

MDC3205

Advance Information

Integrated Relay/Solenoid Driver

- Optimized to Switch 3 V to 5 V Relays from a 5 V Rail
- Compatible with “TX” and “TQ” Series Telecom Relays Rated up to 625 mW at 3 V to 5 V
- Features Low Input Drive Current
- Internal Zener Clamp Routes Induced Current to Ground Rather Than Back to Supply
- Guaranteed Off State with No Input Connection
- Supports Large Systems with Minimal Off-State Leakage
- ESD Resistant in Accordance with the 2000 V Human Body Model
- Provides a Robust Driver Interface Between Relay Coil and Sensitive Logic Circuits

Applications include:

- Telecom Line Cards and Telephony
- Industrial Controls
- Security Systems
- Appliances and White Goods
- Automated Test Equipment
- Automotive Controls

This device is intended to replace an array of three to six discrete components with an integrated part. It can be used to switch other 3 to 5 Vdc Inductive Loads such as solenoids and small DC motors.

MAXIMUM RATINGS

Rating	Symbol	Value	Unit
Power Supply Voltage	V_{CC}	6.0	Vdc
Recommended Operating Supply Voltage	V_{CC}	2.0–5.5	Vdc
Input Voltage	$V_{in(fwd)}$	6.0	Vdc
Reverse Input Voltage	$V_{in(rev)}$	-0.5	Vdc
Output Sink Current — Continuous	I_O	300	mA
Junction Temperature	T_J	150	°C
Operating Ambient Temperature Range	T_A	-40 to +85	°C
Storage Temperature Range	T_{stg}	-65 to +150	°C

THERMAL CHARACTERISTICS

Characteristic	Symbol	Max	Unit
Total Device Dissipation ⁽¹⁾ Derate above 25°C	P_D	625	mW
Thermal Resistance Junction to Ambient	R_{thJA}	200	°C/W

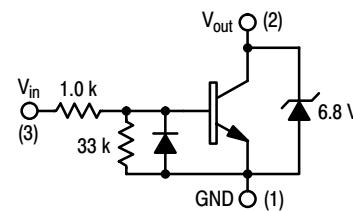
1. FR-5 PCB of 1" x 0.75" x 0.062", $T_A = 25^\circ\text{C}$

This document contains information on a new product. Specifications and information herein are subject to change without notice.

**RELAY/SOLENOID DRIVER
SILICON MONOLITHIC
CIRCUIT BLOCK**



CASE 29-11, STYLE 14
TO-92

INTERNAL CIRCUIT DIAGRAM

ELECTRICAL CHARACTERISTICS ($T_A = 25^\circ\text{C}$ unless otherwise noted)

Characteristic	Symbol	Min	Typ	Max	Unit
OFF CHARACTERISTICS					
Output Zener Breakdown Voltage (@ $I_T = 10$ mA Pulse)	$V_{(\text{BRout})}$ $V_{(-\text{BRout})}$	6.4 —	6.8 —0.7	7.2 —	V
Output Leakage Current @ 0 Input Voltage ($V_{\text{out}} = 5.5$ Vdc, $V_{\text{in}} = \text{O.C.}$, $T_A = 25^\circ\text{C}$) ($V_{\text{out}} = 5.5$ Vdc, $V_{\text{in}} = \text{O.C.}$, $T_A = 85^\circ\text{C}$)	I_{oo}	— —	— —	5.0 30	μA
ON CHARACTERISTICS					
Input Bias Current @ $V_{\text{in}} = 4.0$ Vdc ($I_O = 250$ mA, $V_{\text{out}} = 0.4$ Vdc, $T_A = -40^\circ\text{C}$) (correlated to a measurement @ 25°C)	I_{in}	—	2.5	—	mAdc
Output Saturation Voltage ($I_O = 250$ mA, $V_{\text{in}} = 4.0$ Vdc, $T_A = -40^\circ\text{C}$) (correlated to a measurement @ 25°C)		—	0.2	0.4	Vdc
Output Sink Current — Continuous ($T_A = -40^\circ\text{C}$, $V_{\text{CE}} = 0.4$ Vdc, $V_{\text{in}} = 4.0$ Vdc) (correlated to a measurement @ 25°C)	$I_{\text{C}(\text{on})}$	250	—	—	mA

TYPICAL APPLICATION-DEPENDENT SWITCHING PERFORMANCE

SWITCHING CHARACTERISTICS

Characteristic	Symbol	V_{CC}	Min	Typ	Max	Units
Propagation Delay Times: High to Low Propagation Delay; Figures 1, 2 (5.0 V 74HC04) Low to High Propagation Delay; Figures 1, 2 (5.0 V 74HC04)	t_{PHL} t_{PLH}	5.5 5.5	— —	55 430	— —	ns
High to Low Propagation Delay; Figures 1, 3 (3.0 V 74HC04) Low to High Propagation Delay; Figures 1, 3 (3.0 V 74HC04)	t_{PHL} t_{PLH}	5.5 5.5	— —	85 315	— —	
High to Low Propagation Delay; Figures 1, 4 (5.0 V 74LS04) Low to High Propagation Delay; Figures 1, 4 (5.0 V 74LS04)	t_{PHL} t_{PLH}	5.5 5.5	— —	55 2385	— —	
Transition Times: Fall Time; Figures 1, 2 (5.0 V 74HC04) Rise Time; Figures 1, 2 (5.0 V 74HC04)	t_f t_r	5.5 5.5	— —	45 160	— —	ns
Fall Time; Figures 1, 3 (3.0 V 74HC04) Rise Time; Figures 1, 3 (3.0 V 74HC04)	t_f t_r	5.5 5.5	— —	70 195	— —	
Fall Time; Figures 1, 4 (5.0 V 74LS04) Rise Time; Figures 1, 4 (5.0 V 74LS04)	t_f t_r	5.5 5.5	— —	45 2400	— —	
Input Slew Rate ⁽¹⁾	$\Delta V/\Delta t_{\text{in}}$	5.5	TBD	—	—	V/ms

1. Minimum input slew rate must be followed to avoid overdissipating the device.

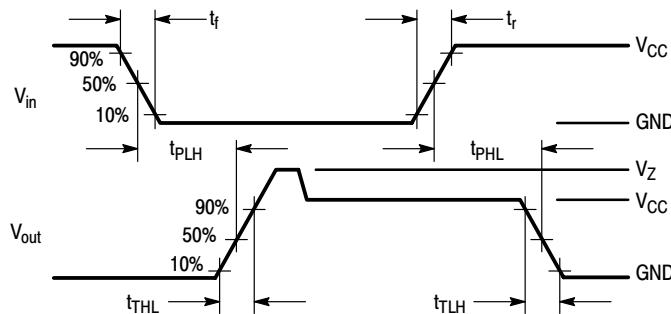


Figure 1. Switching Waveforms

MDC3205

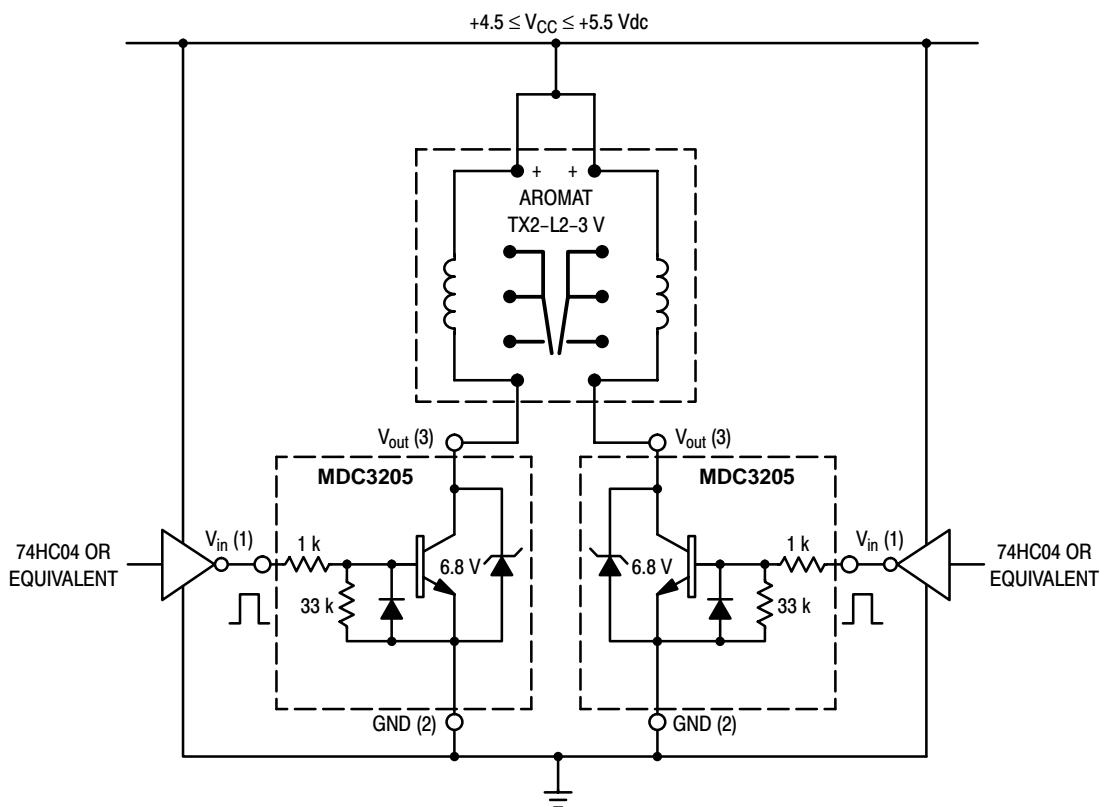


Figure 2. A 3.0-V, 200-mW Dual Coil Latching Relay Application with 5.0 V-HCMOS Interface

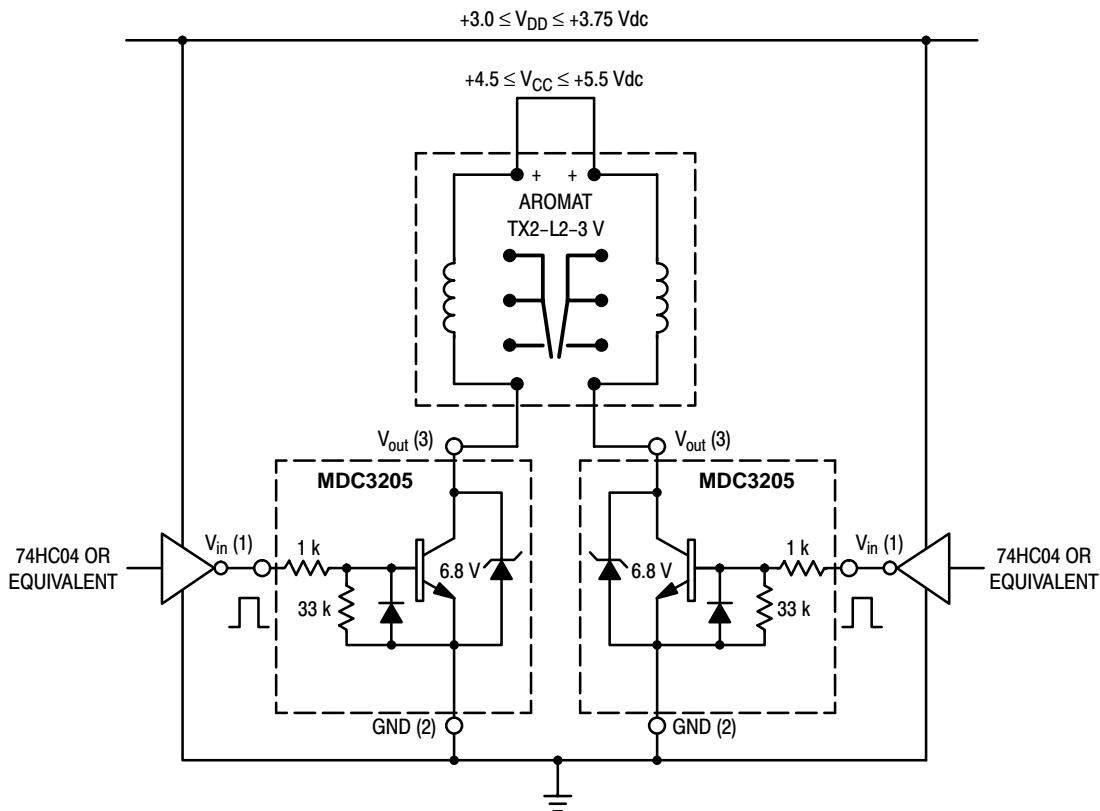


Figure 3. A 3.0-V, 200-mW Dual Coil Latching Relay Application with 3.0 V-HCMOS Interface

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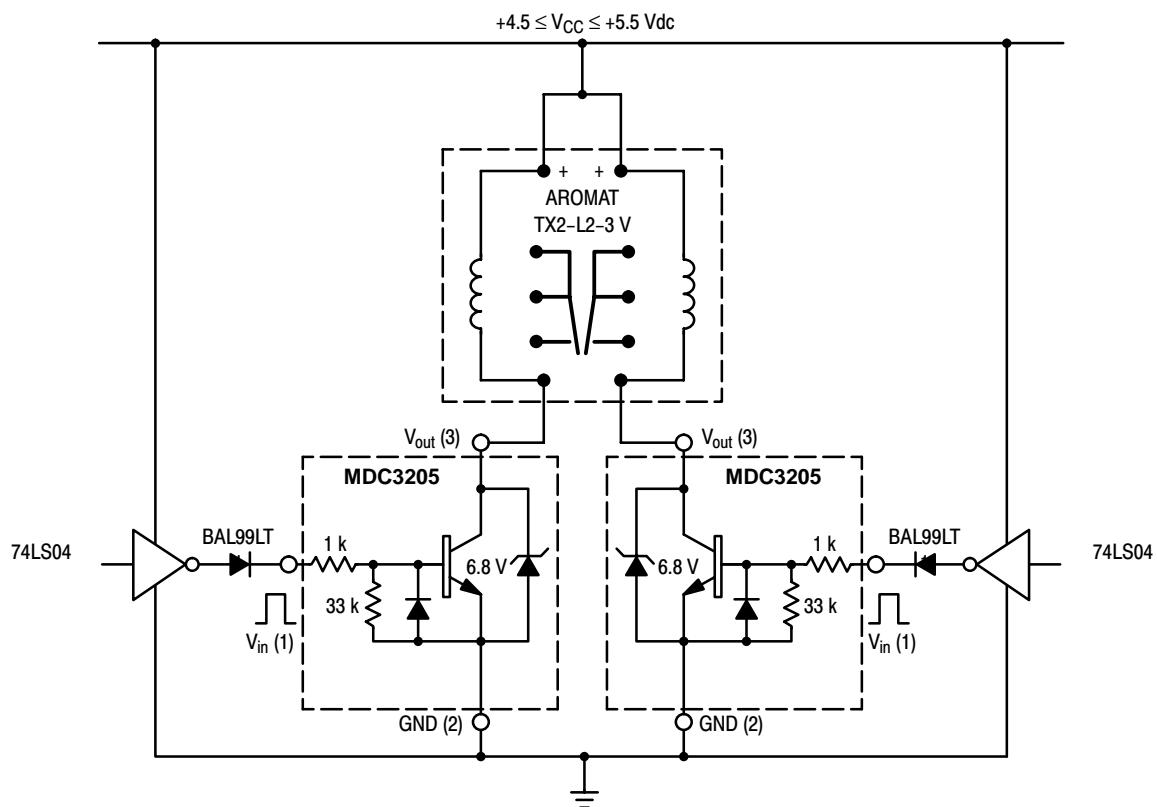


Figure 4. A 3.0-V, 200-mW Dual Coil Latching Relay Application with TTL Interface

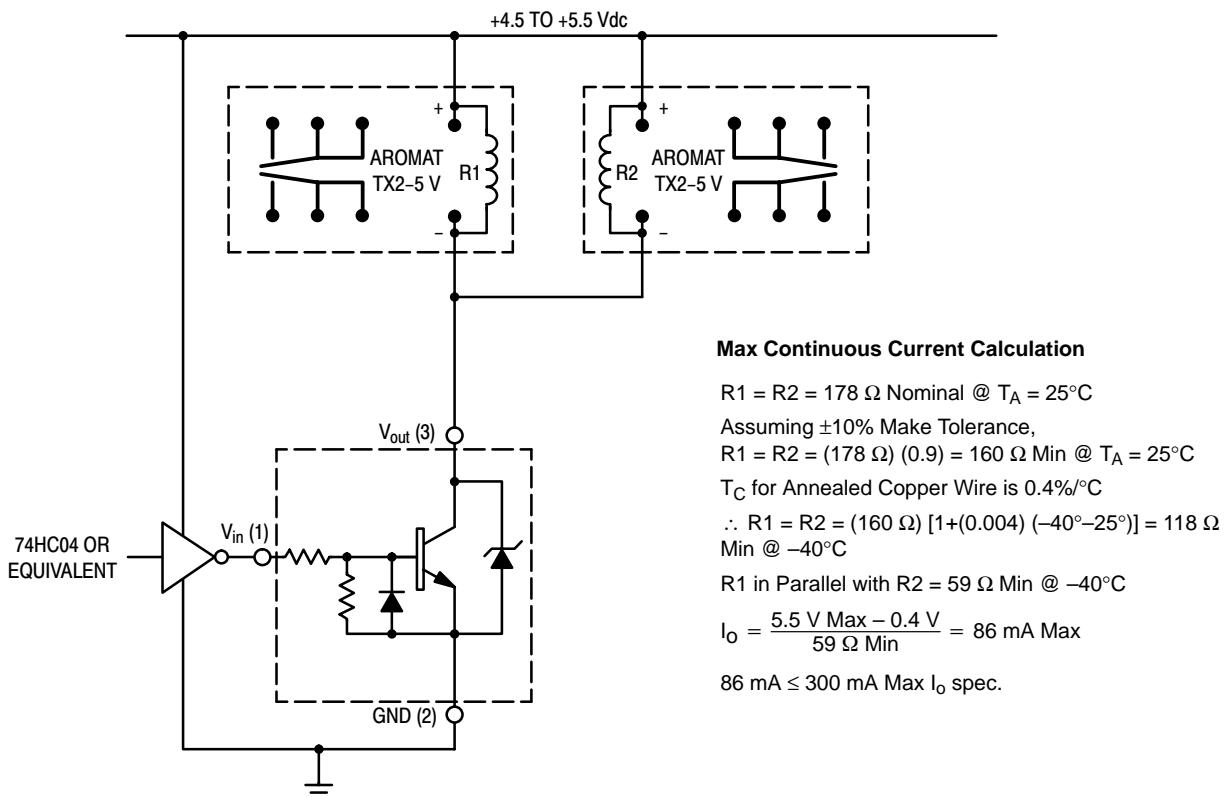
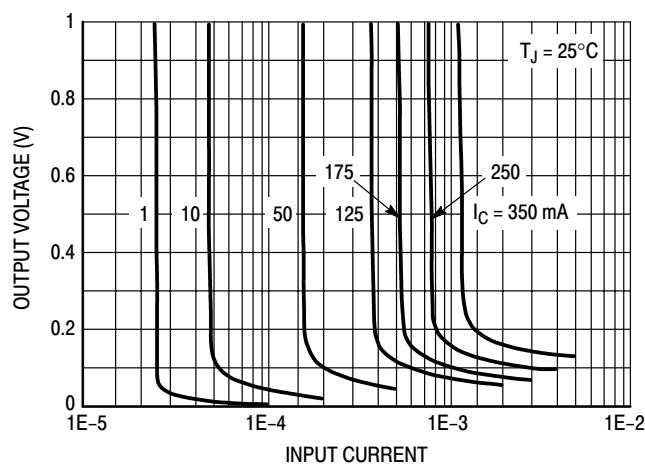
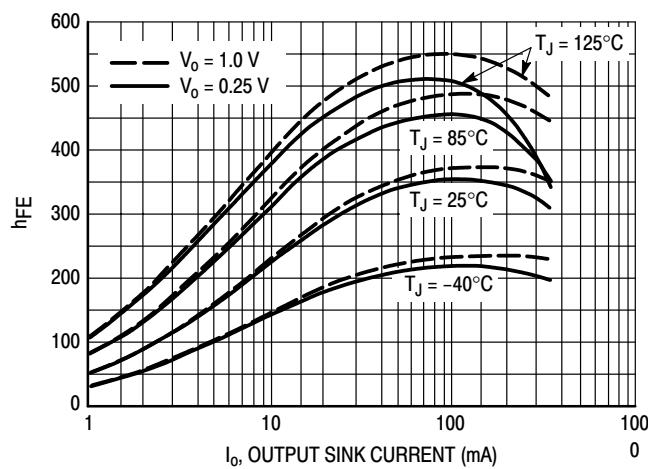
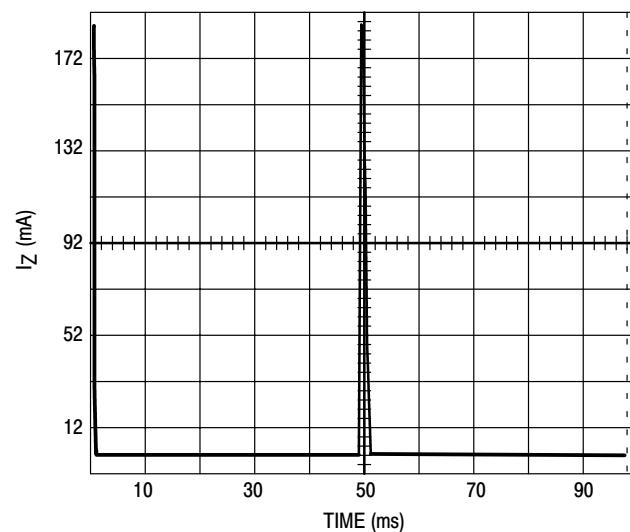
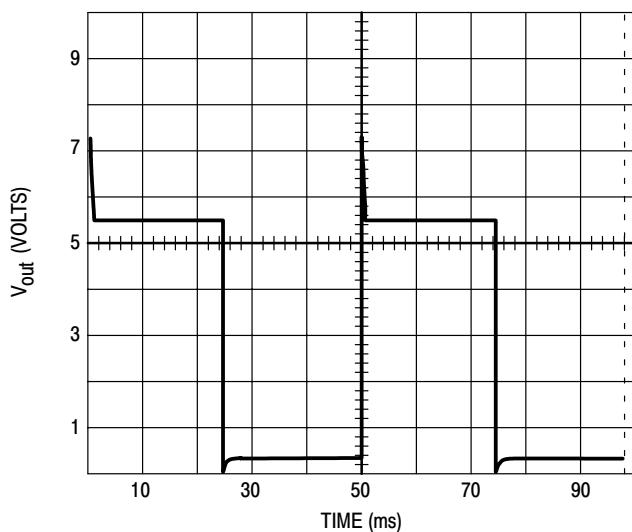
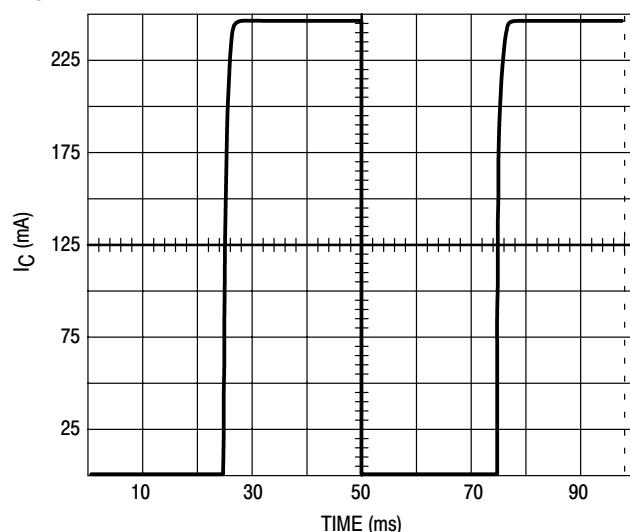
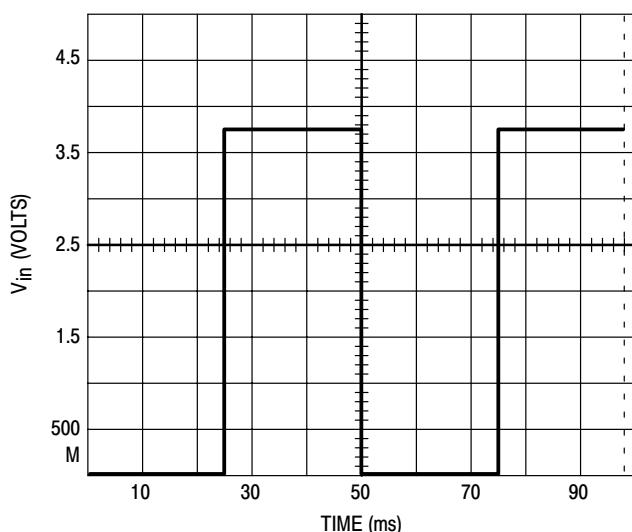


Figure 5. Typical 5.0 V, 140 mW Coil Dual Relay Application

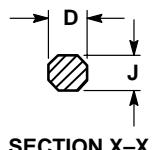
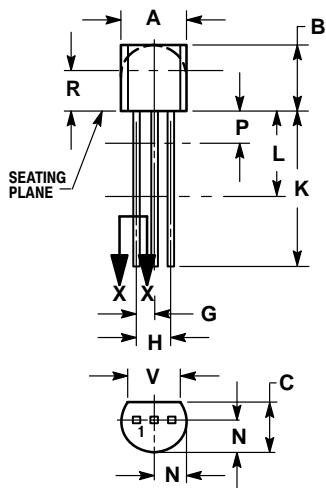
TYPICAL OPERATING WAVEFORMS

(Circuit of Figure 5)



PACKAGE DIMENSIONS

TO-92 (TO-226)
CASE 29-11
ISSUE AL

**SECTION X-X**

STYLE 14:
PIN 1. Emitter
2. Collector
3. Base

NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.
3. CONTOUR OF PACKAGE BEYOND DIMENSION R IS UNCONTROLLED.
4. LEAD DIMENSION IS UNCONTROLLED IN P AND BEYOND DIMENSION K MINIMUM.

DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	0.175	0.205	4.45	5.20
B	0.170	0.210	4.32	5.33
C	0.125	0.165	3.18	4.19
D	0.016	0.021	0.407	0.533
G	0.045	0.055	1.15	1.39
H	0.095	0.105	2.42	2.66
J	0.015	0.020	0.39	0.50
K	0.500	---	12.70	---
L	0.250	---	6.35	---
N	0.080	0.105	2.04	2.66
P	---	0.100	---	2.54
R	0.115	---	2.93	---
V	0.135	---	3.43	---

Notes

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