

RELIABILITY REPORT

FOR

MAX20078ATE+, MAX20078ATE+T,  
MAX20078ATEY+, MAX20078ATEY+T,  
MAX20078AUE+, MAX20078AUE+T

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**MAXIM INTEGRATED**

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## Conclusion

The MAX20078 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 MAX20078 is a high-voltage, synchronous n-channel MOSFET controller for high-current buck LED drivers. The device uses a proprietary average current-mode-control scheme to regulate the inductor current. This control method does not need any control-loop compensation while maintaining nearly constant switching frequency. Inductor current sense is achieved by sensing the current in the bottom synchronous n-channel MOSFET. It does not require any current sense at high voltages. The device operates over a wide 4.5V to 65V input range. The device is designed for high-frequency operation and can operate at switching frequencies as high as 1MHz. The high- and low-side gate drivers have peak source and sink current capability of 2A. The driver block also includes a logic circuit that provides an adaptive nonoverlap time to prevent shoot-through currents during transition. The device includes both analog and PWM dimming. The device includes a 5V VCC regulator capable of delivering 10mA to external circuitry. The device also includes a current monitor that provides an analog voltage proportional to the inductor current. The device has a fault flag that indicates open and shorts across the output. Protection features include inductor current-limit protection, overvoltage protection, and thermal shutdown. The MAX20078 is available in a space-saving (3mm x 3mm), 16-pin TQFN or a 16-pin TSSOP package and is specified to operate over the -40°C to +125°C automotive temperature range.

## II. Manufacturing Information

A. Description/Function:	Synchronous Buck, High-Brightness LED Controller
B. Process:	S18
C. Device Count:	13323
D. Fabrication Location:	Japan
E. Assembly Location:	Thailand, Taiwan
F. Date of Initial Production:	January 2017

## III. Packaging Information

A. Package Type:	16L TQFN-CU	16L TQFN-CU (SW)	16L TSSOP-CU
B. Lead Frame:	Cu194	EFTEC64T	Cu7025
C. Lead Finish:	Matte Tin	Matte Tin	Matte Tin
D. Die Attach:	EN4900G	AB8200T	AB8200T
E. Bondwire:	1 mil CuPd	1 mil CuPd	1 mil CuPd
F. Mold Material:	G700LA	G770HCD	G605L
G. Flammability Rating:	UL-94 (V-0 Rating)	UL-94 (V-0 Rating)	UL-94 (V-0 Rating)
H. Classification of Moisture Sensitivity per JEDEC standard J-STD-020-C	Level 1	Level 1	Level 1
I. Single Layer Theta Ja:	64 °C/W	64 °C/W	48 °C/W
J. Single Layer Theta Jc:	7 °C/W	7 °C/W	3 °C/W
K. Multi Layer Theta Ja:	48 °C/W	48 °C/W	39 °C/W
L. Multi Layer Theta Jc:	7 °C/W	7 °C/W	3 °C/W

## IV. Die Information

A. Dimensions:	60.63 X 57.09 mils
B. Passivation:	SiN / SiO2

## V. Quality Assurance Information

<b>A. Quality Assurance Contacts:</b>	Ryan Wall (Manager, Reliability) Michael Cairnes (Executive Director, Reliability) Bryan Preeshl (SVP of QA)
<b>B. Outgoing Inspection Level:</b>	0.1% for all electrical parameters guaranteed by the Datasheet. 0.1% for all Visual Defects.
<b>C. Observed Outgoing Defect Rate:</b>	< 50 ppm
<b>D. Sampling Plan:</b>	Mil-Std-105D

## VI. Reliability Evaluation

### A. Accelerated Life Test

The results of the 125C biased (static) life test are shown in Table 1. Using these results, the Failure Rate  $\lambda$  is calculated as follows:

$$\lambda = \frac{1}{MTTF} = \frac{1.83}{192 \times 2454 \times 77 \times 2} \text{ (Chi square value for MTTF upper limit)}$$

(where 2454 = Temperature Acceleration factor assuming an activation energy of 0.8eV)

$$\lambda = 25.2 \times 10^{-9}$$

$$\lambda = 25.2 \text{ FITs (60\% confidence level @25°C)}$$

Maxim Integrated performs quarterly life test monitors on its processes. This data is published in the Reliability Report found at <https://www.maximintegrated.com/en/support/qa-reliability/reliability/reliability-monitor-program.html>.

S18 cumulative process data:

$$\lambda = 0.02 \text{ FITs (60\% confidence level @25°C)}$$

$$\lambda = 0.24 \text{ FITs (60\% confidence level @55°C)}$$

### B. ESD and Latch-Up Testing

The MAX20078 has been found to have all pins able to withstand an HBM transient pulse of  $\pm 2500$  V per JEDEC / ESDA JS-001. Latch-Up testing has shown that this device withstands  $\pm 100$  mA current injection and supply overvoltage per JEDEC JESD78.

**Table 1**  
Reliability Evaluation Test Results  
**MAX20078ATE/VY+**

TEST ITEM	TEST CONDITION	FAILURE IDENTIFICATION	SAMPLE SIZE	NUMBER OF FAILURES	COMMENTS
Static Life Test (Note 1)	Ta = 125°C Biased Time = 192 hrs.	DC parameters & functionality	77	0	

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