



MAX20446CATGA/V+T
MAX20446CATGA/VY+T
MAX20446CATGB/V+T

Summary:

This report summarizes the results of the reliability tests performed by Maxim to qualify the MAX20446CATGA/V+T, MAX20446CATGA/VY+T, & MAX20446CATGB/V+T for automotive applications.

Conclusion:

The MAX20446CATGA/V+T, MAX20446CATGA/VY+T, & MAX20446CATGB/V+T successfully meets the reliability requirements performed by Maxim in accordance with the automotive qualification standard, AEC-Q100.

Test Results/Lot information (Device Specific):

Table 1:

| | | | | | |
|---------------------------------|--------------------|--------------------|-------------|----------------|-------------|
| Lot Number: | JCGP5Q001ZQ | JCGP4Q001TQ | | | |
| Part Number: | MAX20446CATGA/V+ | MAX20446BATG/V+ | | | |
| Temperature Grade: | 1 | 1 | | | |
| Fab Site: | MFN | MFN | | | |
| Fab Process Core: | S18 | S18 | | | |
| Metallization/# Layers: | AlCu / 4 | AlCu / 4 | | | |
| Passivation: | SiN / SiO2 | SiN / SiO2 | | | |
| Die Type: | DE03A-1B | DE03A-0B | | | |
| Package Assembly Site: | ASECL | UTL | | | |
| Die Substrate: | Si | Si | | | |
| Package Type: | 24L TQFN 4x4 | 24L TQFN 4x4 | | | |
| Wire Bond Material/Dia.: | CuPd 1.0 mil | CuPd 1.0 mil | | | |
| Mold Compound: | G700LA | G700HCD | | | |
| Die Attach: | EN4900G | AB8200T | | | |
| Leadframe Material: | COPPER | COPPER | | | |
| Lead Finish: | 100% MATTE TIN | 100% MATTE TIN | | | |
| Flammability Rating: | UL-94 (V-0 Rating) | UL-94 (V-0 Rating) | | | |
| Moisture Rating: | MSL 1 | MSL 1 | | | |
| Date Code: | 2031 | 2029 | | | |
| Rel Lot Number: | R41936A | R41935A | | | |
| Test | | Results | | Results | |
| | | <i>SS</i> | <i>Temp</i> | <i>SS</i> | <i>Temp</i> |
| ESD (HBM) | 2500V | 0/5 | RH | - | N/A |
| ESD (CDM) | All Pins: 500V | 0/5 | RH | - | N/A |
| | Corner Pins: 750V | 0/5 | RH | | |
| Latch-Up | Cl: 100mA | 0/6 | RH | - | N/A |
| | OV: 1.5 x MOV | 0/6 | RH | | |
| HTOL | 192 hrs | - | N/A | 0/77 | RHC |

Core Process Cumulative FIT Rate:

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

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

The following tables include the process and package level qualification data to support the product level qualification. Multiple tables may be included if multiple wafer fabrication or assembly subcontractors are used (multiple package variations may be included).

Test Results/Lot information (Package Technology): TQFN/SWTQFN / ASECL

Table 2:

| | | | | |
|---------------------------------|-----------------|-----------------|-------------------|-----------------|
| Lot Number: | TBJG5Q001HQ | EAQR7Q001H | EARB3Q001C | EAZR0A013BA |
| Part Number: | MAX20066ATPA/V+ | MAX20003ATPA/V+ | MAX20080ATM/V+CFT | MAX20003ATPB/V+ |
| Temperature Grade: | 1 | 1 | 1 | 1 |
| Fab Site: | TOWER JAZZ | EPSON | EPSON | EPSON |
| Fab Process: | S18 | S18 | S18 | S18 |
| Metallization/# Layers: | AlCu / 4 | AlCu / 4 | AlCu / 4 | AlCu / 4 |
| Passivation: | SiN / SiO2 | SiN / SiO2 | SiN / SiO2 | SiN / SiO2 |
| Die Type: | SP35A-0B | AP47A-0B | AP80B-0B | AP47A-0E |
| Package Assembly Site: | ASECL | ASECL | ASECL | ASECL |
| Die Size: | 84.25 x 88.98 | 100 x 103.94 | 142.91 x 155.91 | 100 x 103.94 |
| Package Type: | 20L TQFN 4x4 | 20L TQFN 5x5 | 48L TQFN 7x7 | 20L TQFN 5X5 |
| Wire Bond Material/Dia.: | CuPd 1.3 mil | CuPd 1.3 mil | CuPd 1.0 mil | CuPd 1.3 mil |
| Mold Compound: | G700LA | G700LA | G700LA | G700LA |
| Die Attach: | EN4900G | EN4900G | EN4900G | EN4900G |
| Leadframe Material: | COPPER | COPPER | COPPER | COPPER |
| Lead Finish: | 100% MATTE TIN | 100% MATTE TIN | 100% MATTE TIN | 100% MATTE TIN |
| Date Code: | 1611 | 1413 | 1410 | 1631 |
| Rel Lot Number: | R28336A | R27054A | R26792A | R27520D |

| AEC # | Test | Results | | Results | | Results | | Results | |
|-------|-------------------------|---------------|------|---------------|------|---------------|------|--------------|------|
| | | SS | Temp | SS | Temp | SS | Temp | SS | Temp |
| A1 | Preconditioning | 0/231 | R | 0/231 | R | 0/231 | R | 0/45 | R |
| A2 | HAST | 0/77 | RH | 0/77 | RH | 0/77 | RH | - | N/A |
| A3 | Unbiased HAST | 0/77 | R | 0/77 | R | 0/77 | R | - | N/A |
| A4 | Temperature Cycle | 500x – 0/77 | RH | 500x – 0/77 | RH | 500x – 0/77 | RH | - | N/A |
| A5 | Power Temperature Cycle | - | N/A | - | N/A | - | N/A | 1000x – 0/45 | RH |
| C2 | Wire Bond Pull | 0/200 | N/A | 0/150 | N/A | - | N/A | - | N/A |
| A6 | High Temp Storage | 1000hr – 0/45 | RH | 1000hr – 0/45 | RH | 1000hr – 0/45 | RH | - | N/A |
| C3 | Solderability | 0/15 | N/A | - | N/A | - | N/A | - | N/A |
| B1 | High Temp Op/Life | 1000hr – 0/77 | RHC | 1000hr – 0/77 | RHC | - | N/A | - | N/A |

Test Results/Lot information (Package Technology): TQFN/SWTQFN / UTL

Table 3:

| Lot Number: | EAQR7Q001B | EAT03Q001D | EATO3Q002AA | EAZR0A030EB | | | | | |
|---------------------------------|--------------------------------|-----------------|-----------------|-----------------|-------------|----------------|-------------|----------------|-------------|
| Part Number: | MAX20003ATPA/V+ | MAX20003ATPA/V+ | MAX20003ATPA/V+ | MAX20003ATPB/V+ | | | | | |
| Temperature Grade: | 1 | 1 | 1 | 1 | | | | | |
| Fab Site: | EPSON | EPSON | EPSON | EPSON | | | | | |
| Fab Process: | S18 | S18 | S18 | S18 | | | | | |
| Metallization/# Layers: | AlCu / 4 | AlCu / 4 | AlCu / 4 | AlCu / 4 | | | | | |
| Passivation: | SiN / SiO2 | SiN / SiO2 | SiN / SiO2 | SiN / SiO2 | | | | | |
| Die Type: | AP47A-0B | AP47A-0B | AP47A-0B | AP47A-0E | | | | | |
| Package Assembly Site: | UTL | UTL | UTL | UTL | | | | | |
| Die Size: | 100 x 103.94 | 100 x 103.94 | 100 x 103.94 | 100 x 103.94 | | | | | |
| Package Type: | 20L TQFN 5x5 | 20L TQFN 5x5 | 20L TQFN 5x5 | 20L TQFN 5x5 | | | | | |
| Wire Bond Material/Dia.: | CuPd 1.3 mil | CuPd 1.3 mil | CuPd 1.3 mil | CuPd 1.3 mil | | | | | |
| Mold Compound: | G770HCD | G770HCD | G770HCD | G770HCD | | | | | |
| Die Attach: | AB8200T | AB8200T | AB8200T | AB8200T | | | | | |
| Leadframe Material: | COPPER | COPPER | COPPER | COPPER | | | | | |
| Lead Finish: | 100% MATTE TIN | 100% MATTE TIN | 100% MATTE TIN | 100% MATTE TIN | | | | | |
| Date Code: | 1412 | 1424 | 1435 | 1715 | | | | | |
| Rel Lot Number: | R27054B | R27054D | R27054E | R29180A | | | | | |
| AEC # | Test | Results | | Results | | Results | | Results | |
| | | <i>SS</i> | <i>Temp</i> | <i>SS</i> | <i>Temp</i> | <i>SS</i> | <i>Temp</i> | <i>SS</i> | <i>Temp</i> |
| A1 | Preconditioning | 0/231 | R | 0/231 | R | 0/231 | R | 0/45 | R |
| A2 | HAST | 0/77 | RH | 0/77 | RH | 0/77 | RH | - | N/A |
| A3 | Unbiased HAST | 0/77 | R | 0/77 | R | 0/77 | R | - | N/A |
| A4 | Temperature Cycle | 500x – 0/77 | RH | 500x – 0/77 | RH | 500x – 0/77 | RH | - | N/A |
| A5 | Power Temperature Cycle | - | RH | - | RH | - | RH | 1000x – 0/45 | RH |
| C2 | Wire Bond Pull | 0/150 | N/A | 0/150 | N/A | 0/150 | N/A | - | N/A |
| A6 | High Temp Storage | 1000hr – 0/45 | RH | - | RH | - | RH | - | N/A |
| C3 | Solderability | 0/15 | N/A | - | N/A | - | N/A | - | N/A |
| B1 | High Temp Op/Life | 1000hr – 0/77 | RHC | 1000hr – 0/77 | RHC | 1000hr – 0/77 | RHC | - | N/A |

Test Results/Lot information (Wafer Process Technology): S18 / MFN

Table 4:

| | | | | |
|---------------------------------|------------------|------------------|------------------|------------------|
| Lot Number: | JBPH4Q002CC | JBPH4Q002CA | JBPH43005AC | JBPH43004A |
| Part Number: | MAX20094ATIA/VY+ | MAX20094ATIA/VY+ | MAX20094ATIA/VY+ | MAX20094ATIA/VY+ |
| Temperature Grade: | 1 | 1 | 1 | 1 |
| Fab Site: | MFN | MFN | MFN | MFN |
| Fab Process: | S18 | S18 | S18 | S18 |
| Metallization/# Layers: | AlCu / 4 | AlCu / 4 | AlCu / 4 | AlCu / 4 |
| Passivation: | SiN / SiO2 | SiN / SiO2 | SiN / SiO2 | SiN / SiO2 |
| Die Type: | AP77A-0B | AP77A-0B | AP77A-0B | AP77A-0B |
| Package Assembly Site: | UTL | UTL | UTL | ASECL |
| Die Size: | 92.52 x 92.52 | 92.52 x 92.52 | 92.52 x 92.52 | 92.52 x 92.52 |
| Package Type: | 28L SWTQFN 5x5 | 28L SWTQFN 5x5 | 28L SWTQFN 5x5 | 28L SWTQFN 5x5 |
| Wire Bond Material/Dia.: | CuPd 1.3 mil | CuPd 1.3 mil | CuPd 1.3 mil | CuPd 1.3 mil |
| Mold Compound: | G770HCD | G770HCD | G770HCD | G700LA |
| Die Attach: | AB8200T | AB8200T | AB8200T | EN4900G |
| Leadframe Material: | COPPER | COPPER | COPPER | COPPER |
| Lead Finish: | 100% MATTE TIN | 100% MATTE TIN | 100% MATTE TIN | 100% MATTE TIN |
| Date Code: | 1718 | 1718 | 1726 | 1725 |
| Rel Lot Number: | R28961A | R28961B | R28961C | R28961G |

| AEC # | Test | Results | | Results | | Results | | Results | |
|-------|--------------------------|---------------|------|---------------|------|---------------|------|--------------|------|
| | | SS | Temp | SS | Temp | SS | Temp | SS | Temp |
| A1 | Preconditioning | 0/231 | R | 0/231 | R | 0/231 | R | - | N/A |
| A2 | HAST | 0/77 | RH | 0/77 | RH | 0/77 | RH | - | N/A |
| A3 | Unbiased HAST | 0/77 | R | 0/77 | R | 0/77 | R | - | N/A |
| A4 | Temperature Cycle | 500x – 0/77 | RH | 500x – 0/77 | RH | 500x – 0/77 | RH | - | N/A |
| A6 | High Temp Storage | 1000hr – 0/77 | RH | 1000hr – 0/77 | RH | 1000hr – 0/77 | RH | - | N/A |
| B1 | High Temp Operating Life | 1000hr – 0/77 | RHC | 1000hr – 0/77 | RHC | 1000hr – 0/77 | RHC | - | N/A |
| B2 | Early Life Failure Rate | 48hr – 0/800 | RH | - | N/A | 48hr – 0/800 | RH | 48hr – 0/800 | RH |

| Revision | Description of Revision and Author | Approved By | Effective By (Date) |
|----------|------------------------------------|-------------|---------------------|
| A | Initial release. | J. Aquino | 21 Oct 2020 |