TELEDYNE
RELAYS
A Unit of Teledyne Electronic Technologies

SMART Series KA/LA

2.0 to 7.5A, 250 Vrms Optically Isolated
AC Solid-State Relay

Part Number*	Relay Description
KA00HF	2 A, 250 Vrms, AC Solid-State Relay
KA58HF	2 A, 250 Vrms, AC Solid-State Relay with Thermal Protection and Thermal TRIP Status
LA00HL	7.5 A, 250 Vrms, AC Solid-State Relay
LA58HL	7.5 A, 250 Vrms, AC Solid-State Relay with Thermal Protection and Thermal TRIP Status

* The Y suffix denotes parameters tested to MIL-PRF-28750 test methods. The W suffix denotes parameters tested to Teledyne specifications.

ELECTRICAL SPECIFICATIONS

(-55°C TO +110°C UNLESS OTHERWISE SPECIFIED)

INPUT (CONTROL) CHARACTERISTICS

2 Terminal Configuration (See Fig. 1)	Min	Max	Units
Input Voltage (See note 2)	3.8	32	Vdc
Input Current (See Figure 1)			
V_{IN} = 5 Vdc		15	mA dc
Turn-Off Voltage (Guaranteed Off)		1.5	Vdc
Turn-On Voltage (Guaranteed On)	3.8		Vdc
Reverse Voltage Protection		-32	Vdc

INPUT (CONTROL) CHARACTERISTICS

3 Terminal Configuration (See Fig. 1)	Min	Max	Units
Bias Voltage (See note 2)	3.8	32	Vdc
Bias Current (V_{IN}=32 Vdc)		16	mA
Control Voltage Range	0	18	Vdc
Control Current (at 5 Vdc)		250	µAdc
Turn-On Control Voltage		0.3	Vdc
Turn-Off Control Voltage	3.2		Vdc

OUTPUT (LOAD) SPECIFICATIONS

	Min	Max	Units
Load Voltage	20	250	Vrms
Frequency Range	40	440	Hz
Continuous Load Current (See Figure 3)			
KA and LA without Heat Sink		2.0	Arms
LA with Heat Sink		7.5	Arms
Output Voltatge Drop		1.2	Vrms

FEATURES/BENEFITS

- Available with thermal protection and thermal TRIP status: Provides self-protection from thermal runaway conditions and indicates protection state for system BIT.
- Optical Isolation: Isolates control elements from load transients with reduced EMI.
- Fully Floating Output: Eliminates ground potential loops and allows the output to sink or source current.
- Buffered Control: Relay can be controlled directly from TTL or CMOS logic circuits.
- Integral Snubber Circuit: Enhances dV/dt capability while minimizing EMI.

DESCRIPTION

The Series KA/LA solid-state relays (SSRs) is designed for use in AC power switching applications where safety and reliability are primary concerns. These SSRs are rated for load voltages up to 250 Vrms from 40 to 440 Hz and are ideal for resistive and reactive loads with power factors as low as 0.2. Inverse parallel SCRs are configured for zero voltage turn on. Optical isolation to 1250 Vrms between the control (input) and load (output) allows the load to be safely controlled by logic circuitry. The KA/LA series is available with thermal protection and thermal TRIP status. In case of a thermal runaway condition, the SSR will shut down the output switch and latch off until the input is reset and the junction temperature returns to a safe level. When the output does latch off, the TRIP status line will yield a logic level output indicating the protection state of the SSR. This feature provides the user with failure mode indication while enhancing the system diagnostic capability. These SSRs are available to the Y screening level of MIL-PRF-28750 and are packaged in low-profile hermetically sealed cases.

OUTPUT (LOAD) SPECIFICATIONS

	Min	Max	Units
Off-State Leakage Current (250 Vac, 400 Hz)		10	mA
Turn-On Time		1/2	Cycle
Turn-Off Time		1	Cycle
Transient Voltage (5 sec, 25°C)		±500	V pk
Zero Voltage Turn-On Point		±15	V pk
dv/dt	100		V/µs
Surge Current	MIL-PRF-28750		
Load Power Factor	0.2		
Insulation Resistance @ 500 Vdc	10^9		Ohm
Input to Output Capacitance		15	pF
Dielectric Withstanding Voltage (60Hz)	1250		Vrms
Junction Temperature at Rated Current (T_J Max)		125	°C
Thermal Resistance Junction to Ambient (θ_{JA})		30	°C/W
Thermal Resistance Junction to Case (θ_{JC})		5	°C/W

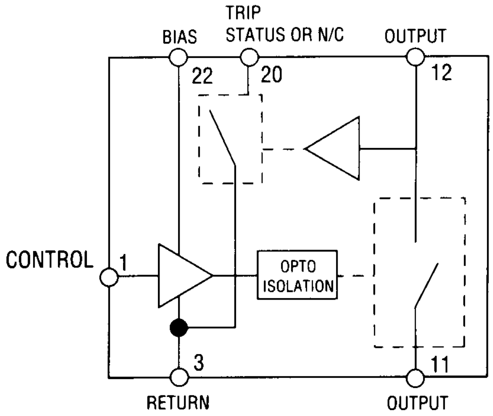
STATUS OUTPUT TRUTH TABLE

Status Output State	Control Input	Output (Load) State
Off (High)	Low	On
On (Low)	Low	Tripped (Off)
Off (High)	High	Off
On (Low)	High	Non-applicable condition

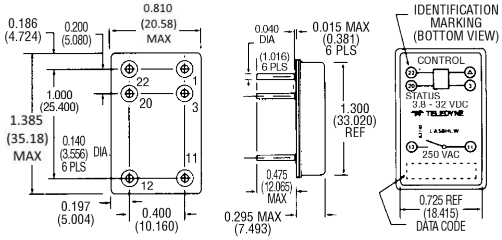
STATUS OUTPUT SPECIFICATIONS

	Min	Max	Units
Status Supply Voltage		32	Vdc
Status "OFF" Leakage Current @ 32 Vdc		10	µAdc
Status Sink Current ($V_{so} \leq 0.4$ Vdc)		10	mAdc
Status "ON" State Voltage @10mAdc		0.4	Vdc

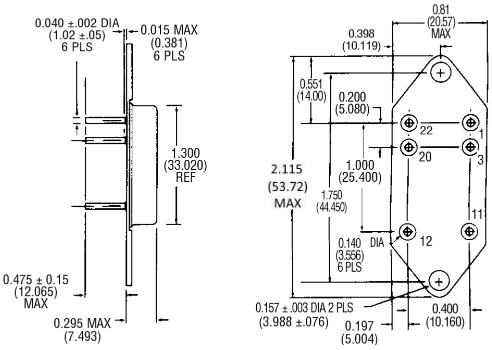
BLOCK DIAGRAM

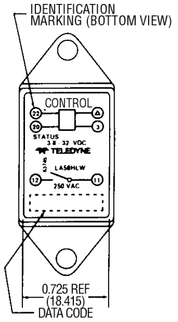


MECHANICAL SPECIFICATIONS



KA SERIES





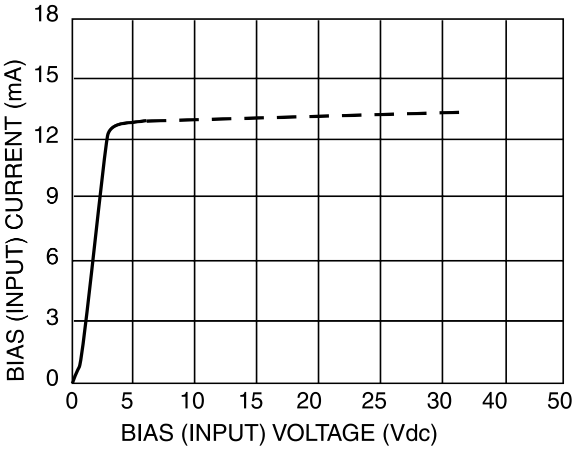
ENCLOSURE:	Hermetically Sealed DIP	
LEAK RATE:	1 x 10-^{8} CC/Sec Maximum	
MATERIAL:	Header	- Cold Rolled Steel Nickel Plated
	Pins	- Copper Core
	Can	- Cold Rolled Steel Nickel Plated
WEIGHT:	20 grams max	
TOLERANCE:	.XX	= ±.010 (±.25)
	.XXX	= ±.005 (±.13)

LA SERIES

DIMENSIONS ARE SHOWN IN INCHES (MILLIMETERS)

ENVIRONMENTAL SPECIFICATIONS

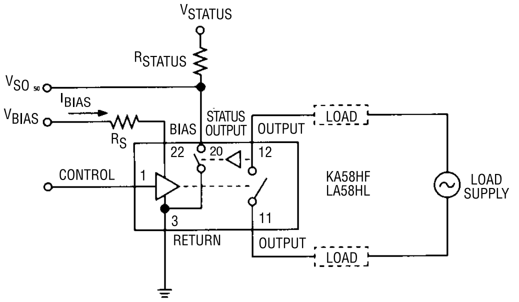
	Min	Max	Units
Ambient Temperature			
Operating	-55	+110	°C
Storage	-55	+125	°C
Shock (0.5 ms Pulse)		1500	g
Vibration (100 g)	10	3000	Hz
Acceleration		5000	g



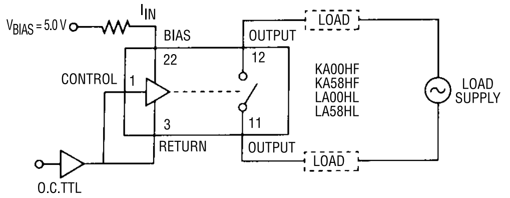
INPUT CURRENT VS VOLTAGE
FIGURE 2 (SEE NOTE 2)

NOTES:

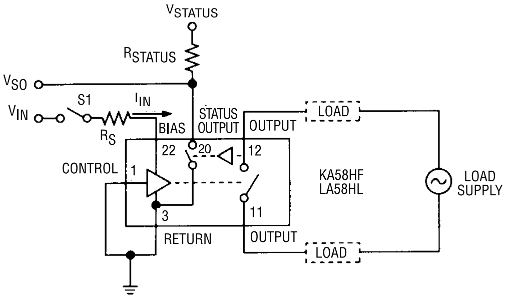
1. Control input is compatible with CMOS or open collector TTL (with pull up resistor).
2. For bias voltages above 6 Vdc, a series resistor is recommended. Use a standard resistor value equal to or less than the value found from Figure 6.
3. Unless otherwise noted, the input voltage for functional tests shall be 5 Vdc.
4. Output may temporarily lose blocking capability during and after a surge, until T_J falls below maximum.
5. Transient suppression must be used to limit the voltage to < 500 Vpeak when switching inductive loads.



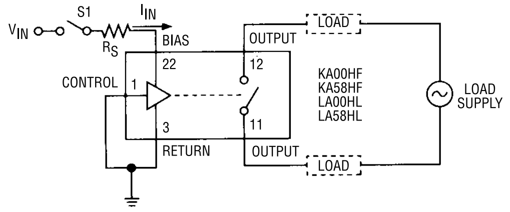
(A) 3 TERMINAL INPUT WITH STATUS (See Note 7)



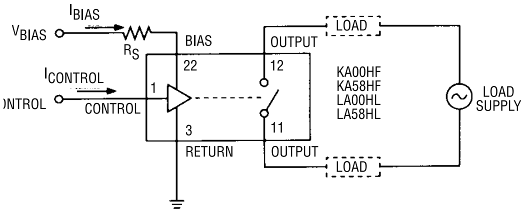
(B) 2 TERMINAL INPUT (OPEN COLLECTOR TTL DRIVE)



(C) 2 TERMINAL INPUT (DIRECT DRIVE) WITH STATUS



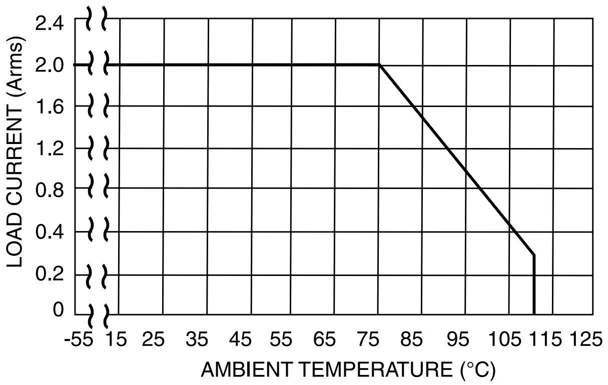
(D) 2 TERMINAL INPUT (DIRECT DRIVE)



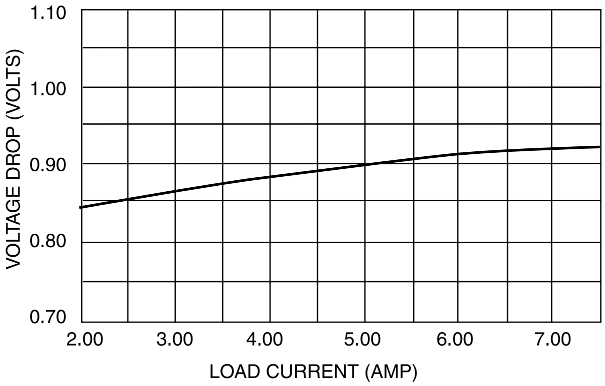
(E) 3 TERMINAL INPUT WITHOUT STATUS

WIRING CONFIGURATION
FIGURE 1
(See Note 1 & 2)

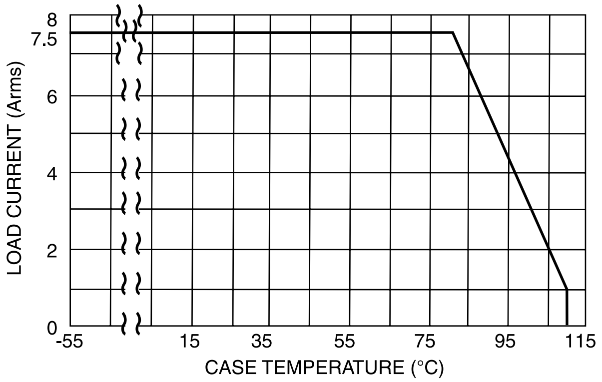
SPECIFICATIONS ARE SUBJECT TO CHANGE WITHOUT NOTICE



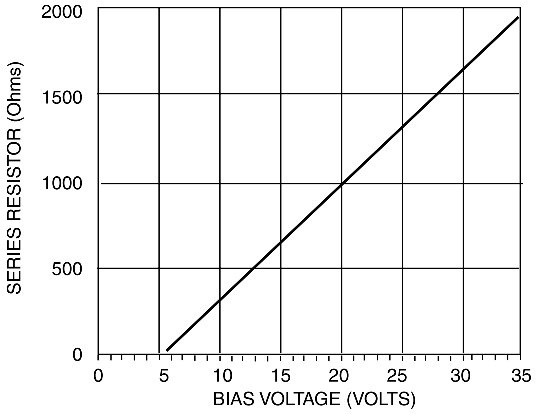
THERMAL DERATING CURVE
LA SERIES / KA SERIES WITOUT HEATSINK
FIGURE 3 (A)



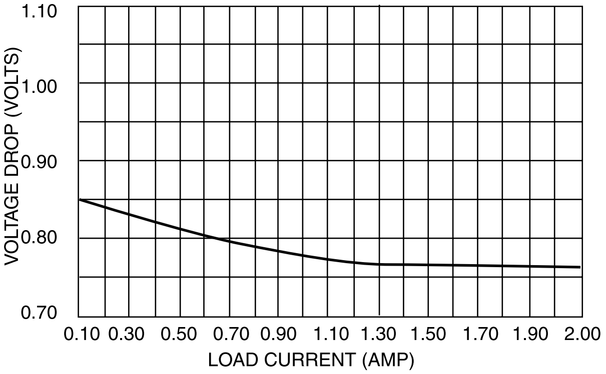
TYPICAL VOLTAGE DROP VS LOAD CURRENT OF
LA SERIES WITH 1 °C/W HEATSINK
FIGURE 5



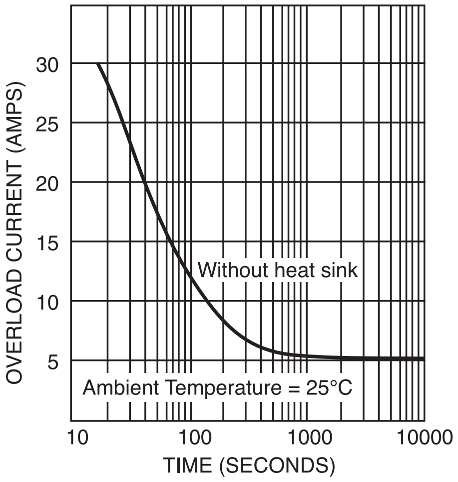
THERMAL DERATING CURVE
LA SERIES WITH HEATSINK
FIGURE 3 (B)



SERIES LIMIT BIAS RESISTOR VS BIAS VOLTAGE
FIGURE 6 (SEE NOTE 2)



TYPICAL VOLTAGE DROP VS LOAD CURRENT OF
LA SERIES WITHOUT HEATSINK
FIGURE 4



TYPICAL THERMAL TRIP TIME
KA58HF AND LA58HL
FIGURE 7

TELEDYNE RELAYS
Everywhereyoulook™

MSSR Handling Guidelines

Military Solid State Relays

1. Do not drop, throw, or in any way mishandle individual relays or cartons containing relays.

2. Store relays in a humidity-controlled, shock- and vibration-free environment. Storage temperature range limits are –25°C to +85°C, however, when possible, relays should be stored in an ambient environment.

3. Do not expose relays to humid condition such that condensation may be formed due to sudden drop in temperature. Relays shall be stored in condensation free condition.

4. Do not stack heavy objects directly onto relays.

5. All MSSR shall be treated as Electrostatic Discharge (ESD) sensitive and shall be handled accordingly. Always work in ESD protected station and wear wrist strap before handling the device.

6. When removing relays from packs, do so with extreme care. Do not allow the relays to fall onto any hard surface during unpacking. Do not "pour" the relays from the packing. Do not allow relays to fall onto the floor.

7. When transferring relays to a production area after unpacking, do so only in a suitable container, transport the devices in anti-static container, taking care not to drop the relays into the container, or to drop, throw or mishandle the container in any way.

8. For either metal-cover relays that are hermetically sealed or plastic relays that are not hermetically sealed, any damage to the casing, leads, or connector may compromise the relay's performance and reliability.

9. Do not reform or reshape plastic relay leads from the original configuration. Trimming relay leads after through hole mounting is acceptable

10. Never subject relays to ultrasonic cleaning environment.

11. Do not submerge plastic relays, which are not hermetically sealed, in cleaning solution or spray aqueous cleaning solution directly onto relays.

12. For plastic relays, which are not hermetically sealed, relays should be baked before use. After bake, relays must be mounted within 8 hours. Relays must be baked again if this 8 hour time period is exceeded. The recommended bake profile is 125°C for 8 hours.

13. After the reflow/mounting process, relays should be baked again after cleaning, prior to a second reflow, or prior to conformal coating.

14. Unless otherwise specified, do not subject relays and relay terminals to reflow solder temperatures above 245°C, 6 seconds maximum. If hand soldering is used, the solder iron tip shall be properly grounded. Observe IPC J-HDBK- 001, paragraph 6.1.0.1 guidelines for heat sensitive components when hand soldering relays.

15. If reshipping product do so in original packaging from factory.

16. Relays should not be exposed to any process or environment that exceeds any limits within this guideline or any published specification that applies to the relay.