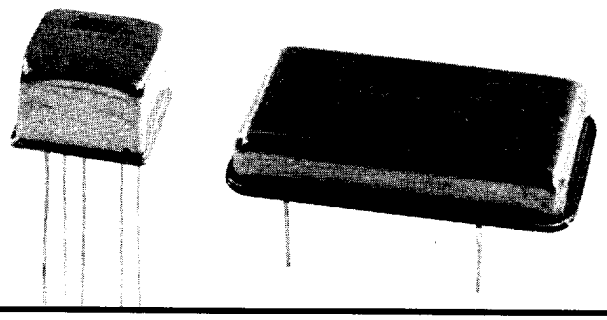
# 53000
# 53004 through 53010
# SPST SOLID-STATE RELAYS

## FEATURES

- Replacements for M85F, M86F, M90F, M91F
- SPST Normally Open
- Up to 1200 V RMS Optical Isolation
- CMOS or TTL Compatible Input
- Power FET Output
  - Low On-state Resistance
- Full Military Temperature Operation: -55°C to +125°C
- Improved Thermal Characteristics
- Temperature Range

## MILITARY SPST SOLID STATE RELAYS



## GENERAL DESCRIPTION

The MII 53000 and 53004 through 53010 are military SPST solid-state relays. These light-weight devices are resistant to damage from shock and vibration, and are immune to contact-related problems (contamination, arcing) associated with mechanical equivalents.

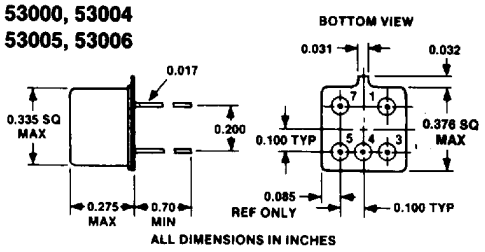
Optical coupling between the input and output stages provides effective isolation up to 1200 volts AC RMS. Power FET outputs eliminate bipolar offset, and minimize output voltage drop.

The control logic is TTL and CMOS compatible, and will accommodate bias supplies between 3.8 and 32 VDC. A built-in Schmitt trigger increases noise margin when using the device in the CMOS input mode.

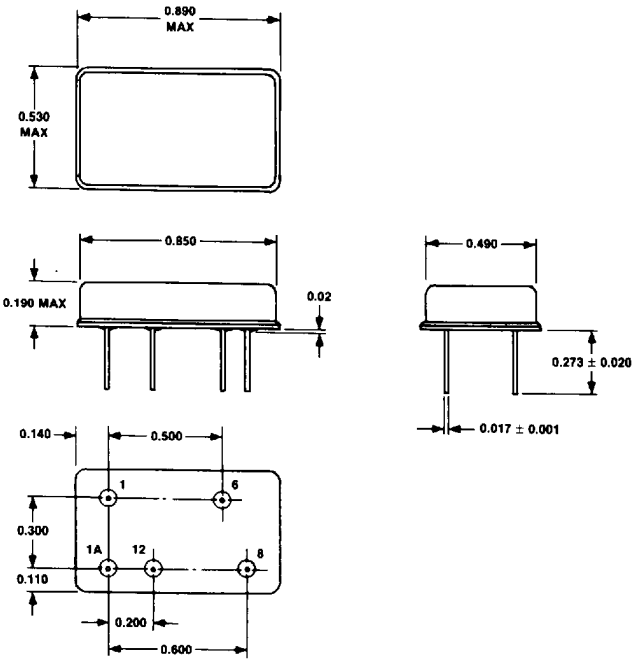
These solid-state relays are ideal for use in military systems, or wherever high reliability, low power actuation, and light weight are design considerations. Applications include general purpose signal switching and electronic load control.

## PACKAGE DIMENSIONS

**53000, 53004**
**53005, 53006**




**53007, 53008,**
**53009, 53010**



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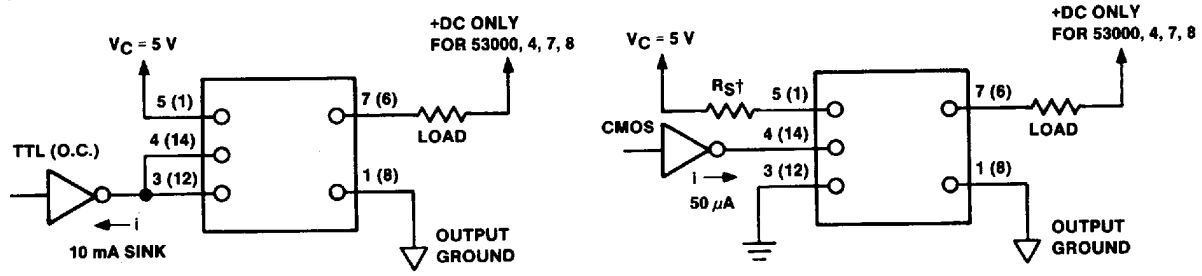
## APPLICATION INFORMATION[1]

(53007-53010 PIN NUMBERS IN PARENTHESIS)




**TTL CONFIGURATION** **CMOS CONFIGURATION**

†Limiting resistor ($R_s$) may be required. See Table 1.
[1]Both circuits shown are logically inverting

## TABLE 1
## LIMITING RESISTANCE ($R_S$) VALUES
**(Without Heat Sink)**

| V (VDC) | 3.8-6 | 6-10 | 10-14 | 14-18 | 22-26 | 26-32 |
|---|---|---|---|---|---|---|
| R ( Ω ) | | 300 | 620 | 910 | 1500 | 2000 |
| Rating (W) | | 1/4 | 1/4 | 1/2 | 1/2 | 1 |

## ABSOLUTE MAXIMUM RATINGS

Isolation Voltage: 53000, 53004, 53005, 53006 ..... 1000 VAC RMS
53007, 53008, 53009, 53010 ..... 1200 VAC RMS
Operating Temperature .....-55°C to +125°C Case
Storage Temperature ..... -55°C to +125°C

## ELECTRICAL CHARACTERISTICS*

$T_A$ = +25°C

| PARAMETER | CONDITIONS | MIN | TYP | MAX | UNITS |
|---|---|---|---|---|---|
| Input (Control) Characteristics TTL Configuration | | | | | |
| Input Current | | | 13 | 16 | mA |
| Control Voltage Range | See Table 1 - Bias Resistance | 3.8 | | 32 | VDC |
| Turn-Off Voltage | | | | 1.5 | VDC |
| Turn-On Voltage | | 3.8 | | | VDC |
| Input (Control) Characteristics CMOS Configuration | | | | | |
| Input Current | | | 25 | 50 | μA |
| Control Voltage Range | | 2.5 | | 18 | VDC |
| Bias Supply - $V_C$ | See Table 1 - Bias Resistance | 3.8 | | 32 | VDC |
| Bias Current | | | 13 | 16 | mA |
| Turn-Off Voltage @ 5 V $V_C$ | | | 3.5 | | VDC |
| Turn-On Voltage | | 0.5 | | | VDC |
| Total Schmitt Hysteresis | | | 1.8 | | VDC |



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## ELECTRICAL CHARACTERISTICS*

$T_A$ = +25°C

| PARAMETER | CONDITIONS | 53005 | 53009 | 53006 | 53010 | UNITS |
|---|---|---|---|---|---|---|
| Maximum Continuous Operating Output Voltage | | 60 Volts Peak | | | | Volts |
| Maximum Load Current | 25 °C | 0.4 | 0.54 | 0.7 | 0.95 | Amps DC or RMS |
| On Resistance - Typical | | 1.2 | 1.2 | 0.60 | 0.60 | Ohms |
| - Maximum | | 1.6 | 1.6 | 0.70 | 0.70 | Ohms |
| Maximum Output Capacitance | 25 V, 1 MHz | 80 | 80 | 200 | 200 | pF |
| Maximum Input-Output Capacitance | 25 V, 1 MHz | 5 | 5 | 5 | 5 | pF |
| Typical Thermal Resistance, θJA | | 120 | 90 | 100 | 70 | °C/W |
| θJC | | 32 | 30 | 25 | 25 | °C/W |
| Typical Rise Time, $t_r$ | 10% - 90% Load Voltage | 300 | 300 | 600 | 600 | µs |
| Typical Fall Time, $t_f$ | 90% - 10% Load Voltage | 50 | 50 | 50 | 50 | µs |
| Typical On Delay, tdON | Min. Turn On Volts to 10% Load | 150 | 150 | 200 | 200 | µs |
| Typical Off Delay, tdOFF | Max. Turn Off Volts to 90% Load | 20 | 20 | 15 | 15 | µs |
| Maximum Surge Voltage | 2 Second Maximum | 80 | 80 | 80 | 80 | VDC or Peak |
| Typical Leakage Current | 60 V | 10 | 10 | 10 | 10 | µA |
| Minimum Dielectric Strength | | 1000 | 1200 | 1000 | 1200 | V RMS |
| Typical Isolation Resistance | Input to Case, 500 V | $10^9$ | $10^9$ | $10^9$ | $10^9$ | Ohms |

**NOTES:** $t_{ON} = t_r + t_{dON}$
$t_{OFF} = t_f + t_{dOFF}$

## ELECTRICAL CHARACTERISTICS*

$T_A$ = +25°C

| PARAMETER | CONDITIONS | 53004 | 53007 | 53000 | 53008 | UNITS |
|---|---|---|---|---|---|---|
| Maximum Continuous Operating Output Voltage | | 60 VDC | | | | Volts |
| Maximum Load Current | 25 °C | 0.56 | 0.75 | 1.0 | 1.35 | Amps DC |
| On Resistance - Typical | | 0.60 | 0.60 | 0.30 | 0.30 | Ohms |
| - Maximum | | 0.90 | 0.90 | 0.35 | 0.35 | Ohms |
| Maximum Output Capacitance | 25 V, 1 MHz | 160 | 160 | 400 | 400 | pF |
| Maximum Input-Output Capacitance | 25 V, 1 MHz | 5 | 5 | 5 | 5 | pF |
| Typical Thermal Resistance, θJA | | 120 | 90 | 100 | 70 | °C/W |
| θJC | | 32 | 30 | 25 | 25 | °C/W |
| Typical Rise Time, $t_r$ | 10% - 90% Load Voltage | 300 | 300 | 600 | 600 | µs |
| Typical Fall Time, $t_f$ | 90% - 10% Load Voltage | 50 | 50 | 10 | 10 | µs |
| Typical On Delay, tdON | Min. Turn On Volts to 10% Load | 250 | 250 | 200 | 200 | µs |
| Typical Off Delay, tdOFF | Max. Turn Off Volts to 90% Load | 20 | 20 | 15 | 15 | µs |
| Maximum Surge Voltage | 2 Second Maximum | 80 | 80 | 80 | 80 | VDC or Peak |
| Typical Leakage Current | 60 V | 10 | 10 | 10 | 10 | µA |
| Minimum Dielectric Strength | | 1000 | 1200 | 1000 | 1200 | V RMS |
| Typical Isolation Resistance | Input to Case, 500 V | $10^9$ | $10^9$ | $10^9$ | $10^9$ | Ohms |

**NOTES:** $t_{ON} = t_r + t_{dON}$
$t_{OFF} = t_f + t_{dOFF}$



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