ERM Series NRZ/PAM4 BERT

Datasheet

ERM3010 Series NRZ BERT

ERM3040 Series NRZ/PAM4 BERT

ERM3000 Series NRZ/PAM4 BERT

SALUKI TECHNOLOGY

ERM Series Bit Error Rate Tester provides high performance, extensive functions, flexible option and ultra-high integration. It can provide high performance and flexibility for the R&D, debugging and production testing of high-speed serial circuits.

ERM Series Bit Error Rate Tester supports data rate continuously adjustable with 1kbps step, It's guaranteed to ensure flexibility and comprehensiveness of testing. This feature makes it possible to test the margin and limit parameters of device under test(DUT) effectively . And PPG supports several taps de-emphasis for PAM4 and NRZ signals to compensate for the loss of the signal during transmission and improve signal quality. The BERT integrates an internal clock recovery module which helps to maintain the link stability when running BER measure-ment. This has made ERM Series Bit Error Rate Tester reach a rigorous requirement for bit error rate which is less than 1e-15 and got the accuracy test result in harsh and complex test environments.

User Interface

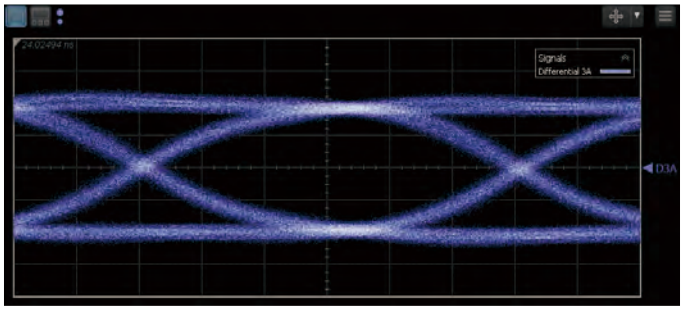
User Interface can bring the availability up to a new level

- Simple and convenient guiding function
- Humanized layout and operation process
- Convenient and flexible interface switching
- Abundant test items
- Connected to external computers via USB

ERM3010 Series NRZ BERT

- PPG supports 1Gbps to 28Gbps NRZ data rate,continuously adjustable with 1kbps step
- PPG supports 4 or 8 channels (ERM30108 supports up to 8 channels)
- Ultra low output jitter (instinct random jitter Rj<1.1ps @28Gbps)
- PPG differential output amplitude: 100mV ~1V
- Test pattern supports prbs7/9/10/13/15/23/31 and 64 bit user defined pattern
- BERT input sensitivity: 40mV
- ERM3010 supports BER gating time setting and advanced analysis features (Eye height, Eye width,Eye Open)

Test Results



NRZ PPG 25.78125Gbps test result (PRBS31)

Product Specifications

PPG

NRZ Output Data Rate	1Gbps-28Gbps
Data Rate Resolution	Continuously adjustable with 1kbps step
Rj (RMS)	≤1.1ps@28Gbps
Rise/Fall Time	16ps(typ)@28Gbps
Output Amplitude(Differential)	100mV-1000mV
Polarity Reversal	Supportive
Emphasis	3 Tap
Pattern Output	PRBS7, PRBS9, PRBS15, PRBS23, PRBS31, 64bit user defined pattern

ED

Data Rate	1Gbps–28Gbps NRZ
Maximum Differential Voltage Input	1.2V
Input Sensitivity	40mV
Pattern Input	PRBS7,PRBS9,PRBS15, PRBS23,PRBS31

Others

Output Port	2.92mm female
Clock Input	50MHz-400MHz, 600mV±200mV @ 50Ω
Clock Output Ratio	2/4/8/16

Size (Gaskets not included)

Width	228.5mm
Depth	176mm
Height	88mm
Weight	≤3kg

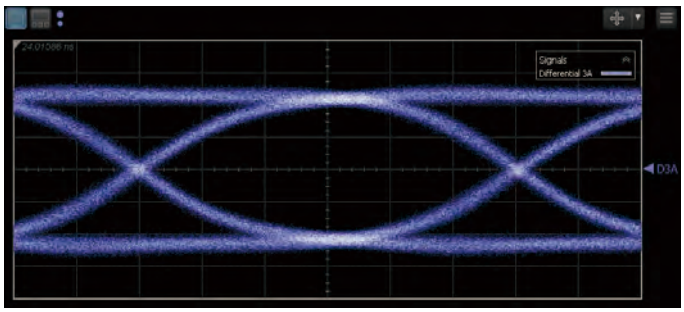
Ordering and Configuration

Product Code	Description	Configuration
ERM30104	4-Channel BERT Mainframe	Mainframe
Option-NP04A	4-Channel NRZ Pattern Generator	Option
Option-NB04A	4-Channel NRZ BERT	Option
ERM30108	8-Channel BERT Mainframe	Mainframe
Option-NP08A	8-Channel NRZ Pattern Generator	Option
Option-NB08A	8-Channel NRZ BERT	Option

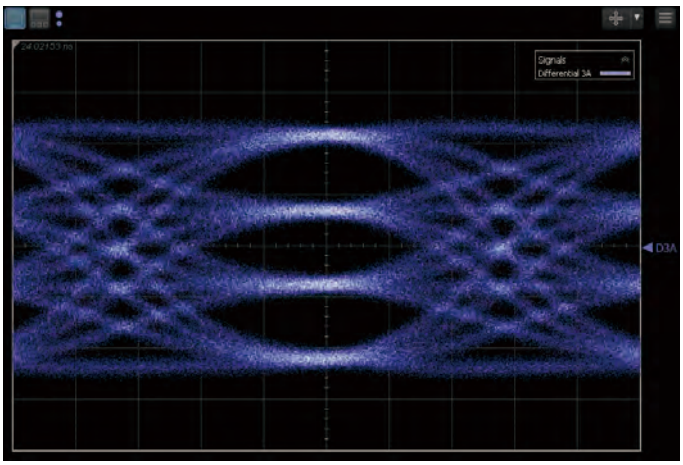
ERM3040 Series NRZ/PAM4 BERT

- Dynamically switch between PAM4 and NRZ mode
- PPG supports 22Gbaud-29.6Gbaud PAM4 data rate
- PG supports 9Gbps to 14Gbps and 18-29.6Gbps NRZ data rate
- PPG supports 4 or 8 channels
- Ultra low output jitter (instinct random jitter Rj<0.8ps @28Gbps)
- The maximum output amplitude of PPG pattern generator is selectable from 0.5V/1V
- Test pattern support (prbs7/9/11/13/15/23/31, prbs7Q/9Q/11Q/13Q/15Q/23Q/31Q ,SSPRQ and User Defined Pattern)
- BERT input sensitivity: 50mV

Test Results



NRZ PPG 25.78125Gbps test result (PRBS31)



PAM4 PPG 26.5625Gbaud test result (PRBS31)

Product Specifications

PPG

NRZ Output Data Rate	9Gbps-14Gbps,18Gbps-29.6Gbps
PAM4 Output Data Rate	22Gbaud-29.6Gbaud
Data Rate Resolution	Continuously adjustable with 1kbps step
Rj (RMS)	≤800fs@28Gbps
Rise/Fall Time	15ps(typ)@28Gbps
Output Amplitude(Differential)	500mV/1000mV
Polarity Reversal	Supportive
Emphasis	Supports up to 7 Tap
Pattern Output	PRBS7/9/11/13/15/23/31, PRBS7Q/9Q/11Q/13Q /15Q/23Q/31Q, SSPRQ,UDP

ED

Data Rate	NRZ:9Gbps-14Gbps,18Gbps-29.6Gbps; PAM4:22Gbaud-29.6Gbaud
Maximum Differential Voltage Input	1.2V
Input Sensitivity	50mV
Pattern Input	PRBS7, PRBS9, PRBS10, PRBS13, PRBS15, PRBS23,PRBS31

Others

Output Port	2.92mm female
Clock Input	50MHz-400MHz, 600mV±200mV @ 50Ω
Clock Output Ratio	4/8/16/32/64/128

Size (Gaskets not included)

Width	444.5mm
Depth	348mm
Height	88mm
Weight	≤5kg

Ordering and Configuration

Product Code	Description	Configuration
ERM3040	NRZ/PAM4 BERT Mainframe	Mainframe
Option ERM3040-4A	4-Channel 500mV NRZ/PAM4 BERT	Option
Option ERM3040-4B	4-Channel 1000mV NRZ/PAM4 BERT	Option
Option ERM3040-8A	8-Channel 500mV NRZ/PAM4 BERT	Option
Option ERM3040-8B	8-Channel 1000mV NRZ/PAM4 BERT	Option

ERM3000 Series NRZ/PAM4 BERT

The ERM3000 is modularized high end BERT (Bit Error Rate Tester) for the high speed serial data physical layer characterization, testing and issue debugging. It provides a fully integrated all-in-one solution with maximum flexibility and performance.

The ERM3000 supports the latest NRZ and PAM4 signaling rates up to 56GBaud. The target application is to test the mature and newly emerging standards such as OIF-CEI from 1Gbps to 58Gbaud , IEEE Ethernet from 1.25Gbps to 53.125GBaud, and PCIE Gen1/2/3/4 from 2.5Gbps to 16Gbps, JESD and CPRI.

- Compact form factor to save the bench space and DUT accessibility without remote head
- NRZ and PAM4 switchable from BERT software
- Data rate coverage from 1Gbps to 56Gbaud
- Modularized design to maximum the flexibility and test coverage
- Multi-channel capability to maximum the test efficiency
- Advanced jitter injection capability
- Advanced noise injection capability
- Channel-skew adjustment
- High voltage output
- DC offset control
- Internal and external reference clock support with Precision Reference Option
- Gray coding and polarity control
- PRBS, PRBS-Q and customized test pattern support
- PPG EQ and ED input EQ support

BERT Mainframe

ERM3000 is the host model of ERM series BERT with pluggable module design, which greatly enhances the flexibility of function expansion while without compromising the performance. The ERM3000 series also supports a variety of advanced features: inter-channel delay adjustment,high voltage output,direct bias adjustment,jitter injection, ect.
It is a high-end laboratory-level measurement instrument in the ERM series of high-speed serial error coders.

There are three mainframe models ERM3002, ERM3004 and ERM3008 available depending on the application, and each mainframe has a rack-mounted option for quick conversion from bench top to rack-mounted instruments.

ERM3002

The ERM3002 mainframe hosts a 2U height and a half-rack design.

Size (Gaskets not included)	
Depth	492mm
Width	220mm
Height	88mm
Others	
Slot Number	2
Built-in system	None

ERM3004

The ERM3004 mainframe hosts a 2U height with a full-rack design, and an option to upgrade the built-in WINDOWS operating system.

Size (Gaskets not included)	
Depth	492mm
Width	440mm
Height	88mm
Others	
Slot Number	8
Built-in system	None or Windows

ERM3008

The ERM3008 mainframe hosts a 4U height with a full-rack design, and an option to upgrade the Windows built-in operating system.

Size (Gaskets not included)	
Depth	492mm
Width	440mm
Height	176mm
Others	
Slot Number	16
Built-in system	None or Windows

General Characteristics

Environmental Requirement	
Operation Temperature	0°C ~ +55°C
Storage Temperature	-20°C to +70°C
Operation Humidity	No condensation, 35°C, 20% ~ 80%

Power Supply	
Supply Voltage	100Vac ~ 240Vac
Voltage Frequency	45Hz ±5Hz

Module Selection

ERM30164

A 4-channel optical port BERT module, the speed range is continuously adjustable from 1 to 16Gbps, and the step size is 1kbps.

Performance index

Channel	4	Built-in clock recovery module	Support
Output Port	SFP	Receiver ED equalization	Support
Data Rate Range	1Gbps-16Gbps	ESD protection	Support
Pattern Type	PRBS7/9/15/23/31/UDP		

ERM30174

A 4-channel electric port error code test plug-in card module, the speed range is continuously adjustable from 1 to 16Gbps, and the speed step is 1kbps.

Performance index

Channel	4	Built-in clock recovery module	Support
Output Port	SMA port	Receiver ED equalization	Support
Signaling Type	NRZ	ESD protection	Support
Data Rate Range	1Gbps to 16Gbps		
Trigger Output	2/4/8/16 bit Variable		
Pattern Type	PRBS7/9/15/23/31/UDP		
Diff Output Amplitude	0.1Vpp-1Vpp		
Amplitude Step Size	40mVpp		
Coupling mode	AC coupling		
Rise/Fall Time	23ps@16Gbps		
Input Sensitivity	50mV		
Maximum Input Amplitude	1.2V		

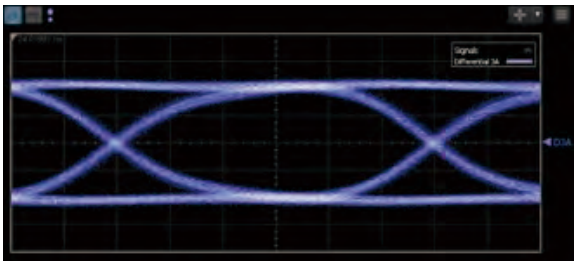
ERM30074

A 4-channel electric port error code test plug-in card module, the speed range is continuously adjustable from 1 to 32Gbps, and the speed step is 1kbps.

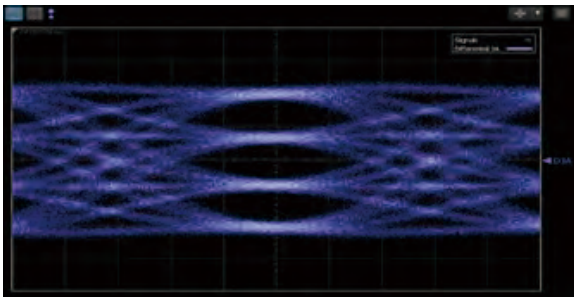
Performance index

Channel	4
Output Port	2.92 mm port
Signaling Type	NRZ
Data Rate Range	1Gbp-32Gbps
Trigger Output	2/4/8/16 variable dividing ratio
Pattern Type	PRBS7/9/10/13/15/23/31/UDP
Diff Output Amplitude	0.1Vpp-1Vpp
Amplitude Step Size	20mVpp
Coupling mode	AC coupling
Rise/Fall Time	14ps@28Gbps
Input Sensitivity	25mV
Maximum Input Amplitude	1.2V

Built-in clock recovery module	Support
Receiver ED equalization	Support
ESD protection	Support



NRZ PPG 25.78125Gbps Test result (PRBS31)



PAM4 PPG 26.5625Gbaud Test Result (PRBS31)

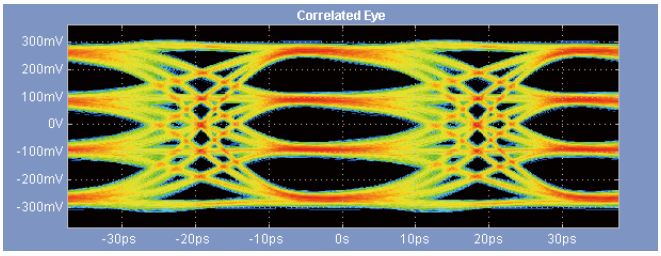
ERM30374

4-channel BERT module, speed range 23.5GBd to 28.5GBd, 50.2GBd to 57GBd NRZ/PAM4 continuously adjustable, speed step size is 1kbps.

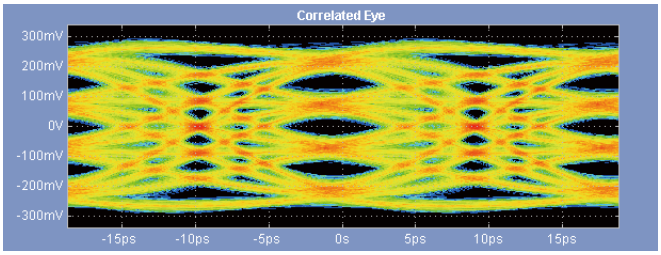
Performance index

Channel	4
Output Connector type	2.4mm female
Signaling Type	NRZ/PAM4
Data Rate Range	23.5GBd-28.5GBd, 50.2GBd-57GBd
Trigger Output	4/8/16/32/128 variable dividing ratio
Pattern Type	PRBS7/9/11/13/15/16/23/31, JP03A/JP03B/LINEARITY/CID/SSPRQ, 64bit
Diff Output Amplitude	0.1Vpp-0.8Vpp UDP
Amplitude Step size	＜10mVpp
Coupling mode	AC coupling
Rise/Fall Time	10ps@56GBaud
Input Sensitivity	25mV
Maximum Input Amplitude	1.2V

Built-in clock recovery module	Support
Receiver ED equalization	Support
ESD protection	Support



PAM4 PPG 26.5625Gbaud Test Result (PRBS13Q)



PAM4 PPG 53.125Gbaud Test Results (PRBS13Q)

ERM33071

Single-channel BERT module, supports 1-33Gbps continuous adjustable, rate step size is 1kbps with built-in pickoff-tees.

Performance index

Channel	1
Output Connector type	2.92mm electrical port
Signaling Type	NRZ
Data Rate Range	1Gbps- 33Gbps
Input Sensitivity	50mV single-ended eye height (typ)
Data Insertion Loss	4.0dB (typ) 6.0dB (max)
Maximum Input Amplitude	±1.2V
Equalization range	0-20dB
Loop Bandwidth	≥25MHz
Coupling mode	DC Coupling

Clock Output Ratio	2/4/8/16/32
Output Amplitude	0.1Vpp-1Vpp (Differential)
Amplitude step	20mVpp(typ)
Coupling mode	AC Coupling
Receiver ED equalization	Support
ESD protection	Support

ERM33171

Single-channel BERT module, supports 1-16Gbps continuous adjustable, rate step size is 1kbps with built-in pickoff-tees.

Performance index

Channel	1	Clock Output Ratio	2/4/8/16/32
Output Connector Type	SMA port	Diff Output Amplitude	0.1Vpp-1Vpp Differential
Signaling Type	NRZ	Amplitude step	20mVpp (typ)
Data Rate Range	1Gbps-16Gbps	Coupling mode	AC Coupling
Input Sensitivity	50mV Differential (typ)	Receiver ED equalization	Support
Insertion Loss	4.0dB (typ) 6.0dB (max)	ESD protection	Support
Maximum Input Amplitude	±1.2V		
Equalization range	0 to 20dB		
Loop Bandwidth	≥25MHz		
Coupling mode	AC Coupling		

Options

Product Code	illustrate	Remark
OPTION-17	PPG High Voltage option	Scalable output amplitude to differential 2Vpp
OPTION-04	DC bias option	Scalable Output to DC Coupled, Bias Voltage -2V to +2V
OPTION-05	Phase/Skew adjustment option	Delay adjustment accuracy: 100fs (typ) Delay adjustment range depends on output rate
OPTION-06	Precision Reference Option	Support internal and external reference switching Reference clock frequency: 10MHz, clock stability: ≤ ±5e-8
OPTION-18	Sinusoidal Jitter Injection Option	Support sinusoidal jitter frequency range 1kHz to 5MHz, jitter amplitude greater than 100UI@100kHz
OPTION-07	USB3.0 test tooling	
OPTION-08	SFP28 Test tooling	
OPTION-09	QSFP Test tooling	
OPTION-10	2.92mm Cable Assembly	
OPTION-11	2.4mm Cable Assembly	
OPTION-12	50ohm load	
OPTION-13	torque wrench	
OPTION-14	Reinforced packing box	
OPTION-15	3 years warranty	
OPTION-16	5 years warranty	

General Technical Data

Unless otherwise stated, all of the following technical data applies to all

models: Environmental Requirements

Operation Temperature	0°C～+55°C
Storage Temperature	-20°C～+80°C
Operation Humidity	noncondensing, 35°C, 20~80%
Power Supply	100-240Vac, 45-55Hz

Configuration

Product Code	Description	Configuration
Option-01	Panel Connector: 2.92mm-K	Option
Option-02	Panel Connector: 2.4mm-K	Option
Option-03	High Amplitude Module	Option
Option-04	DC Offset Module	Option
Option-05	Phase Control Module	Option
Option-06	10MHz Reference Module	Option
Option-07	USB3.0 Test Board	Option
Option-08	SFP28 Test Board	Option
Option-09	QSFP Test Board	Option
Option-10	2.92mm-JJ Cable Components	Option
Option-11	2.92mm-JJ Cable Components	Option
Option-12	50ohm Load	Option
Option-13	Torque Wrench	Option
Option-14	Crates Reinforcement	Option
Option-15	3-year warranty	Option
Option-16	5-year warranty	Option