



AS53F SERIES

3300V ▲ SiC MOSFET RELAY

SILICON CARBIDE SiC MOSFET RELAY ▲ SMD type

High voltage with low on-resistance

Fast reverse recovery time

SMD16 wide body package







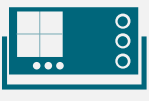
Creepage and clearance ≥ 8mm (input to output)

Creepage ≥ 8mm ▲ Between drain pins of MOSFETs

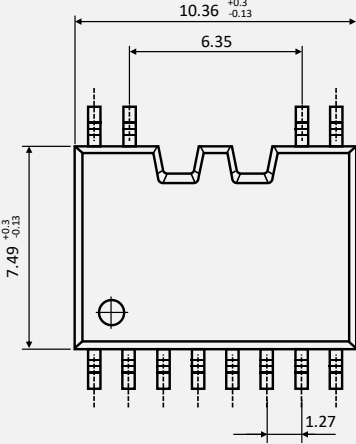
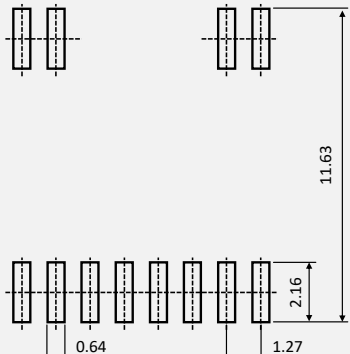
SPECIFICATION

| Item | | Characteristics |
|-------------------------------|-------------|---------------------------------|
| Contact Form | | 1 Form A ▲ Normally open switch |
| Load Voltage | V_L | 3300V |
| Operation LED Current | $I_{F\ ON}$ | 5.0mA |
| Load Current | I_L | 350mA |
| On-Resistance | R_{ON} | 3.2Ω |
| Output Capacitance | C_{OUT} | 220pF |
| Low Off-State Leakage Current | I_{LEAK} | 1μA at 3300V _{DC} |

APPLICATIONS

| Automatic Test Equipment | Battery Management | Building Automation | Energy Storage Systems | EV Charging | Industrial Automation | Measurement Equipment |
|---|---|---|---|--|---|---|
|  |  |  |  |  |  |  |

DIMENSIONS

| Dimensions ▲ SMD16 Package | PCB Board Pattern |
|---|---|
|  |  |

PIN DESCRIPTION AND PART NUMBER

| Circuit Diagram Top View | Pin Description | Part No. | Package | Packing |
|--------------------------|---|-------------------|----------------|--------------------------------|
| | 1, 2 NC 3, 5 Cathode (-) ■ LED 4 Anode (+) ■ LED 6, 7, 8 NC 9, 10 Drain ■ MOSFET 1 15, 16 Drain ■ MOSFET 2 | AS53F AS53F-R1 | SMD16 SMD16 | Tube (43pcs) Reel (1000pcs) |

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

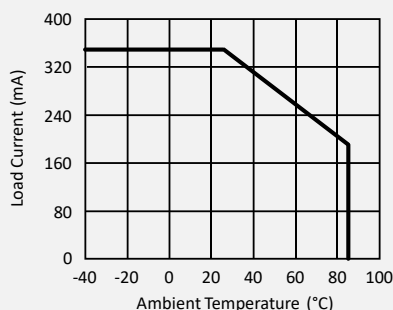
| Item | Condition | Symbol | Value | Unit |
|--------|-----------------------------|------------|-------------|--------------------|
| Input | Continuous LED Current | I_F | 50 | mA |
| | Peak LED Current | I_{FP} | 500 | mA |
| | LED Reverse Voltage | V_R | 5 | V |
| | Input Power Dissipation | P_{IN} | 75 | mW |
| Output | Load Voltage | V_L | 3300 | V (AC peak or DC) |
| | Load Current | I_L | 350 | mA |
| | Peak Load Current | I_{PEAK} | 1050 | mA |
| | Output Power Dissipation | P_{OUT} | 550 | mW |
| Relay | Total Power Dissipation | P_T | 600 | mW |
| | I/O Breakdown Voltage | $V_{I/O}$ | 5000 | Vrms |
| | Operating Temperature Range | T_{OPR} | -40 to +105 | $^{\circ}\text{C}$ |
| | Storage Temperature Range | T_{STG} | -40 to +125 | $^{\circ}\text{C}$ |

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

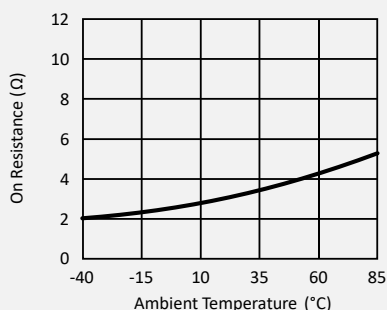
| Item | | Condition | Symbol | Min. | Typ. | Max. | Unit |
|-------------------|--|--|--------------------|------------------|------|------|------|
| Input | LED Forward Voltage | I _F = 10mA | V _F | 1 | 1.33 | 1.5 | V |
| | Operation LED Current | | I _{F ON} | | 2.4 | 5 | mA |
| | Recovery LED Voltage | | V _{F OFF} | 0.5 | 1.2 | | V |
| Output | On-Resistance Drain to Drain (tested within 1 sec.) | I _F =10mA, I _L =Rating | R _{ON} | | 3.2 | 4 | Ω |
| | Off-State Leakage Current | V _L =3300V | I _{LEAK} | | | 1 | μA |
| | Output Capacitance | V _L =0V, f=1 MHz | C _{OUT} | | 220 | | pF |
| Trans- mission | Turn-On Time | I _F =10mA, I _L =Rating | T _{ON} | | 1 | 3 | ms |
| | Turn-Off Time | I _F =10mA, I _L =Rating | T _{OFF} | | 0.05 | 1 | ms |
| Coupled | I/O Insulation Resistance | | R _{I/O} | 10 ¹⁰ | | | Ω |
| | I/O Capacitance | f=1MHz | C _{I/O} | | 1.3 | | pF |

REFERENCE DATA

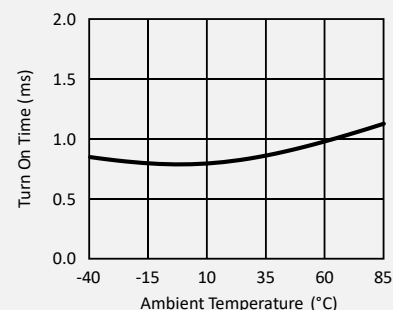
Load current vs. ambient temp.



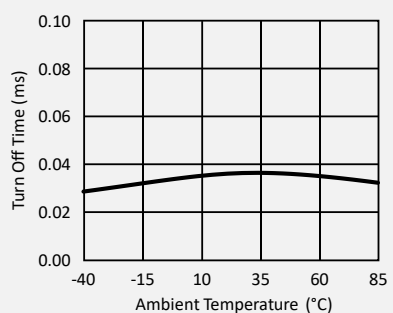
On resistance vs. ambient temp.



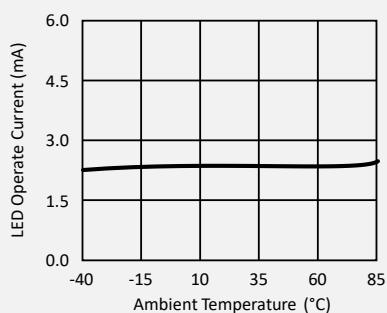
Turn on time vs. ambient temp.



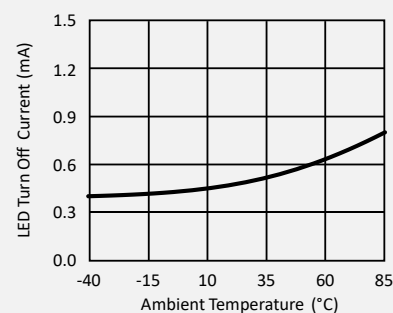
Turn off time vs. ambient temp.



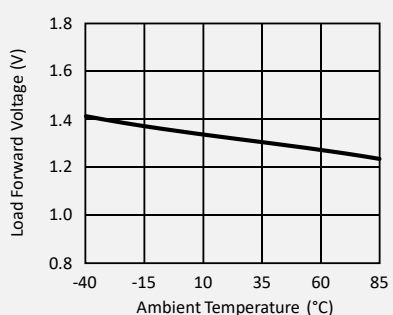
LED operate current vs. ambient temp



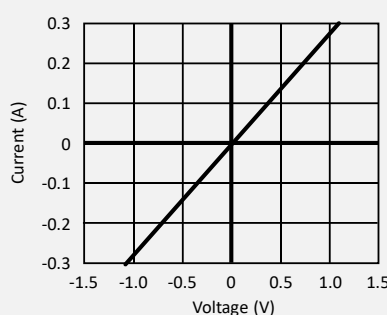
LED turn off current vs. ambient temp.



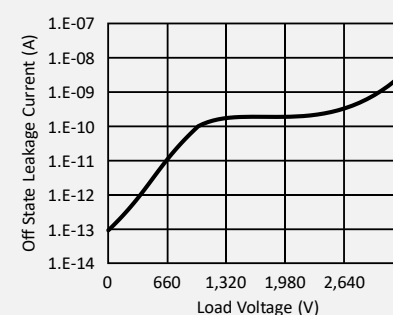
Load forward voltage vs. ambient temp.



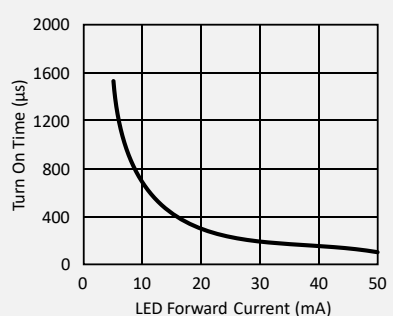
Current vs. voltage characteristics of output at MOS portion



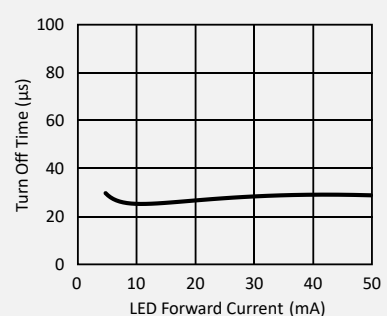
Off state leakage current vs. load voltage



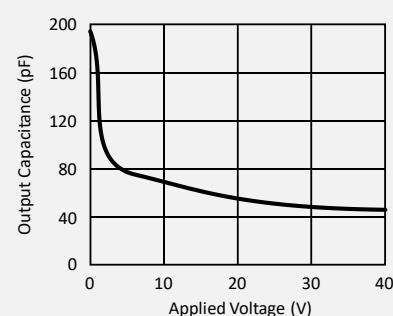
Turn on time vs. LED forward current



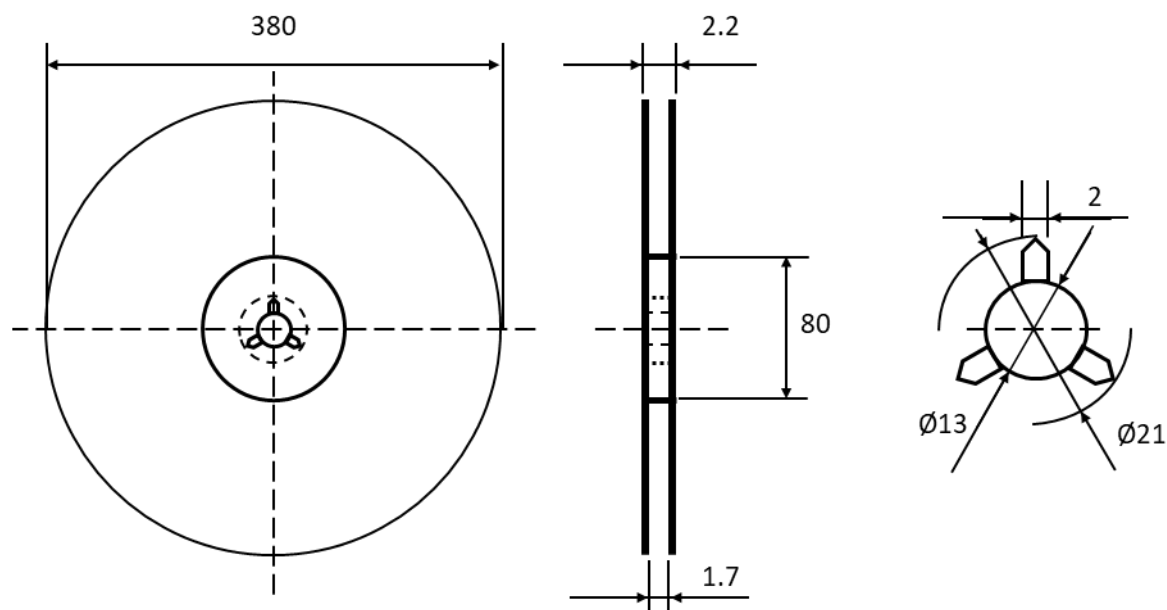
Turn off time vs. LED forward current



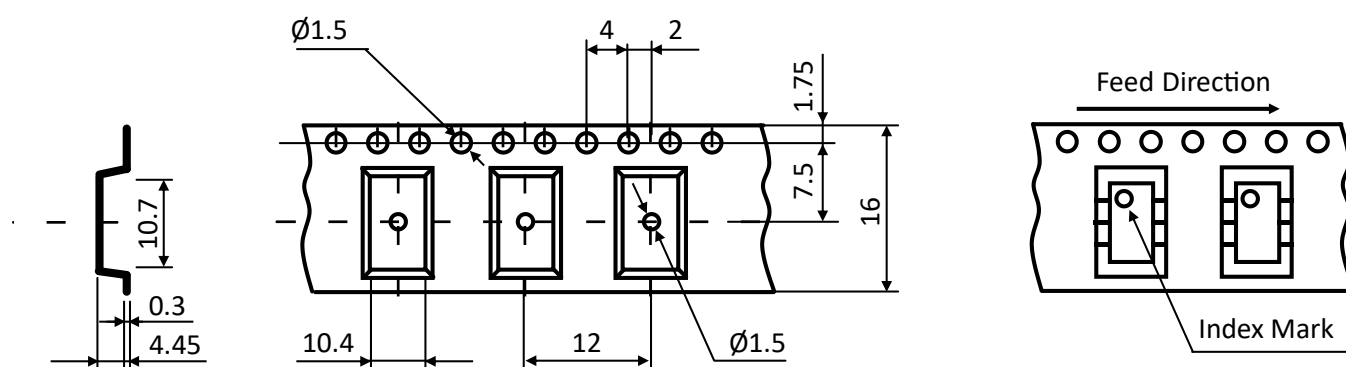
Output capacitance vs. applied voltage



REEL DIMENSIONS ▲ All dimensions in mm



TAPE DIMENSIONS ▲ All dimensions in mm



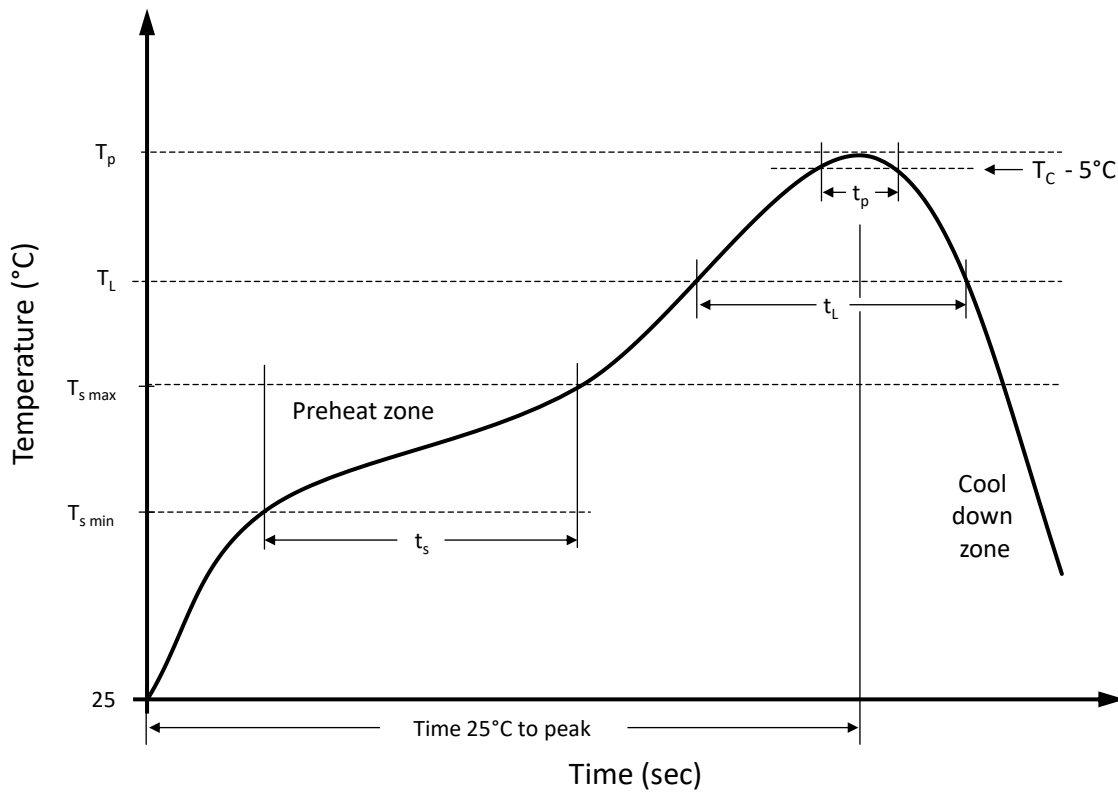
| Tape and Reel Packing | PCS/Reel |
|-----------------------|----------|
| SMD16 | 1000 |

| Tube Packing | PCS/Tube | Tubes/Box | Units/Box |
|--------------|----------|-----------|-----------|
| SMD16 | 43 | 32 | 1376 |

STORAGE AND HANDLING CONDITIONS

| ESD level | Floor life | Conditions | MSL |
|-------------|------------|---------------------------------|-----|
| HBM class 2 | Unlimited | T _A < 30°C, RH < 85% | 1 |

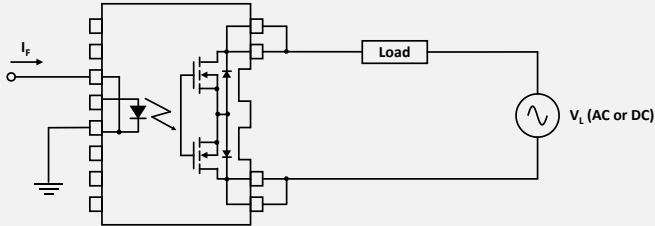
RECOMMENDED REFLOW SOLDERING PROFILE ▲ SMD PACKAGE



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 |
|---------|---------------|--|----------------------------------|
| 16 pins | A AC or DC |  | Control bi-directional signal |

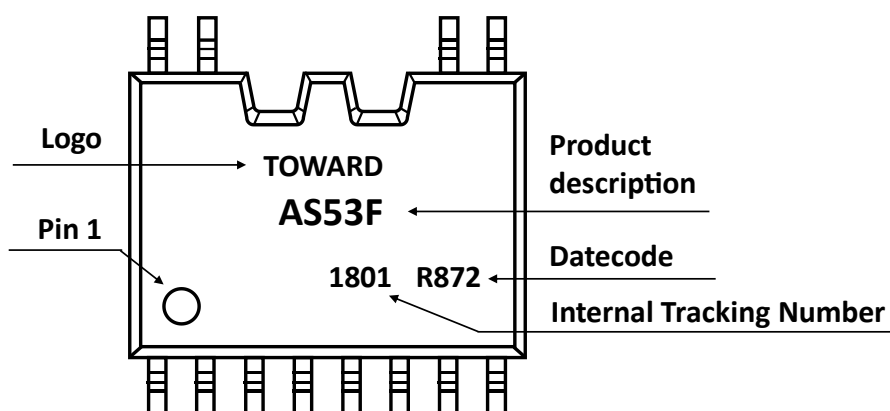
PRODUCT CODE

Example: AS53F series ▲ 3300V ▲ SMD16 ▲ Tape & Reel

| AS | | 58 | | F | | R1 | |
|---------|----|--------|-------|------|-----|-------------|--------------|
| Package | | Series | | Type | | Packing | |
| AS | 16 | 53 | 3300V | F | SMD | Blank R1 | Tube Reel |

PRODUCT MARKING

Package SMD16



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 | | |
| | | ... | ... | ... | ... | | |
| | | G | 2026 | 12 | Dec | | |
| | | | | | | | |

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-A118B | 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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