

RELIABILITY REPORT
FOR
MAX22700DASA+
MAX22700DASA+T

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MAXIM INTEGRATED

160 RIO ROBLES
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Conclusion

The MAX22700D 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 MAX22700–MAX22702 are a family of single-channel isolated gate drivers with ultra-high common-mode transient immunity (CMTI) of 300kV/μs (typ). The devices are designed to drive silicon-carbide (SiC) or galliumnitride (GaN) transistors in various inverter or motor control applications. All devices have integrated digital galvanic isolation using Maxim's proprietary process technology. The devices feature variants with output options for gate driver common pin GNDB (MAX22700), Miller clamp (MAX22701), and adjustable undervoltage-lockout UVLO (MAX22702). In addition, variants are offered as differential (D versions) or single-ended (E versions) inputs. These devices transfer digital signals between circuits with different power domains. All of the devices in the family feature isolation for a withstand voltage rating of 3kVRMS for 60 seconds.

All devices support a minimum pulse width of 20ns with a maximum pulse width distortion of 2ns. The part-to-part propagation delay is matched within 2ns (max) at +25°C ambient temperature, and 5ns (max) over the -40°C to +125°C operating temperature range. This feature reduces the power transistor's dead time, thus improving overall efficiency.

The MAX22700 and the MAX22702 have a maximum RDSON of 1.25Ω for the low-side driver, and the MAX22701 has an RDSON of 2.5Ω for the low-side driver. All devices have a maximum RDSON of 4.5Ω for the high-side driver. See the Ordering Information for suffixes associated with each option.

The MAX22700–MAX22702 can be used to drive SiC or GaN FETs with different output gate drive circuitry and B-side supply voltages. See the Typical Operating Circuits for details.

All of the devices in the MAX22700–MAX22702 family are available in an 8-pin, narrow-body SOIC package with 4mm of creepage and clearance. The package material has a minimum comparative tracking index (CTI) of 600V, which gives it a group I rating in creepage tables. All devices are rated for operation at ambient temperatures of -40°C to +125°C.

II. Manufacturing Information

| | |
|--------------------------------|---------------------------------------|
| A. Description/Function: | Ultra-High CMTI Isolated Gate Drivers |
| B. Process: | S18 |
| C. Device Count: | N/A |
| D. Fabrication Location: | USA |
| E. Assembly Location: | Taiwan |
| F. Date of Initial Production: | July 1, 2020 |

III. Packaging Information

| | |
|--|--------------------|
| A. Package Type: | SOIC (N) |
| B. Lead Frame: | CU194 |
| C. Lead Finish: | Matte Tin |
| D. Die Attach: | CDF625P8C8 |
| E. Bondwire: | 1 mil Au |
| F. Mold Material: | G770HCD |
| G. Assembly Diagram: | 05-101009 |
| H. Flammability Rating: | UL-94 (V-0 Rating) |
| I. Classification of Moisture Sensitivity per JEDEC standard J-STD-020-C | Level 3 |
| J. Single Layer Theta Ja: | N/A |
| K. Single Layer Theta Jc: | N/A |
| L. Multi Layer Theta Ja: | 106.54 °C/W |
| M. Multi Layer Theta Jc: | 44.91 °C/W |

IV. Die Information

| | |
|-----------------|---------------------|
| A. Dimensions: | 35.4331X39.370 mils |
| B. Passivation: | SiN/SiO2 |

V. Quality Assurance Information

| | |
|-----------------------------------|--|
| A. Quality Assurance Contacts: | Ryan Wall (Manager, Reliability) Michael Cairnes (Executive Director, Reliability) Bryan Preeshl (SVP 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 125C biased (static) life test are shown in Table 1. Using these results, the Failure Rate λ is calculated as follows:

$$\lambda = \frac{1}{MTTF} = \frac{1.83}{192 \times 2454 \times 80 \times 2} \text{ (Chi square value for MTTF upper limit)}$$

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

$$\lambda = 24.3 \times 10^{-9}$$

$$\lambda = 24.3 \text{ FITs (60\% confidence level @25°C)}$$

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 Fit

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

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

B. ESD and Latch-Up Testing

The MAX22700D has been found to have all pins able to withstand an HBM transient pulse of ± 2500 V per JEDEC / ESDA JS-001. Latch-Up testing has shown that this device withstands ± 250 mA current injection and supply overvoltage per JEDEC JESD78.

Table 1
Reliability Evaluation Test Results
MAX22700DASA+

| 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 | 80 | 0 | |

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