

RELIABILITY REPORT
FOR
MAX16543GPC+T
PLASTIC ENCAPSULATED DEVICES

May 12, 2017

MAXIM INTEGRATED

160 RIO ROBLES
SAN JOSE, CA 95134

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Conclusion

The MAX16543GPC+T successfully meets the quality and reliability standards required of all Maxim Integrated products. In addition, Maxim Integrated's continuous reliability monitoring program ensures that all outgoing product will continue to meet Maxim Integrated's quality and reliability standards.

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I. Device Description

A. General

The MAX16543 is an integrated follower protection IC that is used in parallel with a Maxim VT7505/MAX16545 master integrated protection IC for distribution, control, monitoring and protection of a system's 12V bus. The MAX16543 increases the current capability of the VT7505/MAX16545. The VT7505/MAX16545 provide the reporting and fault protection circuits for the combined chipset. Up to two MAX16543s can be added to a VT7505/MAX16545 IC to provide DC current capability of more than 60A. The 1.8V bias supply and gate drive voltage supply of the MAX16543 are powered by the VT7505/MAX16545. All features of the VT7505/MAX16545 remain available when a MAX16543 is added to the circuit. The chipset provides monotonic startup with programmable ramp and delay to limit inrush current during startup. The total current is monitored and reported. Programmable system overcurrent protection is provided with several levels of protection. The MAX16543 includes Maxim's patented lossless current sense to provide high accuracy current sensing through the VT7505/MAX16545 IC. The MAX16543 reports its current to the VT7505/MAX16545, which then reports the total current. The MAX16543 is controlled entirely by the VT7505/MAX16545 IC. The chipset input and output voltage fault protection is provided by the VT7505/MAX16545, which enables and disables the MAX16543 as commanded by circuit conditions and command signals. Master + 1 Follower Chipset and Master + 2 Follower Chipsets show the basic application circuits for the master/follower chipset, with single and dual MAX16543s working in tandem to provide higher current ratings than a single VT7505/MAX16545.

II. Manufacturing Information

A. Description/Function:	Integrated Protection IC on a High-Power 12V Bus with an Integrated MOSFET and Lossless Current Sensing
B. Process:	TS18
C. Fabrication Location:	Taiwan
D. Assembly Location:	China
E. Date of Initial Production:	February 9, 2017

III. Packaging Information

A. Package Type:	12-pin FCQFN
B. Lead Frame:	Copper
C. Lead Finish:	100% matte Tin
D. Die Attach:	N/A
E. Bondwire:	SAC105 (9.8 mil dia.)
F. Mold Material:	Epoxy with silica filler
G. Assembly Diagram:	#05-0761
H. Flammability Rating:	Class UL94-V0
I. Classification of Moisture Sensitivity per JEDEC standard J-STD-020-C	Level 1
J. Single Layer Theta Ja:	N/A°C/W
K. Single Layer Theta Jc:	0.56°C/W
L. Multi Layer Theta Ja:	N/A°C/W
M. Multi Layer Theta Jc:	0.56°C/W

IV. Die Information

A. Dimensions:	125.9842X133.8582 mils
B. Passivation:	Si ₃ N ₄ /SiO ₂
C. Interconnect:	Al/0.5%Cu
D. Backside Metallization:	None
E. Minimum Metal Width:	0.23 microns (as drawn)
F. Minimum Metal Spacing:	0.23 microns (as drawn)
G. Isolation Dielectric:	SiO ₂
H. Die Separation Method:	Wafer Saw

V. Quality Assurance Information

A. Quality Assurance Contacts:	Eric Wright (Reliability Engineering) Brian Standley (Manager, Reliability) Bryan Preeshl (Vice President of QA)
B. Outgoing Inspection Level:	0.1% for all electrical parameters guaranteed by the Datasheet. 0.1% for all Visual Defects.
C. Observed Outgoing Defect Rate:	< 50 ppm
D. Sampling Plan:	Mil-Std-105D

VI. Reliability Evaluation

A. Accelerated Life Test

The results of the 135C biased (static) life test are shown in Table 1. Using these results, the Failure Rate (λ) is calculated as follows:

$$\lambda = \frac{1}{\text{MTTF}} = \frac{1.83}{192 \times 4340 \times 80 \times 2} \quad (\text{Chi square value for MTTF upper limit})$$

(where 4340 = Temperature Acceleration factor assuming an activation energy of 0.8eV)

$$\lambda = 13.7 \times 10^{-9}$$

$$\lambda = 13.7 \text{ F.I.T. (60\% confidence level @ 25°C)}$$

The following failure rate represents data collected from Maxim Integrated's reliability monitor program. Maxim Integrated performs quarterly life test monitors on its processes. This data is published in the Reliability Report found at <http://www.maximintegrated.com/qa/reliability/monitor>. Cumulative monitor data for the TS18 Process results in a FIT Rate of 0.1@ 25C and 1.9 @ 55C (0.8 eV, 60% UCL)

B. E.S.D. and Latch-Up Testing

The MAX16543 has been found to have all pins able to withstand an HBM transient pulse of +/-2500V per JEDEC JESD22-A114. Latch-Up testing has shown that this device withstands a current of +/-250mA and overvoltage per JEDEC JESD78.

Table 1
Reliability Evaluation Test Results

MAX16543GPC+T

TEST ITEM	TEST CONDITION	FAILURE IDENTIFICATION	SAMPLE SIZE	NUMBER OF FAILURES	COMMENTS
Static Life Test (Note 1)	Ta = 135C	DC Parameters & functionality	80	0	
	Biased Time = 192 hrs.				

Note 1: Life Test Data may represent plastic DIP qualification lots.