pi Equivalent, Valid to <9GHz

C1, C2	0.316	pF
L1	1.04	nН
•	•	

\Rightarrow \Rightarrow

Figure 6: Transmission Line Model

C1,2,3,4	0.316	pF
Cm1,	0.061	pF

1.04

0.23

35.7

25.5

1,500

Ohms

ps

Ohms

nΗ

nΗ

Z0

L

R4

Cm2

L1, L2

M12

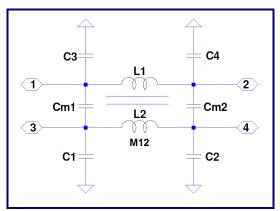


Figure 7: Lumped, Mutual Elements

	Coupler Zo K Elec Len Freq	
1⊶		2
	3	

Figure 8: Transmission Line Equivalent for Crosstalk

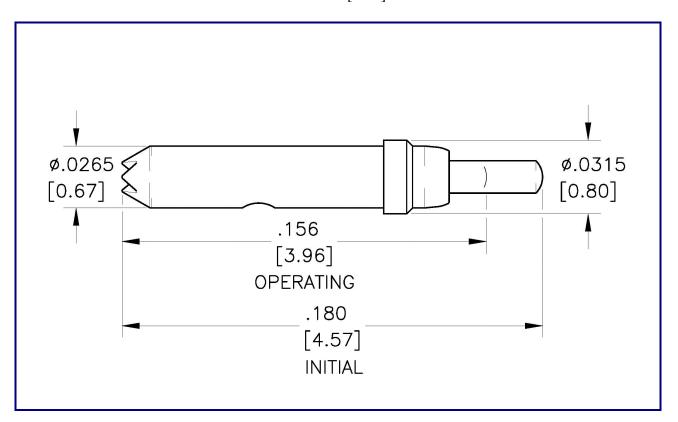
Z0	35.7	Ohms
Tl	25.5	ps



E SERIES MODELS

E Series 1.0mm (.0394) pitch									
Probe Series	Initial L			erating sition	Operating	Self	Insertion Loss	Typical Contact	Maximum
Selles	inch/mm		inch	n/mm	Spring Force	Inductance	< -1db to	Resistance	Current
<u>E5566</u>	.121"	3.08	.098"	2.49	24-35 g	0.49 nH	>40 GHz	20 mOhms	4.3 A
E5533	.144"	3.66	.119"	3.02	25-40 g	0.72 nH	25.3 GHz	20 mOhms	8.5 A
E5544	.124"	3.15	.098"	2.49	25 g	0.70 nH	>40 GHz	30 mOhms	2.7 A
<u>E5548</u>	400"	4 5 7	450"	0.00	20-39 g	1.04 nH	14.5 GHz	25 mOhms	7.0 A
E5593	.180" 4.57	.180" 4.57 .156" 3.96	27 g	1.14 nH	31.5 GHz	20 mOhms	6.0 A		
E5656					28-36 g	0.90 nH	13.9 GHz	20 mOhms	6.0 A

MECHANICAL DIMENSIONS INCHES [MM]



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