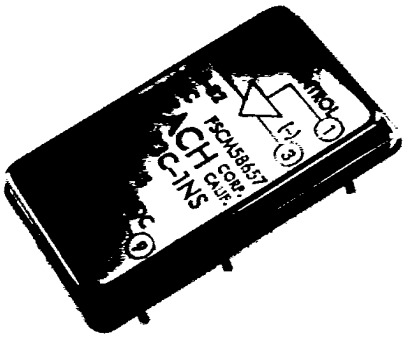
LEACH® CORPORATION

INTELLIGENT SWITCHING DEVICE (ISD)
SSR
(5A-DC-SPST-NO)

Description



This all Solid State Relay (SSR) utilizes the latest power FET technology to minimize on-state resistance and bipolar offset voltages normally associated with solid state relay outputs. An output status pin provides feedback on the output state of the power controller. A high status indicates the output section is on. Additionally, the L-M33C-1NS features integrated short-circuit and current overload protection to protect both the unit and system wiring.

The input and output are optically isolated to protect delicate input logic circuits from output voltage transients. The input is buffered to enable the power controller to be driven directly by standard CMOS or open collector TTL logic. State-of-the-art solid state construction techniques maximize MTBF and minimize package size.

The L-M33C-1NS is housed in a hermetic metal DIP package to maximize heat dissipation.

Features

- Power FET output
- Low voltage drop
- Integrated short-circuit/current overload protection
- Trip-free characteristics
- High MTBF
- Discrete status
- Optical isolation
- Input TTL/CMOS logic compatible
- Fast switching speed
- Meets 28 VDC MIL-STD-704 surge and spike requirements

Applications

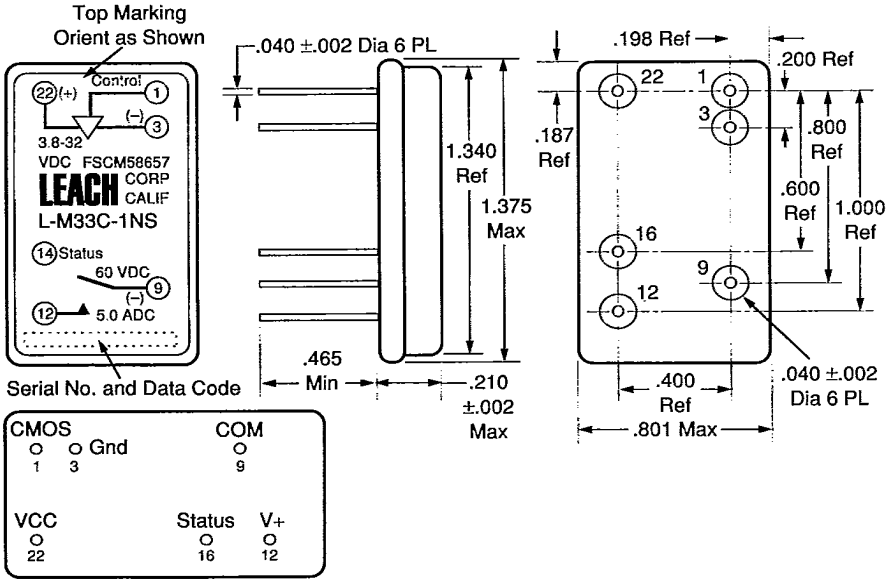
- Manual and automated electrical aerospace systems
- Combined load switching and wire protection
- Load switching in high vibration and shock environments
- High MTBF switching requirements

Physical Data

- ENCLOSURE: 22 pin DIP, hermetically sealed
- MATERIAL:
  - Header
    - – Cold rolled steel nickel plated
  - Pins
    - – Copper core, alloy #52 clad gold plated
  - Can
    - – Cold rolled steel nickel plated
- WEIGHT: 20 grams max. (0.7 oz)

Part Number
L-M33C-1NS

(Dimensions in Inches)



Electrical Characteristics (–55°C to 105°C Ambient Temperature Unless Otherwise Noted)

		Min	Typ	Max	Units
INPUT (CONTROL) CHARACTERISTICS					
When Used In 2 Terminal Configuration					
(TTL) See Figure 1					
Bias Current	at 5 VDC		14	15	mA
	at 32 VDC (Table 1)			16	mA
Turn-Off Maximum (For Guaranteed Off)				1.5	VDC
Turn-On Minimum (For Guaranteed On)		3.8			VDC
Reverse Voltage Protection				–32	VDC
Bias Supply Range (See Table 1)		3.8		32	VDC
INPUT (CONTROL) CHARACTERISTICS					
When Used In 3 Terminal Configuration					
(CMOS) See Figure 1, Note 1.					
Control Current	at 5 VDC			250	µA
	at 18 VDC			1	mA
Control Voltage Range		0		18	VDC
Bias Supply Range V_{DD} (See Table 1)		3.8		32	VDC
Bias Current at 5 VDC			14	15	mA
Turn-Off Voltage	at –55°C to +25°C	3.2			VDC
	at –25°C to +105°C	2.8			VDC
Turn-On Voltage	at –55°C to +25°C			0.5	VDC
	at 25°C to +105°C			0.3	VDC
OUTPUT (LOAD) SPECIFICATIONS					
Continuous Load Current (See Figure 4)				5.0	Amps
Surge Current Ratings (See Figure 5)					
Leakage Current at 60 VDC				2.0	mA
Output Voltage Drop (See Note 9)				0.5	VDC
Continuous Operating Output Voltage				60	VDC
Transient Blocking Voltage (See Note 13)				80	VDC
On-State Resistance R_{ds} (on) at 25°C at 100 mA. (See Note 9)				0.10	Ohms
Turn-On Time (See Figure 3, Note 9)	at –55°C to +25°C			3.0	mSec
	at –25°C to +105°C			5.0	mSec
Turn-Off Time at –55°C to +105°C				2.0	mSec
Status Supply Range		1		18	VDC
Status Supply Blocking Voltage				30	VDC
Leakage Current at 16 VDC				4	µA
Status Current				600	µA
Output Junction Temperature (T_J Max)				+125	°C
Thermal Resistance Junction to Ambient (θ_{JA})				30	°C/W
Thermal Resistance Junction to Case (θ_{JC})				7	°C/W
Electrical System Spike (10 µSec)				±600	VDC
Output Capacitance V_{DD} = 25 VDC, 0.1 MHz				1500	pf
Input to Output Capacitance				10	pf
Dielectric Strength				1000	VAC
Insulation Resistance at 500 VDC		10^9			Ohms

Notes: (Unless Otherwise Specified)

1. Control input is compatible with CMOS or open collector TTL (with pull up resistor).
2. When using the status feature, RPC must be operated in 3-terminal configuration (pin 12 must be tied to input ground).
3. The status is an open-drain, N-channel MOS FET referenced to input ground.
4. Maximum input repetition rate into shorted load not to exceed 10 Hz.
5. System series inductance in "load-shorted" mode of operation to be ≤ 50 microhenries.
6. Reversing polarity of output may cause permanent damage.
7. Inductive loads must be diode suppressed.
8. Input transition should be ≤ 1 mSec duration and input drive should be "bounceless contact" type.
9. The rated input voltage for functional tests shall be 5 VDC. This includes tests for On-Resistance, Output Voltage Drop, Timing, and Short-Circuit Protection.
10. Overload testing to the requirements of MIL-R-28750 is constrained to the limits imposed by the Short-Circuit Protection requirements of this specification.
11. For on-state resistance at junction temperatures greater than +25°c, use the following equation:

$$R = R_o\, e^{(0.006\, T(J) - 25°C)} + R_S$$

where $R(T_J)$= on resistance at T_J in ohms

T_J = Junction temperature in °C

R_o = Resistance at +25°C (.10 ohm)

e = 2.7182818

R_S = Lead resistance = 0.05 ohm max

12. All power FET relays and RPC's may drive loads connected to either positive or negative referenced power supply lines.
13. Transient Voltage requirements are limited to 80 VDC max per MIL-STD-704A.

Table 1
Bias Supply Series Resistors

Vc Range	Rs Ohms	Power Rating Watts
3.8–6 V	Not Required	
6–10 V	300	1/4
10–14 V	620	1/4
14–18 V	910	1/2
18–22 V	1200	1/2
22–26 V	1500	1/2
26–32 V	2000	1

Table 2
Truth Table for Status

Control Voltage	Output State	Status
High	Off	Low (V_{DS} ≤ 0.4 VDC)
Low	On	High (Open Drain)

Block Diagram

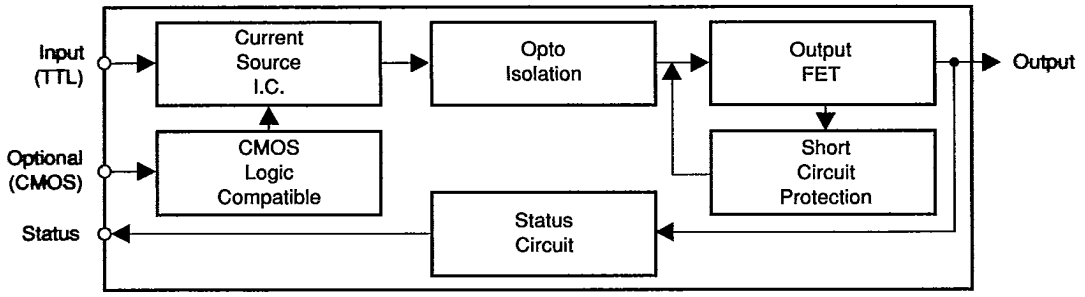
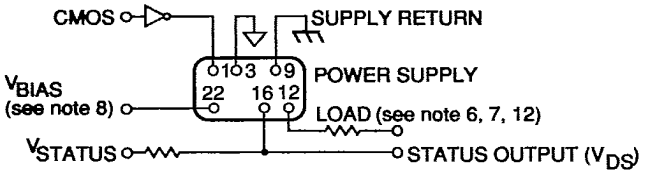
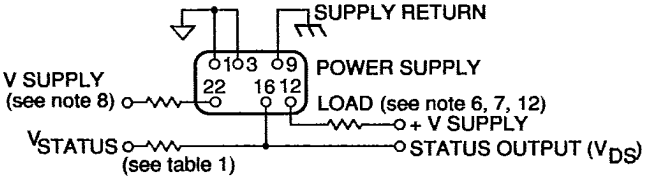
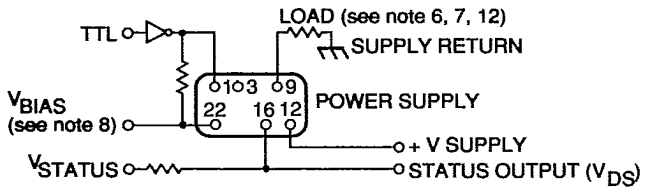


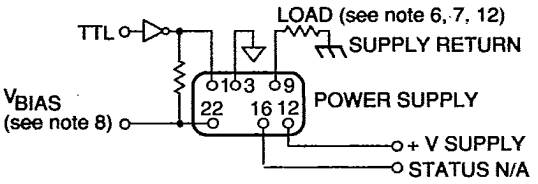
Figure 1
Wiring Configurations







Three Terminal Application



Two Terminal Application

Figure 2
Maximum Bias Current Versus Bias Voltage

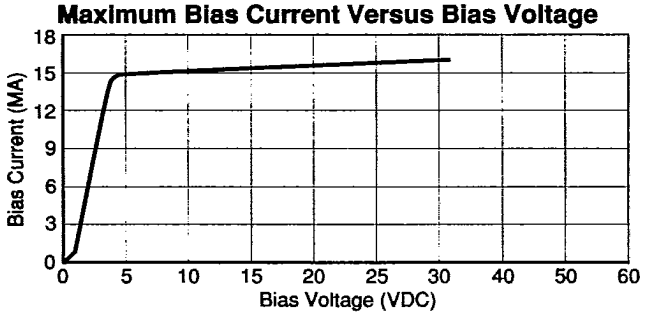


Figure 3
Turn-On and Turn-Off Timing

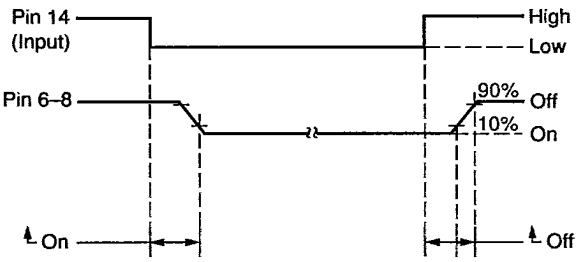


Figure 4
Temperature Derating Curve
(Maximum Load Versus Ambient Temperature)

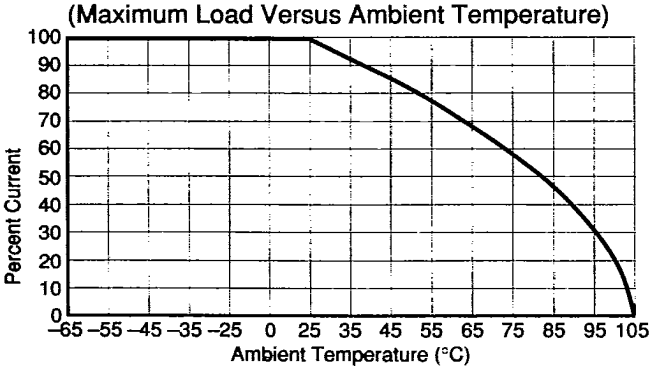


Figure 5
Current Trip Levels
(Maximum Current Surge Without Tripping)

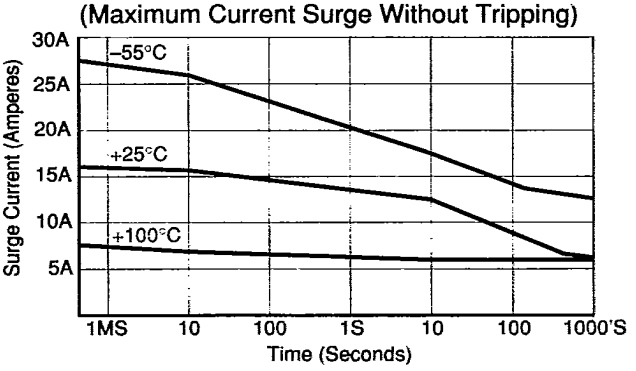


Figure 6
Typical Current Pulse When Turning On the Remote Power Controller Into a Shorted Load

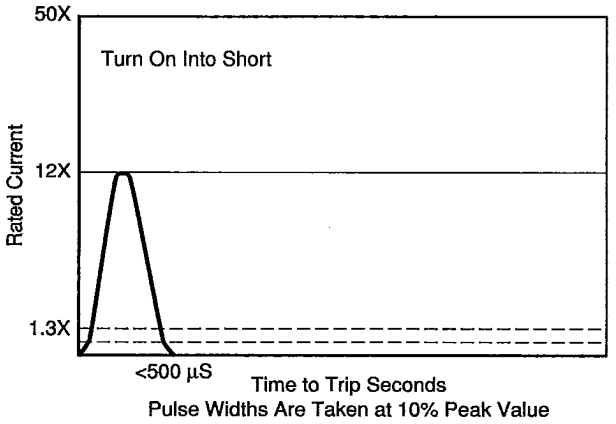
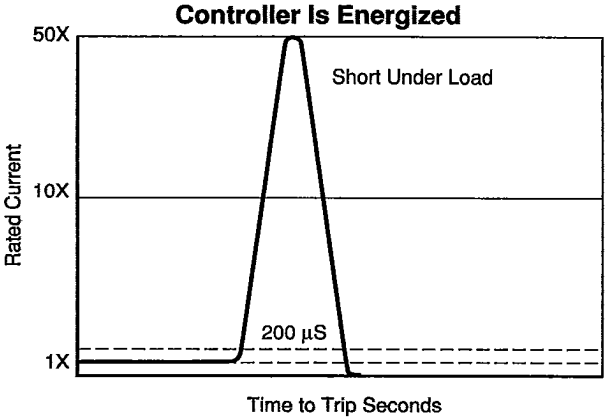


Figure 7
Typical Current Pulse for Mechanically Shorting Load While the Remote Power Controller Is Energized



Environmental Data

- Temperature Range:
  - Operating –55°C to + 105°C
  - Storage –55°C to + 125°C
- Vibration 100g, 10 to 3000 Hz
- Acceleration 5000g
- Shock 50g, 11 mSec

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