
VPIN Product Qualification Report

TGS4305-FC, TGS4306-FC

Abstract

This report summarizes the reliability testing that was completed to qualify TriQuint's TGS4305-FC and TGS4306-FC.

These products are fabricated at TriQuint Dallas, Texas on the proven VPIN GaAs process flow STD-PIN. The products are sold as bumped die for flip chip applications. The primary customer is automotive electronics, in support of automotive radar applications. The products are general market offerings.

The Qualification Plan was based on Automotive AECQ100 Specification for grade 3 automotive products.

Process Description

TriQuint's STD-PIN VPIN process flow is a Gallium Arsenide (GaAs) semiconductor process fabricated at TriQuint's Dallas, Texas facility. The products also use the front-side Cu / Sn pillar technology for flip-chip application.

Mask set EG2467 – TGS4305-FC

Mask set EG2468 – TGS4306-FC

Product Description

<u>TQNT Part #</u>	<u>Description</u>	<u>Process</u>
TGS4305	SP3T Switch	VPIN
TGS4306	SP4T Switch	VPIN

Product Description

TGS4305-FC

The TriQuint TGS4305-FC is a 60-90 GHz SP3T Switch. This part is designed using TriQuint's proven standard VPIN production process. The switching speed for TGS4305-FC is < 5 nsec typically. The TGS4305-FC, when flipped, provides a nominal 2.3 dB insertion loss, > 13 dB Thru State return loss, and 20 dB isolation in the automotive band. The TGS4305-FC integrates DC blocking capacitors on all output ports to reduce the number of off-chip components. The TGS4305-FC has a protective surface passivation layer providing environmental robustness. Lead-free and RoHS compliant

TGS4306-FC

The TriQuint TGS4306-FC is a 70-90 GHz SP4T Switch. This part is designed using TriQuint's proven standard VPIN production process. The switching speed for TGS4306-FC is < 5 nsec typically. The TGS4306-FC, when flipped, provides a nominal 3.0 dB insertion loss, 8 dB return loss in the thru state, and 20 dB isolation in the automotive band. The TGS4306-FC integrates DC blocking capacitors on all output ports to reduce the number of off-chip components. The TGS4306-FC has a protective surface passivation layer providing environmental robustness. Lead-free and RoHS compliant

Reliability Test Plan

The table below lists the qualification plan for the TGS4305 and TGS4306 devices. The plan is based on the AEC Q100 specification for grade 3 automotive products.

Test:	Device:	Conditions:	Sample Size	# of Lots	Total Units
HAST	TGS4305 (SP3T)	121C/85%/15psig, 96hr, Vb = -5V	77	1	77
TEMP CYCLE	TGS4305 (SP3T)	-50C/125C, 500 cycles	77	1	77
HTOL	TGS4305 (SP3T)	TA=105C, 408hr Vb = 1.8V	77	3	231
HBM ESD	TGS4305 (SP3T)	EIA/JESD22-A114	3	1	3
MM ESD	TGS4305 (SP3T)	EIA/JESD22-A115	3	1	3
HBM ESD	TGS4306 (SP4T)	EIA/JESD22-A114	3	1	3
MM ESD	TGS4306 (SP4T)	EIA/JESD22-A115	3	1	3

* Note that not all devices were used for all reliability tests. Parts not stressed were qualified by similarity.

Reliability Testing

TGS4305 Pre and Post HTOL Test Conditions

Temperatures 25C
 Vb1=1.35V; Vb2 = -5V (port 2 on)
 Measure Pout for -5dBm Pin @ 77 GHz (thru path only)
 Vb = 1.35V
 Measure total Ib
 Vb = -5V
 Measure total Ib

TGS4305 Pre and Post HAST Test Condition

Temperatures 25C
 Vb = swept from 0V to -5V
 Measure leakage at Vb = -5V

TGC4702 Pre and Post Temp Cycle Test Condition

Temperatures 25C
 Vb = -5V
 Measure Total Ib.

Vb = 1.35V
 Measure Total Ib.

Summary of Results

Acceptance criteria was based on the product meeting customer specification and an acceptable parameter shift of <10%.

Test:	Device:	Results (Total/Fail)
HAST	TGS4305 (SP3T)	77/0
TEMP CYCLE	TGS4305 (SP3T)	77/0
HTOL	TGS4305 (SP3T)	231/0
HBM ESD	TGS4305 (SP3T)	150 V
MM ESD	TGS4305 (SP3T)	<50 V
HBM ESD	TGS4306 (SP4T)	150 V
MM ESD	TGS4306 (SP4T)	<50 V