

21RS SERIES

HIGH FREQUENCY ▲ Si MOSFET RELAY

SILICON Si MOSFET RELAY ▲ SMD type

Low output capacitance ▲ Switches AC or DC load

One channel and two channel packages available

Input TTL / CMOS compatible








Moisture Sensitivity Level ▲ MSL 1

 **UL 1577 approved ▲ File no E344988**


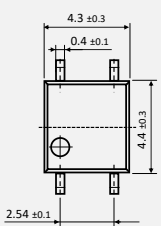
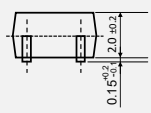
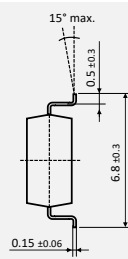
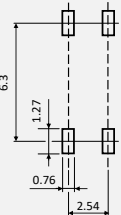
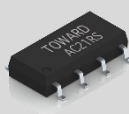
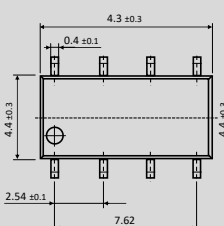
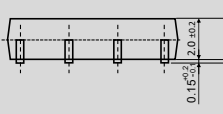
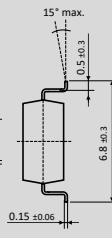
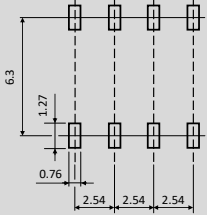
SPECIFICATION

| Item | | Characteristics |
|-------------------------------|-------------|--|
| Contact Form | | 1 Form A / 2 Form A ▲ Normally open switch |
| Load Voltage | V_L | 40V |
| Operation LED Current | $I_{F\ ON}$ | 3mA |
| Load Current | I_L | 250mA |
| On-Resistance | R_{ON} | 0.9Ω |
| Output Capacitance | C_{OUT} | 13pF |
| Low Off-State Leakage Current | I_{LEAK} | 10nA at 40V _{DC} |

APPLICATIONS

| Automatic Test Equipment | I/O Modules | Industrial Automation | Measurement Equipment | Security Equipment | Sensing Equipment | Telecom Equipment |
|---|---|---|---|--|---|---|
|  |  |  |  |  |  |  |

DIMENSIONS

| Package | Illustration | Dimensions | PCB Board Pattern |
|---------|---|--|---|
| SOP-4 |  |    |  <p>TOP VIEW</p> |
| SOP-8 |  |    |  <p>TOP VIEW</p> |

ABSOLUTE MAXIMUM RATINGS ▲ AMBIENT TEMPERATURE $T_A = 25^\circ\text{C}$

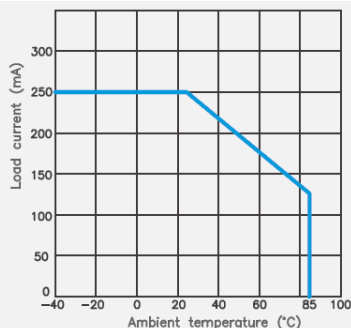
| Item | Condition | Symbol | Value | | Unit |
|--------|-----------------------------|-----------------------------|--------------------|--------|------------------|
| Type | Outline package | | SOP-4 | SOP-8 | |
| | Part number | | AB21RS | AC21RS | |
| | Output channels | | 1 | 2 | Channels |
| Input | Continuous LED Current | I_F | 50 | | mA |
| | Peak LED Current | 100 Hz, Duty 1% I_{FP} | 500 | | mA |
| | LED Reverse Voltage | V_R | 5 | | V |
| | Input Power Dissipation | P_{IN} | 75 | | mW |
| Output | Load Voltage | V_L | 40 (AC peak or DC) | | V |
| | Load Current | I_L | 250 | | mA |
| | Peak Load Current | 1 ms, 1 shot I_{PEAK} | 750 | | mA |
| | Output Power Dissipation | P_{OUT} | 300 | 400 | mW |
| Relay | Total Power Dissipation | P_T | 350 | 450 | mW |
| | I/O Breakdown Voltage | $V_{I/O}$ | 1500 | | V_{RMS} |
| | Operating Temperature Range | T_{OPR} | -40 to +85 | | $^\circ\text{C}$ |
| | Storage Temperature Range | T_{STG} | -40 to +100 | | $^\circ\text{C}$ |

ELECTRICAL CHARACTERISTICS ▲ AMBIENT TEMPERATURE $T_A = 25^\circ\text{C}$

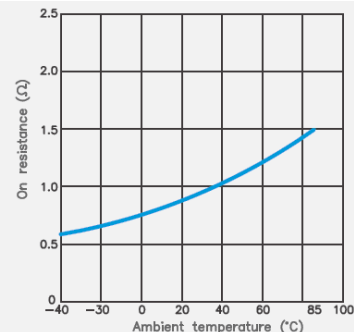
| Item | Condition | Symbol | Min. | Typ. | Max. | Unit |
|-------------------|---------------------------------------|--|--------|------|------|----------|
| Input | LED Forward Voltage | $I_F = 10\text{mA}$ V_F | 1 | 1.17 | 1.5 | V |
| | Operation LED Current | $I_{F\text{ ON}}$ | | 0.3 | 3 | mA |
| | Recovery LED Voltage | $V_{F\text{ OFF}}$ | 0.5 | 1 | | V |
| Output | On-Resistance | $I_F=5\text{mA}, I_L=\text{Rating}$ R_{ON} | | 0.9 | 1.25 | Ω |
| | Drain to Drain (tested within 1 sec.) | $V_L = 40\text{V}$ I_{LEAK} | | 0.03 | 10 | nA |
| | Off-State Leakage Current | $V_L=0\text{V}, f=1\text{MHz}$ C_{OUT} | | 13 | | pF |
| Trans- mission | Turn-On Time | $I_F=5\text{mA}, I_L=\text{Rating}$ t_{ON} | | 0.07 | 0.5 | ms |
| | Turn-Off Time | $I_F=5\text{mA}, I_L=\text{Rating}$ t_{OFF} | | 0.06 | 0.2 | ms |
| Coupled | I/O Insulation Resistance | $R_{I/O}$ | 10^9 | | | Ω |
| | I/O Capacitance | $f=1\text{MHz}$ $C_{I/O}$ | | 0.8 | | pF |

REFERENCE DATA

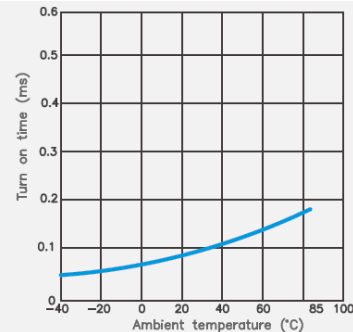
Load current vs. ambient temp.



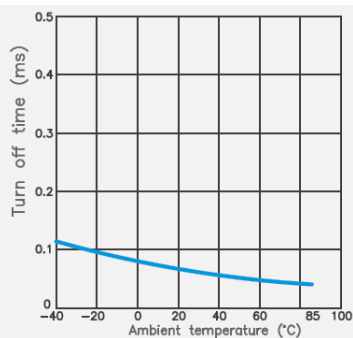
On resistance vs. ambient temp.



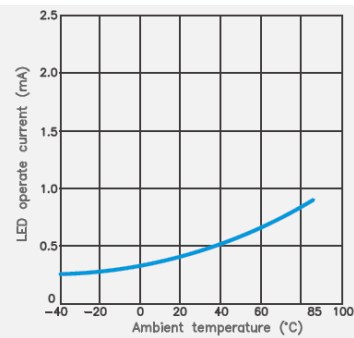
Turn on time vs. ambient temp.



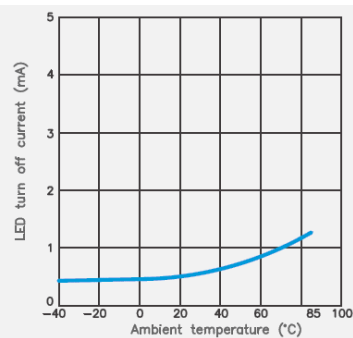
Turn off time vs. ambient temp.



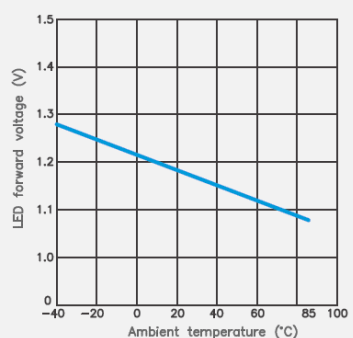
LED operate current vs. ambient temp



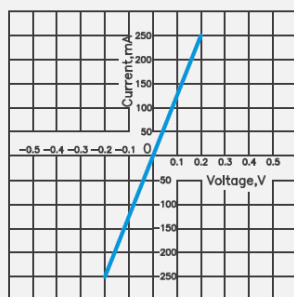
LED turn off current vs. ambient temp.



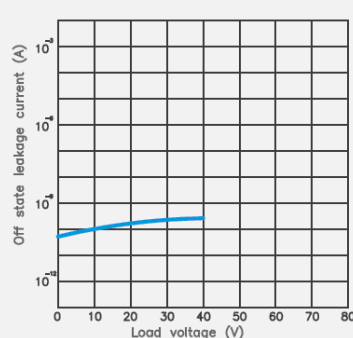
LED forward voltage vs. ambient temp.



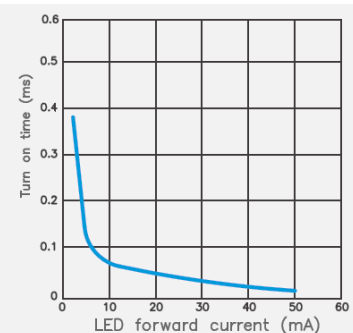
Current vs. voltage characteristics of output at MOS portion



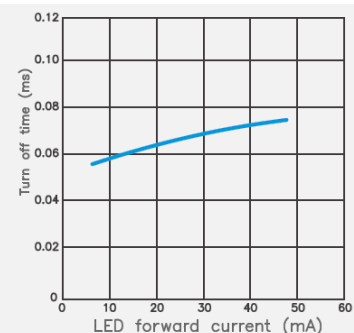
Off state leakage current vs. load voltage



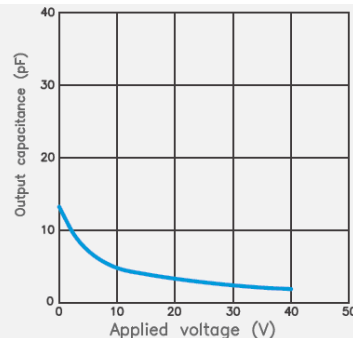
Turn on time vs. LED forward current



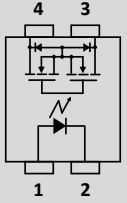
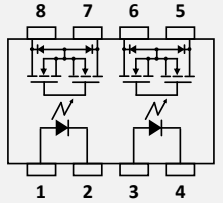
Turn off time vs. LED forward current



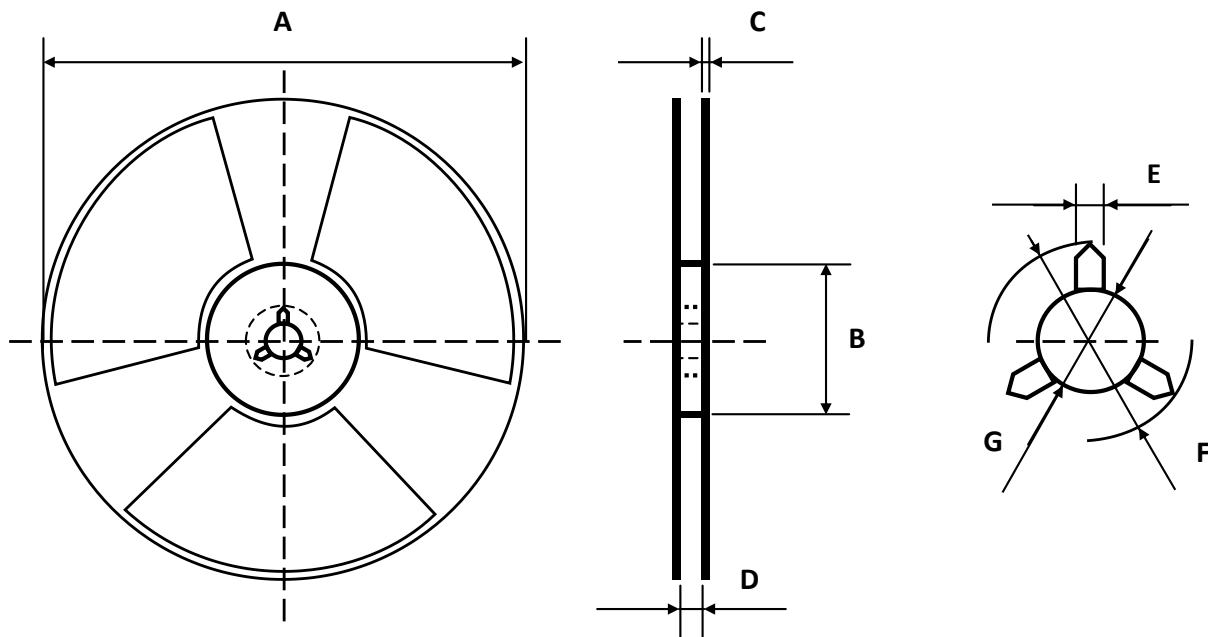
Output capacitance vs. applied voltage



PIN DESCRIPTION AND PART NUMBER

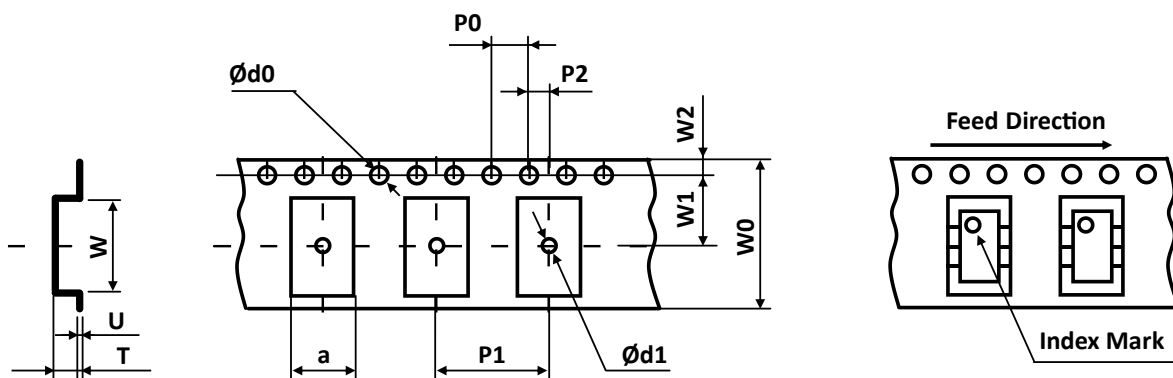
| Circuit Diagram | Pin Description | | Part No. | Package | Packing |
|---|-----------------|-------------------|---------------------|----------------|----------------------------------|
|  | 1 | Anode (+) ■ LED | AB21RS AB21RS-R1 | SOP-4 SOP-4 | Tube (100pcs) Reel (1 000pcs) |
| | 2 | Cathode (-) ■ LED | | | |
| | 3,4 | Drain ■ MOSFET | | | |
|  | 1,3 | Anode (+) ■ LED | AC21RS AC21RS-R1 | SOP-8 SOP-8 | Tube (50pcs) Reel (1 000pcs) |
| | 2,4 | Cathode (-) ■ LED | | | |
| | 5,6,7,8 | Drain ■ MOSFET | | | |

REEL DIMENSIONS ▲ All dimensions in mm



| Size | A | B | C | D | E | F | G |
|-------|-----|-----|---|----|---|----|----|
| SOP-4 | 330 | 100 | 2 | 13 | 2 | 13 | 21 |
| SOP-8 | 330 | 100 | 2 | 17 | 2 | 13 | 21 |

TAPE DIMENSIONS ▲ All dimensions in mm



| Size | W | U | T | a | Ød0 | Ød1 | P0 | P1 | P2 | W0 | W1 | W2 |
|-------|------|-----|-----|-----|-----|-----|----|----|----|----|-----|------|
| SOP-4 | 4.6 | 0.3 | 2.3 | 7.2 | 1.5 | 1.5 | 4 | 12 | 2 | 12 | 7.5 | 1.75 |
| SOP-8 | 10.4 | 0.3 | 2.3 | 7.5 | 1.5 | 1.5 | 4 | 12 | 2 | 16 | 7.5 | 1.75 |



PACKING QUANTITIES

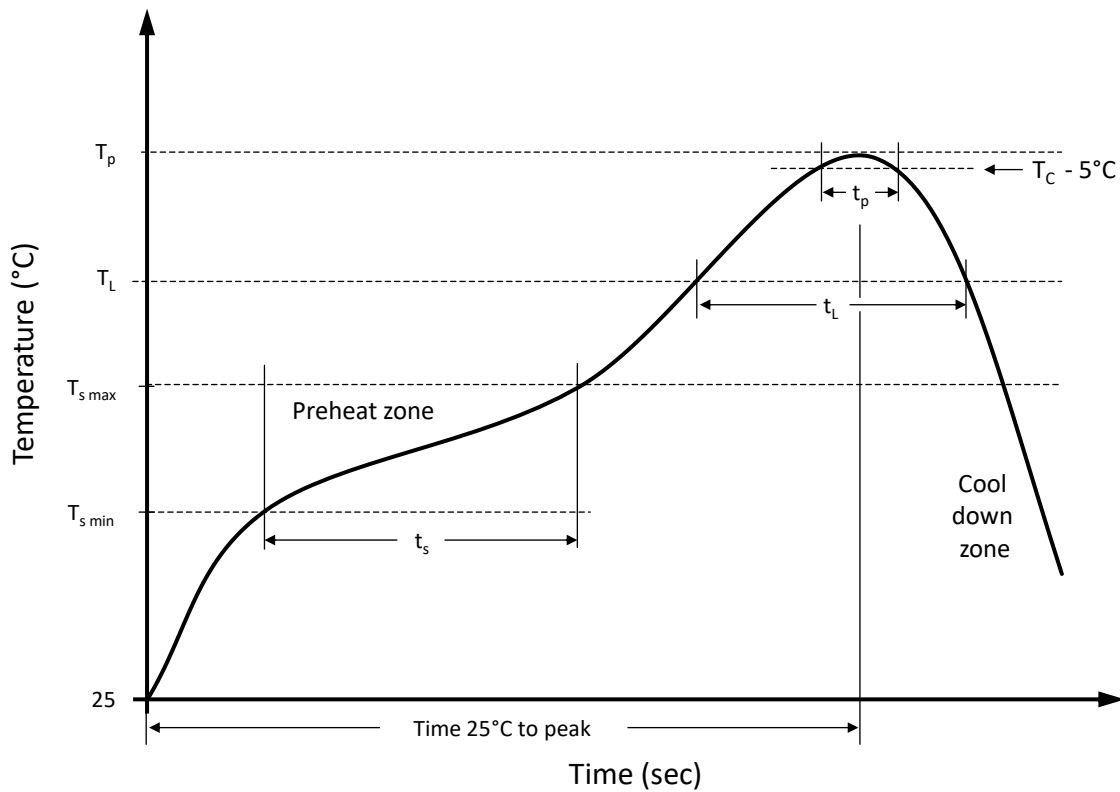
| Tape and Reel Packing | PCS/Reel |
|-----------------------|----------|
| SOP-4 | 1 000 |
| SOP-8 | 1 000 |

| Tube Packing | PCS/Tube | Tubes/Box | Units/Box |
|--------------|----------|-----------|-----------|
| SOP-4 | 100 | 30 | 3 000 |
| SOP-8 | 50 | 30 | 1 500 |

STORAGE AND HANDLING CONDITIONS

| ESD level | Floor life | Conditions | MSL |
|-------------|------------|---------------------------------------|-----|
| HBM class 2 | Unlimited | $T_A < 30^{\circ}\text{C}$, RH < 85% | 1 |

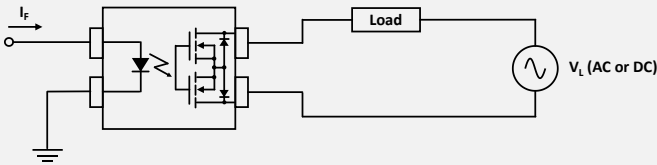
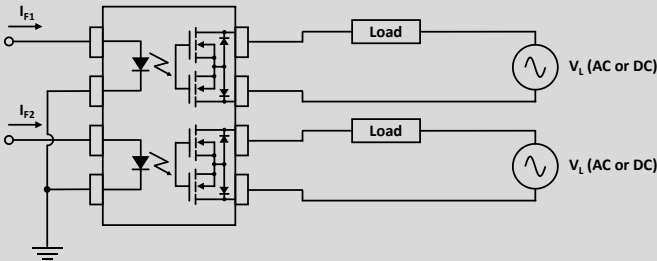
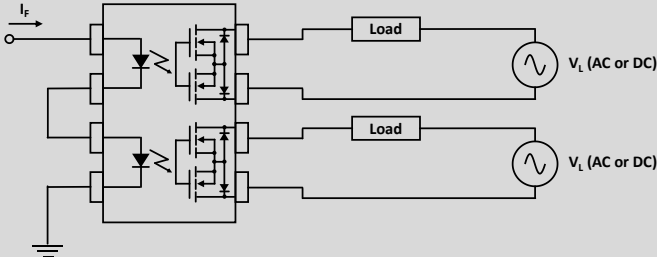
RECOMMENDED REFLOW SOLDERING PROFILE ▲ SMD PACKAGE



Recommended reflow soldering conditions ▲ Refer to JEDEC J-STD-020E

| Profile Features | | Sn-Pb Eutetic Assembly | Pb-Free Assembly |
|--|--------------|------------------------|------------------|
| Preheat temperature min. | $T_{s \min}$ | 100 °C | 150 °C |
| Preheat temperature max. | $T_{s \max}$ | 150 °C | 200 °C |
| Preheat time t_s from $T_{s \min}$ to $T_{s \max}$ | t_s | 120 seconds | 120 seconds |
| Ramp-up rate (T_L to T_p) | | max. 3 °C/second | max. 3 °C/second |
| Liquidous temperature | T_L | 183 °C | 217 °C |
| Time t_L maintained above T_L | t_L | 150 seconds max. | 60 seconds max. |
| Peak package body temperature | T_p | 235°C | 260°C |
| Timeframe of within 5°C below and up to max actual peak body temperature | t_p | 20 seconds max. | 30 seconds max. |
| Ramp-down rate (T_L to T_p) | | max. 6 °C/second | max. 6 °C/second |
| Time 25°C to peak temperature | | max. 6 minutes | max. 8 minutes |

LOAD CONNECTING METHOD

| Type | Load | Connection | Feature |
|--------|----------|---|----------------------------------|
| 4 pins | AC or DC |  | Control bi-directional signal |
| 8 pins | AC or DC |  | 2 input and 2 output |
| | |  | 1 input and 2 output |

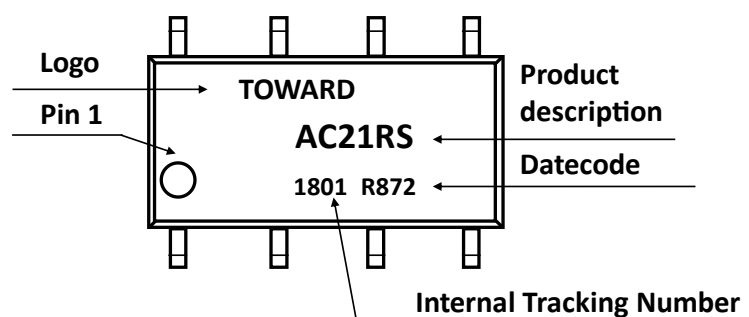
PRODUCT CODE

Example: AC21RS series ▲ 2 Form A ▲ 40V ▲ SOP-8 ▲ Tape & Reel

| AC | | 21R | | S | | R1 | |
|---------|------------------|--------|-----|------|-----|-------------|--------------|
| Package | | Series | | Type | | Packing | |
| AB | 4 Pin ▲ 1 Form A | 21R | 40V | S | SOP | Blank R1 | Tube Reel |
| AC | 8 Pin ▲ 2 Form A | | | | | | |

PRODUCT MARKING

Example: AC21RS series ▲ 2 Form A ▲ 40V ▲ SOP-8 ▲ Tape & Reel



DATE CODE

Example: R872

| R | | 8 | | 7 | | 2 | |
|--------------------------|-------------------|------|------|-------|-----|-------------------|-----------------|
| Material Characteristics | | Year | | Month | | Week of the Month | |
| R | RoHS compliant | 8 | 2018 | 1 | Jan | 1 2 3 4 | 1 st |
| | | 9 | 2019 | 2 | Feb | | 2 nd |
| | | A | 2020 | 3 | Mar | | 3 rd |
| | | B | 2021 | 4 | Apr | | 4 th |
| H | Halogen free | C | 2022 | 5 | May | 1 2 3 4 | 1 st |
| | | ... | ... | ... | ... | | 2 nd |
| | | G | 2026 | 12 | Dec | | 3 rd |
| | | | | | | | 4 th |

RELIABILITY TESTS ▲ STANDARD

Standard: JESD22-A

| No. | Test | Test Specification | Test Standard | Test Limits |
|-----|---|--|---------------|--|
| 1 | Moisture Sensitivity Level Test | Bake condition: Temperature: 125°C; Duration 24 hours Soak condition: Temperature: 30°C; Humidity: 60% RH Duration 192 hours Reflow condition: Peak temperature: 260°C Duration: 3 cycles | JESD22-A113H | No abnormal phenomenon was found. Functional test passed. |
| 2 | High Temperature Storage Test | Temperature: 150°C Duration: 500 hours | JESD22-A103E | No abnormal phenomenon was found. Functional test passed. |
| 3 | Temperature Cycling Test | Temperature range: -55°C to +125°C -55°C for 30 minutes +125°C for 30 minutes Duration: 100 cycles with 1 cycle = 70 minutes | JESD22-A104E | No abnormal phenomenon was found. Functional test passed. |
| 4 | Low Temperature Storage Test | Temperature: -40°C Duration: 500 hours | JESD22-A119E | No abnormal phenomenon was found. Functional test passed. |
| 5 | Temperature & Humidity Storage Test | Temperature: 85°C Humidity: 85% RH Duration: 500 hours | JESD22-A101D | No abnormal phenomenon was found. Functional test passed. |
| 6 | Highly Accelerated Temperature and Humidity Stress Test | Temperature: 130°C Humidity: 85% RH Duration: 96 hours | JESD22-A-118B | No abnormal phenomenon was found. Functional test passed. |

REVISION TABLE

| Revision | Date | Status | Notes |
|----------|------------|-----------------|---------------------|
| 001 | 01/10/2021 | Initial release | Initial publication |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |

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