becker nachrichtentechnik

TSQA-1X8PMF

8 Channel, 5 W Precise Automatic HTOL RF Sub System 1700 … 9800 MHz

Features

- compact 19”, 3 U design
- USB and LAN remote interfaces
- Graphic User Interface (GUI)
- high level accuracy and stability
- integrated CW signal source
- LAN and USB remote interface
- AC power consumption adapted to output power

Options

- pulse modulator
- automatic test sequencing

Applications

- qualification of e.g., active and passive cellular and wireless front-end components
- quality assurance (new designs, batch verification)
- research and development (R&D)

At a Glance

High-temperature Operating Life Time (HTOL) testing is an intense stress test performed to simulate aging and accelerate thermally activated failure mechanisms.

During HTOL testing a large set of devices under test (DUTs) is put under extreme temperature and absolute maximum rating conditions. Typically, it is performed at 125°C and according to JEDEC JESD22-A108 specification.

Power stress tests and HTOL tests require RF systems with many output channels each delivering output power with high level precision and stability over time.

TSQA-1X8PMF is a compact, automatic HTOL RF testing subsystem, suitable for a wide frequency range in 50 ohms technology. TSQA-1X8PMF offers an output power capability of up to 8 W per channel. Each channel has an ALC for precise output power stability over long periods. The device also offers 8 input channels in order to monitor the DUT output power levels. In standard version TSQA-1X8PMF is equipped with an internal CW RF signal source and implements software to automate the complete testing process of e.g., electronic components like semiconductors, SAW/BAW filters and LTCC (Low Temperature Cofired Ceramics) components. Due to its large frequency range the device is suitable for tests of components for the 5G (FR1) and Wi-Fi 6E standards.

High TX to TX Port Isolation

HTOL systems must offer a high isolation between the RF output ports. A failing DUT should not have any influence to the other DUTs during the tests. The TSQA-1X8PMF offers very high isolation of 80 dB type between ports to avoid this effect.

Optimized Power Consumption

The power consumption and efficiency are adapted to the required RF output power level in 2 power classes. Dependant on the desired RF output power the supply voltage of the power amplifier stages is varied. This optimizes cost for electrical power and heat generation.

High RF Level Precision

Each output channel provides a very precise RF output level with closed-loop level control (ALC), and virtually no visible steps. As a consequence, the symmetry between the 8 outputs as well as the long stability is guaranteed. Also, the control loop’s smooth characteristic guarantees avoidance of overshoot.

The output level range is large to cover a big variety of DUT categories. HTOL tests can be run both with active components and gain (e.g., amplifiers) as well as passive components with low insertion loss (e.g. filters).

Harmonic Suppression

The RF energy in HTOL tests should be concentrated on the fundamental of the signal to avoid additional stress to the DUTs coming from harmonics. The TSQA-1X8PMF has an adaptive harmonic filter for effective suppression of harmonics.

High precision RF level detection

Corresponding to each output channel, the TSQA-1X8PMF subsystem provides one input channel to precisely measure the power at the DUT output.

Optional Pulse Modulator

With option pulse modulator installed, the TSQA-1X8PMF is able to generate CW and pulse modulated signals.

Input for External Generator

For HTOL tests with complex modulated signals like e.g., LTE or Wi-Fi TSQA-1X8PMF has an input for the connection of external signal generators.

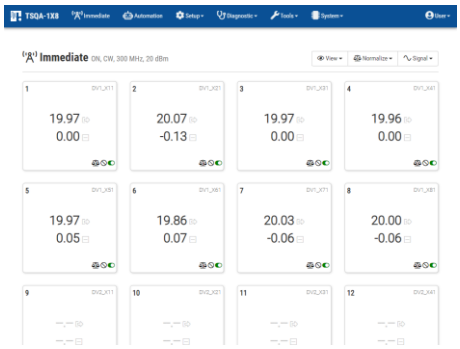
Minimizing RF Cable Losses

Losses of RF cables to and from the DUTs have important consequences with respect to performance. High cable losses must be compensated by the power stages to avoid reduction of power level at the DUT input. This causes high impact on the power consumption and heat generation of HTOL systems. Additionally, RF cables have temperature and frequency dependent effects which reduce the precision of the power level at the DUTs.

Depending on the location of the DUTs, the TSQA-1X8PMF features RF output and input ports on the left or the right site allowing keep cables as short as possible.

Software Functionalities

Physical remote interfaces: LAN or USB. TSQA-1X8PMF is controllable via GUI (Graphic User Interface) without any additional effort of application software development and regardless of location. Alternatively, the system offers the control via an SCPI inspired ASCII string protocol for ATE (Automatic Test Equipment) applications.



GUI appearance (example)

Impact of Cable Losses

The unavoidable loss of the RF cables to and from the DUTs is taken into account by the software. Therefore, cable type and length are configurable. The data of many customary cable types are already implemented in the software. The software calculates the input- and output power levels at the DUT.

System Self-Monitoring

TSQA-1X8PMF can run without human intervention during entire test periods of multiple months. It contains automatic self-checking like current consumption, module temperature and logging of errors.

Optional Automatic Test Sequencing

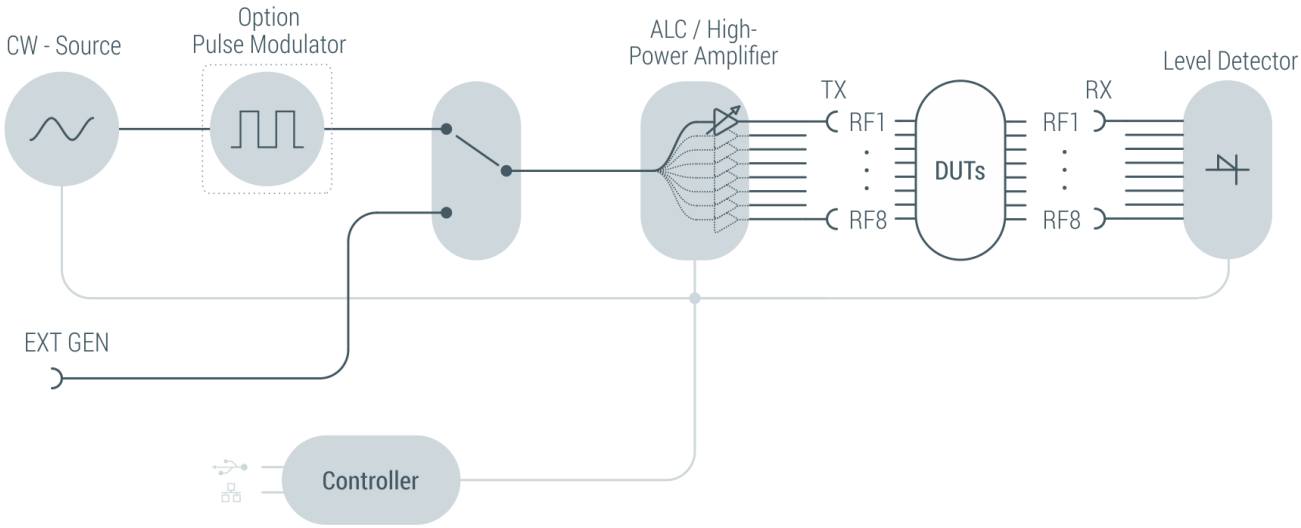
The Automatic Test Sequencing option reduces significantly the number of operator interventions. The operator defines all test parameters before starting the test: E.g., test duration, warm up time, insertion loss limits. After that the system runs autonomously over the entire test time, displaying test status and statistics and writing protocol data for later analysis. In order to allow optimal failure analysis, the device offers the possibility to take off the RF stress from failed DUTs individually and immediately after the failure occurs. After the predefined test time has elapsed, the test procedure stops automatically and the RF levels will be turned down to remove the RF stress from the DUTs.

Higher Number of Channels

Often batches of 77 DUTs are tested simultaneously in a HTOL test. Higher number of test channels can be provided by stacking TSQA-1X8PMF subsystems in a 19” system rack. 10 subsystems are needed to realize an 80 channel HTOL system and can be provided in just 42 U, which is extremely compact.

Becker Nachrichtentechnik GmbH offers turnkey solutions with higher number of channels on customer demand.

Block Diagram



RF Specification

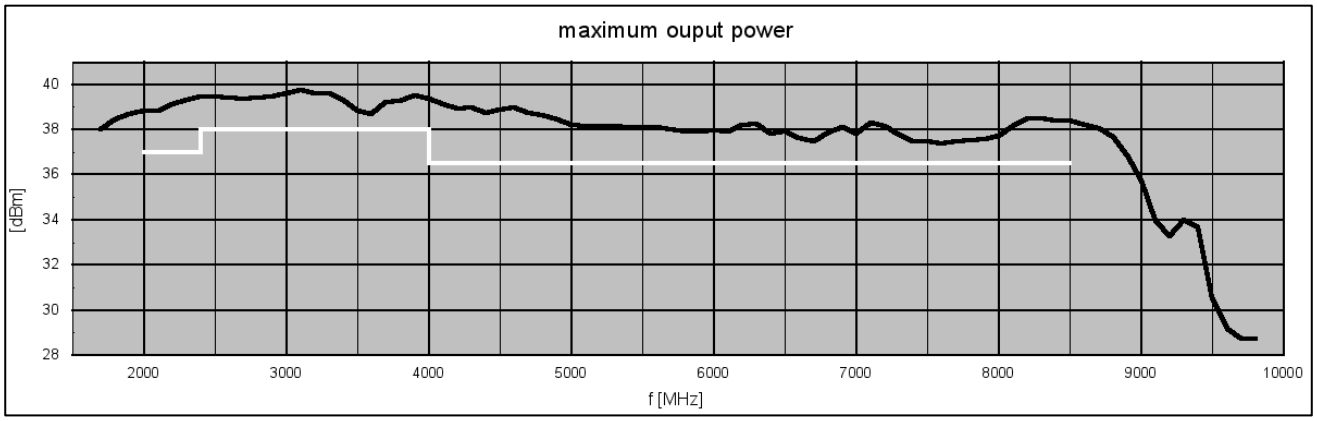
Parameter	Symbol	Min.	Typ.	Max.	Unit	Condition
impedance	Z_{IN}/Z_{OUT}		50		Ω	
number of outputs	n_{OUT}		8			
low frequency	f_{MIN}		1700	2000	MHz	
high frequency	f_{MAX}	8500	9800		MHz	
min. output power	P_{TX_MIN}			+20.0	dBm	
max. output power	P_{TX_MAX}		+37.0		dBm	f < 2 GHz
	P_{TX_MAX}	+37.0	+38.0		dBm	2 GHz ≤ f < 2.4GHz
	P_{TX_MAX}	+38.0	+39.0		dBm	2.4 GHz ≤ f ≤ 4 GHz
	P_{TX_MAX}	+36.5	+38.0		dBm	4 GHz < f ≤ 8.5 GHz
	P_{TX_MAX}		+36.0		dBm	f > 8.5 GHz
ALC resolution	ΔP_{TX}			0.05	dB	
output power accuracy	dP_{TX}		±0.3		dB	CW, RMS detection
harmonics	HD		-25		dBc	f = 2.7 GHz, P_{TX} = + 37 dBm
output isolation	S_{23}		-80		dB	full gain
number of inputs	n_{RX}		8			power measurement
detection			RMS			CW (continuous wave)
			Peak			envelope (option Pulse Mod.)
measuring level range	P_{RX_MIN}		+10	+20	dBm	RF level measurement inputs
	P_{RX_MAX}	+40			dBm	
abs. meas. accuracy	dP_{RX_M}		± 0.5		dB	RMS detection
rel. meas. accuracy	dP_{RX_M}		± 0.2		dB	DUT I.L. < 2 dB
RF connectors	X_{RFHI}		SMA female			RF outputs and inputs
CW signal source						
low frequency	fMIN			1700	MHz	
high frequency	fMAX	9800			MHz	
frequency resolution	ΔfGEN		10		kHz	
frequency accuracy	dfGEN		±2.5		ppm	
Ext. Generator Input						
impedance	Z_{IN}/Z_{OUT}		50		Ω	
low frequency	f_{MIN}			1700	MHz	
high frequency	f_{MAX}	9800			MHz	
input power	P_{RF}		0		dBm	nominal
maximum input power	P_{RF}			+10	dBm	
Option Pulse Modulator						
pulse lenght	t_W	577		2300	ms	
period	t_P	4.6		1000	ms	
detection			RMS and peak power			

Common Specification

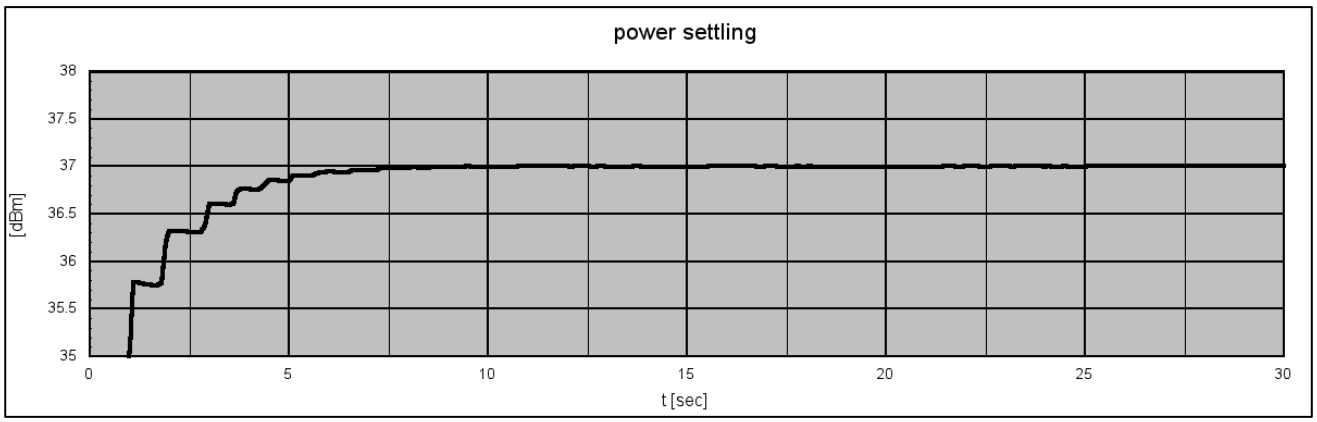
Parameter	Symbol	Min.	Typ.	Max.	Unit	Condition
power supply	U_{AC}	90	230	260	V	50 / 60 Hz
power consumption	P_{AC}		500		W	full RF power
power socket	X_{AC}	IEC-60320 C14				country specific power cable
dimensions	W x H x D	approx. 483 x 133 x 431			mm	19”, 3 U
weight			18.5		kg	
remote interface		RJ45 10/100BaseT				ASCII commands
operating temp. range	T_o	+ 20		+ 30	°C	within specification
storage temp. range	T_s	- 40		+ 70	°C	
Electromagnetic compatibility	EU: in line with EMC directive (2014/30/EC)					applied harmonized standards: EN61326-2-1, (for use in control and laboratory environments), EN55035, EN55032, EN61000-3-2, EN61000-3-3
Electrical safety	EU: in line with low voltage directive (2014/35/EC)					applied harmonized standard: EN 61010-1

Ordering information	Designation	P/N:	Remarks
8 Channel, 5 W RF Sub System	TSQA-1X8PMF	2003.6202.1	RF connectors on left side
8 Channel, 5 W RF Sub System	TSQA-1X8PMF	2003.6202.2	RF connectors on right side
Option pulse modulator	TSQA-1X8PMF-P	2003.6202.O1	
Option Automatic Test Sequencing	TSQA-1X8PMF-TS	2003.6202.O2	

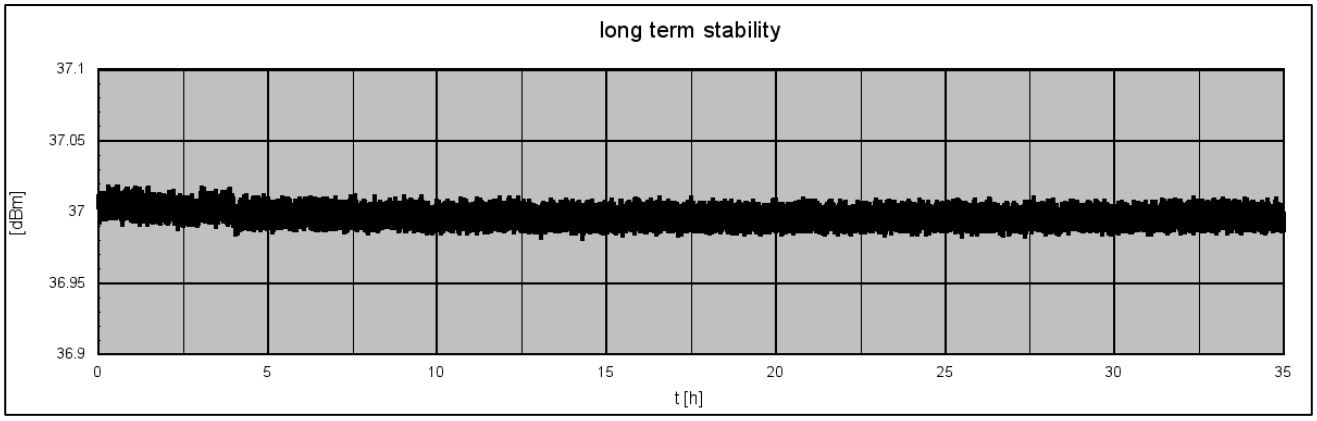
Typical maximum RF output power



RF output power response after power setting (no over shoot)



RF power long term stability (over 35 hours)



Appearances

TSQA-1X8PMF with RF ports on right side

TSQA-1X8PMF with RF ports and power/remote

Network Operation

80 Channel Automatic HTOL Test System

Arrangement of 10 TSQA-1X8PME subsystem units in a 19”, 42 U system rack optimized for short RF cable lengths to cable inlets of temperature chamber.

Related Products

Product	Description	P/N
TSQA-80PMF	80 Channel, 5 W Precise Automatic HTOL RF Test System 1700 MHz … 9800 MHz	2003.6302
TSQA-1X8PMF	8 Channel, 5 W Precise Automatic HTOL RF Sub System 1700 MHz … 9800 MHz	2003.6202
TSQA-80PME	80 Channel 10 W Precise Automatic HTOL RF Test System 300 MHz…6000 MHz	1804.6302
TSQA-1X8PME	8 Channel, 10 W Precise Automatic HTOL RF Sub System 300 MHz…6000 MHz	1804.6202
TSQA-80XME	80 Channel, 500 mW Precise Automatic HTOL RF Test System 300 MHz…6000 MHz	1804.6002
TSQA-1X8XME	8 Channel, 500 mW Precise Automatic HTOL RF Sub System 300 … 6000 MHz	1804.6002
TSQA-1X80PM	80 Channel 2.5 W Precise Automatic HTOL RF Test System 20 MHz…3000 MHz	1606.1012
TSQA-1X16PM	16 Channel 2.5 W Precise Automatic HTOL RF Test System 20 MHz…3000 MHz	1606.1027