

Integrated Circuits

ULS-2064H THROUGH ULS-2077H
1.25 A QUAD DARLINGTON SWITCHES

MIL-STD-883 Compliant

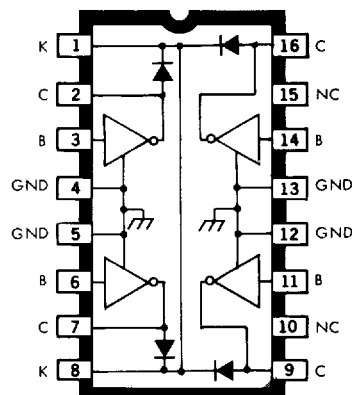
FEATURES

- TTL, DTL, PMOS, or CMOS Compatible Units
- Transient-Protected Outputs
- Hermetically Sealed Packages
- High-Reliability Screening to MIL-STD-883, Class B

INTENDED FOR MILITARY, aerospace, and related applications, ULS-2064H through ULS-2077H quad Darlington switches interface between low-level logic and a variety of peripheral power loads such as relays, solenoids, dc and stepping motors, multiplexed LED and incandescent displays, heaters, and similar loads of up to 400 watts (1.25 A per output, 80 V, 12.5% duty cycle, +50°C). The devices are specified with a minimum output breakdown of 50 volts (35 volts sustaining at 100 mA) or 80 volts (50 volts sustaining), and a saturated output current specification of 1.25 A.

The ULS-2064/65/68/69H switches are designed for use with TTL, DTL, Schottky TTL, and 5 V CMOS logic. The ULS-2066/67/70/77H are intended for use with 6 V to 15 V CMOS and PMOS logic. These devices include integral transient-suppression diodes for use with inductive loads.

Types ULS-2068H and ULS-2069H incorporate a pre-driver stage operating from a low-current, 5 V



Dwg. No. 1,025

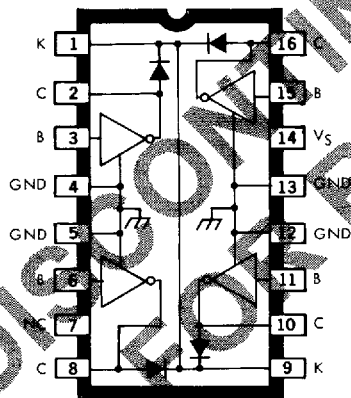
Uls-2064H—Uls-2067H

supply. The pre-driver for the ULS-2070H and ULS-2071H operates from a low-current, 12 V supply. The input drive requirements for these devices are reduced while still allowing the outputs to switch currents up to 1.5 A.

The ULS-2074H through ULS-2077H switches are intended for use in emitter-follower applications. These circuits are identical with the ULS-2064H through ULS-2067H except for the uncommitted emitters and the omission of the suppression diodes.

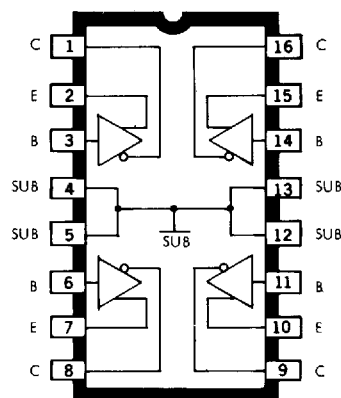
Reverse-bias burn-in and 100% high-reliability screening are standard for all side-brazed hermetic

Continued next page



Dwg. No. A-11.026

U.S.-2068H—U.S.-2071H



Dwg. No. A-11,027

ULS-2074H—ULS-2077H

**INTEGRATED CIRCUITS DIVISION
SPRAGUE ELECTRIC COMPANY**

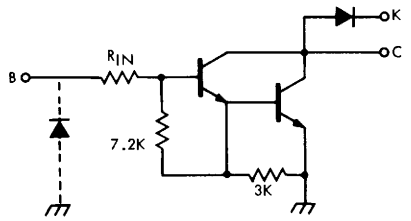
115 Northeast Cutoff, WORCESTER, MASS. 01606

U.S. 2064H THROUGH U.S. 2077H
1.25 A QUAD DARLINGTON SWITCHES

29305 1A
BULLETIN
NATIONAL

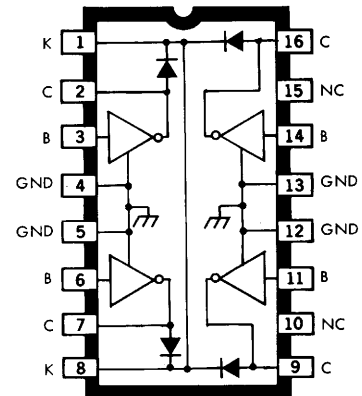
ULS-2064H THROUGH ULS-2067H

PARTIAL SCHEMATIC



Dwg. No. A-10,353

ULS-2064H $R_{IN} = 350 \Omega$
 ULS-2065H
 ULS-2066H $R_{IN} = 3 \text{ k}\Omega$
 ULS-2067H

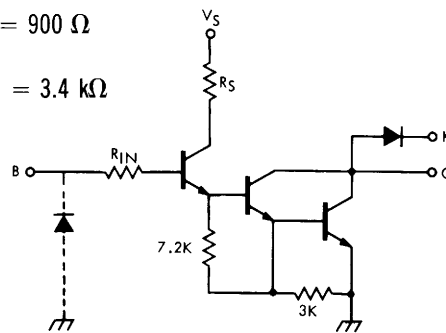


Dwg. No. A-11,025

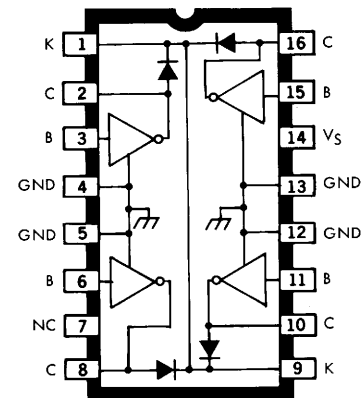
ULS-2068H THROUGH ULS-2071H

PARTIAL SCHEMATIC

ULS-2068H $R_{IN} = 2.5 \text{ k}\Omega$, $R_S = 900 \Omega$
 ULS-2069H
 ULS-2070H $R_{IN} = 11.6 \text{ k}\Omega$, $R_S = 3.4 \text{ k}\Omega$
 ULS-2071H



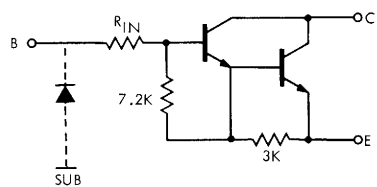
Dwg. No. A-10,354



Dwg. No. A-11,026

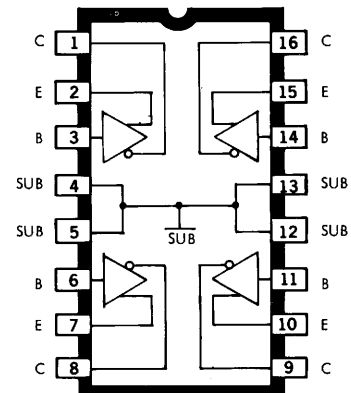
ULS-2074H THROUGH ULS-2077H

PARTIAL SCHEMATIC



Dwg. No. A-10,355

ULS-2074H $R_{IN} = 350 \Omega$
 ULS-2075H
 ULS-2076H $R_{IN} = 3 \text{ k}\Omega$
 ULS-2077H



Dwg. No. A-11,027

ULS-2064H THROUGH ULS-2067H

ELECTRICAL CHARACTERISTICS over operating temperature range (unless otherwise noted)

Characteristic	Symbol	Applicable Devices	Test Conditions			Limits		
			Temp.	Electrical Conditions	Fig.	Min.	Max.	Units
Output Leakage Current	I_{CEX}	ULS-2064/66H		$V_{CE} = 50 \text{ V}$	1	—	500	μA
		ULS-2065/67H		$V_{CE} = 80 \text{ V}$	1	—	500	μA
Output Sustaining Voltage	$V_{CE(SUS)}$	ULS-2064/66H		$I_C = 100 \text{ mA}$, $V_{IN} = 0.4 \text{ V}$	2	35	—	V
		ULS-2065/67H		$I_C = 100 \text{ mA}$, $V_{IN} = 0.4 \text{ V}$	2	50	—	V
Collector-Emitter Saturation Voltage	$V_{CE(SAT)}$	All	− 55°C	$I_C = 500 \text{ mA}$, $I_B = 1.1 \text{ mA}$	3	—	1.35	V
				$I_C = 750 \text{ mA}$, $I_B = 1.7 \text{ mA}$	3	—	1.55	V
				$I_C = 1.0 \text{ A}$, $I_B = 2.25 \text{ mA}$	3	—	1.75	V
				$I_C = 1.25 \text{ A}$, $I_B = 3.75 \text{ mA}$	3	—	1.95	V
			+ 25°C	$I_C = 500 \text{ mA}$, $I_B = 625 \mu\text{A}$	3	—	1.20	V
				$I_C = 750 \text{ mA}$, $I_B = 935 \mu\text{A}$	3	—	1.35	V
				$I_C = 1.0 \text{ A}$, $I_B = 1.25 \text{ mA}$	3	—	1.55	V
				$I_C = 1.25 \text{ A}$, $I_B = 2.0 \text{ mA}$	3	—	1.75	V
			+ 125°C	$I_C = 500 \text{ mA}$, $I_B = 625 \mu\text{A}$	3	—	1.35	V
				$I_C = 750 \text{ mA}$, $I_B = 935 \mu\text{A}$	3	—	1.55	V
				$I_C = 1.0 \text{ A}$, $I_B = 1.25 \text{ mA}$	3	—	1.75	V
				$I_C = 1.25 \text{ A}$, $I_B = 2.0 \text{ mA}$	3	—	1.95	V
Input Current	$I_{IN(ON)}$	ULS-2064/65H		$V_{IN} = 2.4 \text{ V}$	4	—	4.3	mA
				$V_{IN} = 3.75 \text{ V}$	4	—	9.6	mA
		ULS-2066/67H		$V_{IN} = 5.0 \text{ V}$	4	—	1.8	mA
				$V_{IN} = 12 \text{ V}$	4	—	5.2	mA
Input Voltage	$V_{IN(ON)}$	ULS-2064/65H	− 55°C	$V_{CE} = 2.0 \text{ V}$, $I_C = 1.0 \text{ A}$	5	—	3.1	V
			+ 25°C	$V_{CE} = 2.0 \text{ V}$, $I_C = 1.0 \text{ A}$	5	—	2.0	V
		ULS-2066/67H	− 55°C	$V_{CE} = 2.0 \text{ V}$, $I_C = 1.0 \text{ A}$	5	—	11.5	V
			+ 25°C	$V_{CE} = 2.0 \text{ V}$, $I_C = 1.0 \text{ A}$	5	—	6.5	V
Turn-On Delay	t_{pHL}	All	+ 25°C		9	—	1.0	μs
Turn-Off Delay	t_{pLH}	All	+ 25°C		9	—	1.5	μs
Clamp Diode Leakage Current	I_R	ULS-2064/66H		$V_R = 50 \text{ V}$	6	—	100	μA
		ULS-2065/67H		$V_R = 80 \text{ V}$	6	—	100	μA
Clamp Diode Forward Voltage	V_F	All		$I_F = 1.25 \text{ A}$	7	—	2.1	V

ULS-2068H THROUGH ULS-2071H

ELECTRICAL CHARACTERISTICS over operating temperature range,
 $V_s = 5.0\text{ V}$ (ULS-2068/69H) or $V_s = 12\text{ V}$ (ULS-2070/71H), (unless otherwise noted)

Characteristic	Symbol	Applicable Devices	Test Conditions			Limits		
			Temp.	Electrical Conditions	Fig.	Min.	Max.	Units
Output Leakage Current	I_{CEX}	ULS-2068/70H		$V_{CE} = 50\text{ V}$	1	—	500	μA
		ULS-2069/71H		$V_{CE} = 80\text{ V}$	1	—	500	μA
Output Sustaining Voltage	$V_{CE(SUS)}$	ULS-2068/70H		$I_C = 100\text{ mA}$, $V_{IN} = 0.4\text{ V}$	2	35	—	V
		ULS-2069/71H		$I_C = 100\text{ mA}$, $V_{IN} = 0.4\text{ V}$	2	50	—	V
Collector-Emitter Saturation Voltage	$V_{CE(SAT)}$	ULS-2068/69H	-55°C	$I_C = 500\text{ mA}$, $V_{IN} = 3.2\text{ V}$	3	—	1.35	V
				$I_C = 750\text{ mA}$, $V_{IN} = 3.2\text{ V}$	3	—	1.55	V
				$I_C = 1.0\text{ A}$, $V_{IN} = 3.2\text{ V}$	3	—	1.75	V
				$I_C = 1.25\text{ A}$, $V_{IN} = 3.2\text{ V}$	3	—	1.95	V
			$+25^\circ\text{C}$	$I_C = 500\text{ mA}$, $V_{IN} = 2.9\text{ V}$	3	—	1.20	V
				$I_C = 750\text{ mA}$, $V_{IN} = 2.9\text{ V}$	3	—	1.35	V
				$I_C = 1.0\text{ A}$, $V_{IN} = 2.9\text{ V}$	3	—	1.55	V
				$I_C = 1.25\text{ A}$, $V_{IN} = 2.9\text{ V}$	3	—	1.75	V
			$+125^\circ\text{C}$	$I_C = 500\text{ mA}$, $V_{IN} = 2.8\text{ V}$	3	—	1.35	V
				$I_C = 750\text{ mA}$, $V_{IN} = 2.8\text{ V}$	3	—	1.55	V
				$I_C = 1.0\text{ A}$, $V_{IN} = 2.8\text{ V}$	3	—	1.75	V
				$I_C = 1.25\text{ A}$, $V_{IN} = 2.8\text{ V}$	3	—	1.95	V
		ULS-2070/71H	-55°C	$I_C = 500\text{ mA}$, $V_{IN} = 5.5\text{ V}$	3	—	1.35	V
				$I_C = 750\text{ mA}$, $V_{IN} = 5.5\text{ V}$	3	—	1.55	V
				$I_C = 1.0\text{ A}$, $V_{IN} = 5.5\text{ V}$	3	—	1.75	V
				$I_C = 1.25\text{ A}$, $V_{IN} = 5.5\text{ V}$	3	—	1.95	V
			$+25^\circ\text{C}$	$I_C = 500\text{ mA}$, $V_{IN} = 5.1\text{ V}$	3	—	1.20	V
				$I_C = 750\text{ mA}$, $V_{IN} = 5.1\text{ V}$	3	—	1.35	V
				$I_C = 1.0\text{ A}$, $V_{IN} = 5.1\text{ V}$	3	—	1.55	V
				$I_C = 1.25\text{ A}$, $V_{IN} = 5.1\text{ V}$	3	—	1.75	V
			$+125^\circ\text{C}$	$I_C = 500\text{ mA}$, $V_{IN} = 5.0\text{ V}$	3	—	1.35	V
				$I_C = 750\text{ mA}$, $V_{IN} = 5.0\text{ V}$	3	—	1.55	V
				$I_C = 1.0\text{ A}$, $V_{IN} = 5.0\text{ V}$	3	—	1.75	V
				$I_C = 1.25\text{ A}$, $V_{IN} = 5.0\text{ V}$	3	—	1.95	V
Input Current	$I_{IN(ON)}$	ULS-2068/69H	-55°C	$V_{IN} = 3.2\text{ V}$	4	—	600	μA
			$+25^\circ\text{C}$	$V_{IN} = 2.75\text{ V}$	4	—	550	μA
			$+125^\circ\text{C}$	$V_{IN} = 2.75\text{ V}$	4	—	850	μA
			$+125^\circ\text{C}$	$V_{IN} = 3.75\text{ V}$	4	—	1400	μA
		ULS-2070/71H		$V_{IN} = 5.0\text{ V}$	4	—	400	μA
				$V_{IN} = 12\text{ V}$	4	—	1250	μA
Input Voltage	$V_{IN(ON)}$	ULS-2068/69H	-55°C	$V_{CE} = 2.0\text{ V}$, $I_C = 1.0\text{ A}$	5	—	3.2	V
			$+25^\circ\text{C}$	$V_{CE} = 2.0\text{ V}$, $I_C = 1.0\text{ A}$	5	—	2.75	V
		ULS-2070/71H	-55°C	$V_{CE} = 2.0\text{ V}$, $I_C = 1.0\text{ A}$	5	—	5.0	V
			$+25^\circ\text{C}$	$V_{CE} = 2.0\text{ V}$, $I_C = 1.0\text{ A}$	5	—	5.0	V
Supply Current	I_S	ULS-2068/69H		$I_C = 500\text{ mA}$, $V_{IN} = 3.2\text{ V}$	8	—	6.0	mA
		ULS-2070/71H		$I_C = 500\text{ mA}$, $V_{IN} = 5.0\text{ V}$	8	—	4.5	mA
Turn-On Delay	t_{PHL}	All	$+25^\circ\text{C}$		9	—	1.0	μs
Turn-Off Delay	t_{PLH}	All	$+25^\circ\text{C}$		9	—	1.5	μs
Clamp Diode Leakage Current	I_R	ULS-2068/70H		$V_R = 50\text{ V}$	6	—	100	μA
		ULS-2069/71H		$V_R = 80\text{ V}$	6	—	100	μA
Clamp Diode Forward Voltage	V_F	All		$I_F = 1.25\text{ A}$	7	—	2.1	V

ULS-2074H THROUGH ULS-2077H

ELECTRICAL CHARACTERISTICS over operating temperature range (unless otherwise noted)

Characteristic	Symbol	Applicable Devices	Test Conditions			Limits		
			Temp.	Electrical Conditions	Fig.	Min.	Max.	Units
Output Leakage Current	I_{CEX}	ULS-2074/76H		$V_{CE} = 50 \text{ V}$	1	—	500	μA
		ULS-2075/77H		$V_{CE} = 80 \text{ V}$	1	—	500	μA
Output Sustaining Voltage	$V_{CE(SUS)}$	ULS-2074/76H		$I_C = 100 \text{ mA}, V_{IN} = 0.4 \text{ V}$	2	35	—	V
		ULS-2075/77H		$I_C = 100 \text{ mA}, V_{IN} = 0.4 \text{ V}$	2	50	—	V
Collector-Emitter Saturation Voltage	$V_{CE(SAT)}$	All	− 55°C	$I_C = 500 \text{ mA}, I_B = 1.1 \text{ mA}$	3	—	1.35	V
				$I_C = 750 \text{ mA}, I_B = 1.7 \text{ mA}$	3	—	1.55	V
				$I_C = 1.0 \text{ A}, I_B = 2.25 \text{ mA}$	3	—	1.75	V
				$I_C = 1.25 \text{ A}, I_B = 3.75 \text{ mA}$	3	—	1.95	V
			+ 25°C	$I_C = 500 \text{ mA}, I_B = 625 \mu\text{A}$	3	—	1.20	V
				$I_C = 750 \text{ mA}, I_B = 935 \mu\text{A}$	3	—	1.35	V
				$I_C = 1.0 \text{ A}, I_B = 1.25 \text{ mA}$	3	—	1.55	V
				$I_C = 1.25 \text{ A}, I_B = 2.0 \text{ mA}$	3	—	1.75	V
			+ 125°C	$I_C = 500 \text{ mA}, I_B = 625 \mu\text{A}$	3	—	1.35	V
				$I_C = 750 \text{ mA}, I_B = 935 \mu\text{A}$	3	—	1.55	V
				$I_C = 1.0 \text{ A}, I_B = 1.25 \text{ mA}$	3	—	1.75	V
				$I_C = 1.25 \text{ A}, I_B = 2.0 \text{ mA}$	3	—	1.95	V
Input Current	$I_{IN(ON)}$	ULS-2074/75H		$V_{IN} = 2.4 \text{ V}$	4	—	4.3	mA
				$V_{IN} = 3.75 \text{ V}$	4	—	9.6	mA
		ULS-2076/77H		$V_{IN} = 5.0 \text{ V}$	4	—	1.8	mA
				$V_{IN} = 12 \text{ V}$	4	—	5.2	mA
Input Voltage	$V_{IN(ON)}$	ULS-2074/75H	− 55°C	$V_{CE} = 2.0 \text{ V}, I_C = 1.0 \text{ A}$	5	—	3.1	V
			+ 25°C	$V_{CE} = 2.0 \text{ V}, I_C = 1.0 \text{ A}$	5	—	2.0	V
		ULS-2076/77H	− 55°C	$V_{CE} = 2.0 \text{ V}, I_C = 1.0 \text{ A}$	5	—	11.5	V
			+ 25°C	$V_{CE} = 2.0 \text{ V}, I_C = 1.0 \text{ A}$	5	—	6.5	V
Turn-On Delay	t_{PHL}	All	+ 25°C		9	—	1.0	μs
Turn-Off Delay	t_{PLH}	All	+ 25°C		9	—	1.5	μs

TEST FIGURES

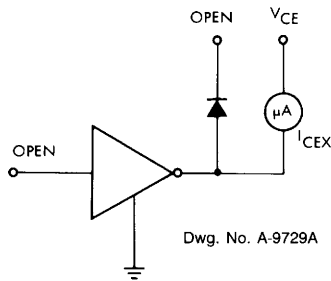


Figure 1

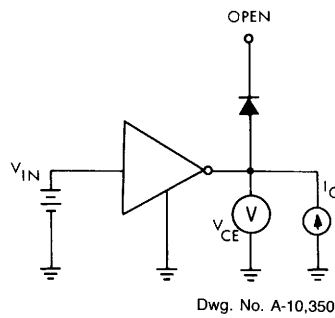


Figure 2

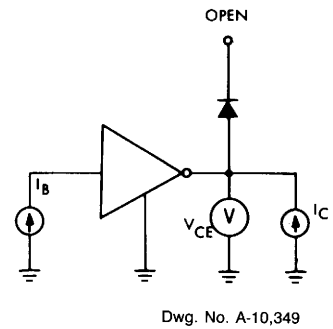


Figure 3

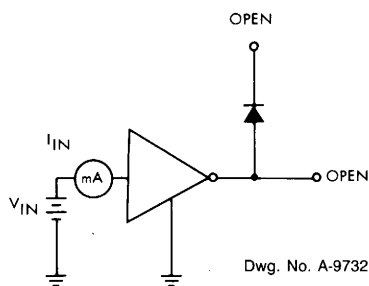


Figure 4

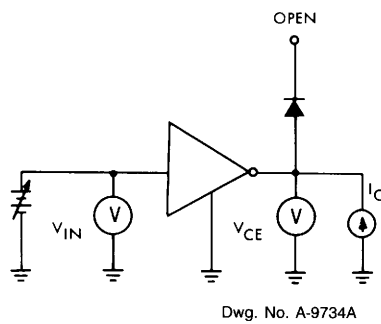


Figure 5

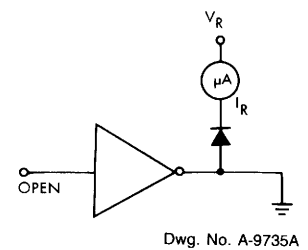


Figure 6

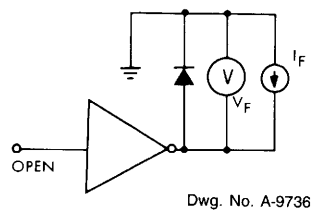


Figure 7

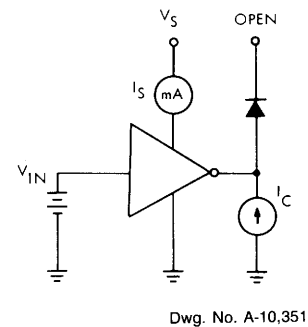


Figure 8

NOTE: Diodes not applicable to Types ULS-2074H through ULS-2077H.

ULS-2064H THROUGH ULS-2077H
 1.25 A QUAD DARLINGTON SWITCHES

COLLECTOR CURRENT
 AS A FUNCTION OF INPUT CURRENT

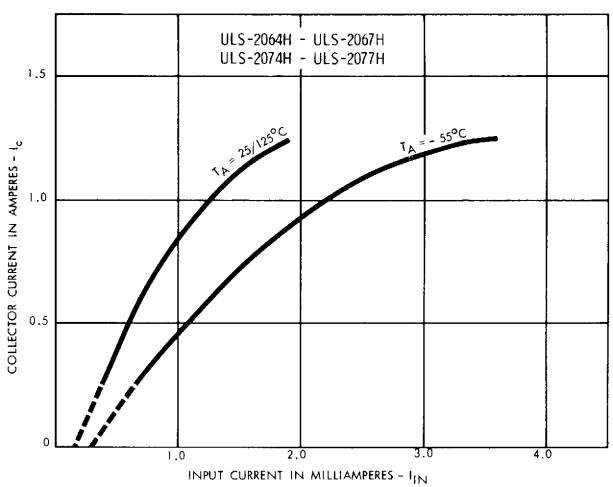
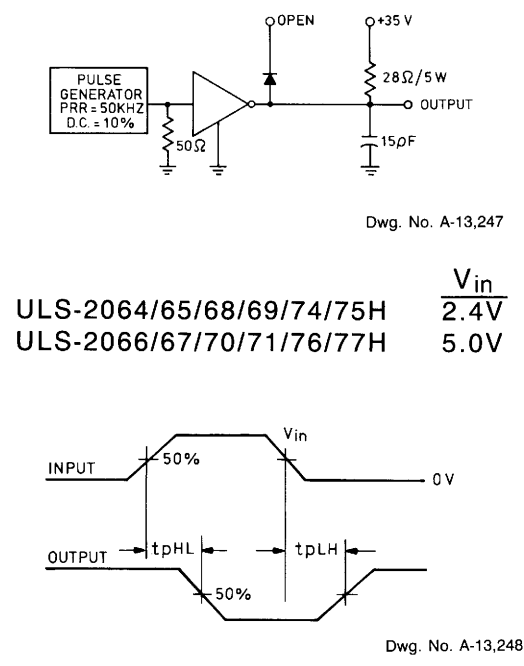
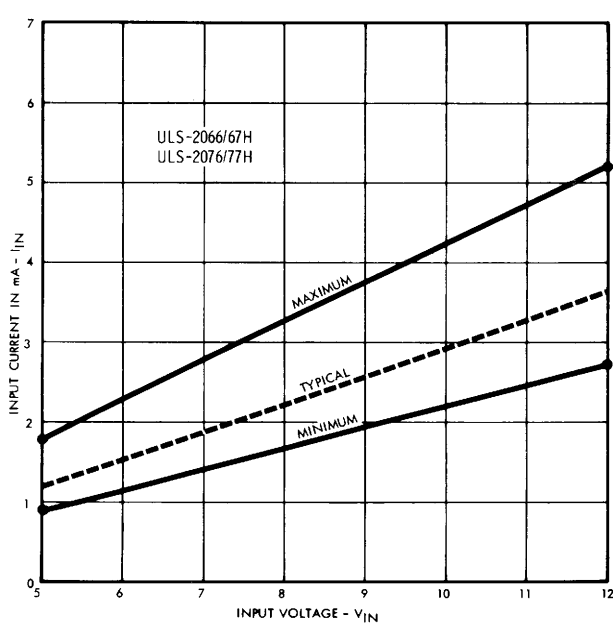
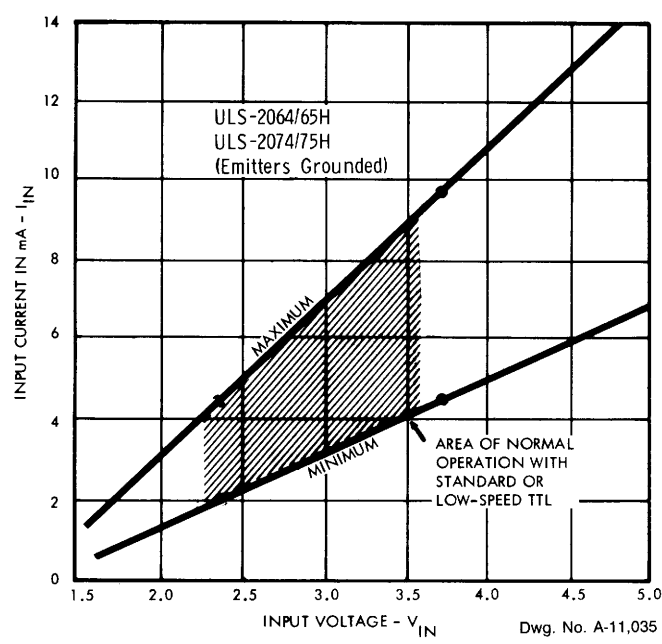


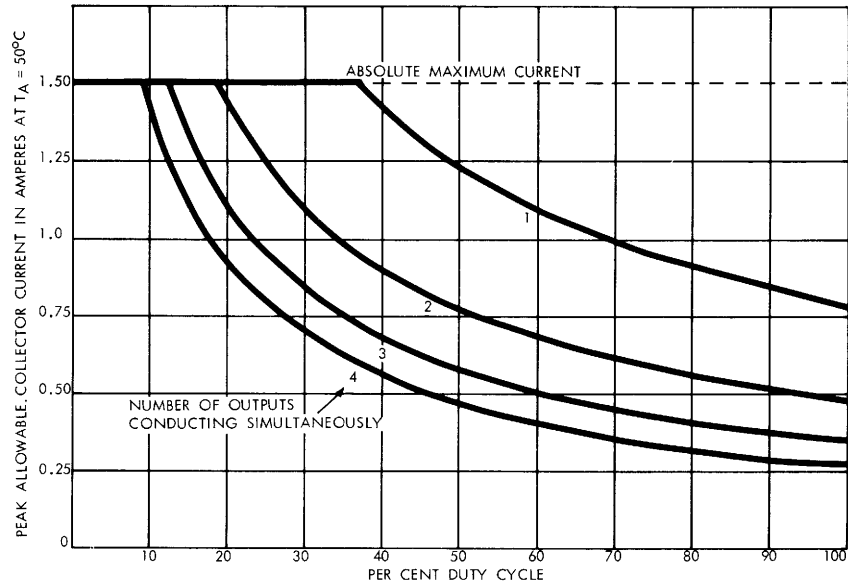
Figure 9

INPUT CURRENT AS A FUNCTION OF INPUT VOLTAGE



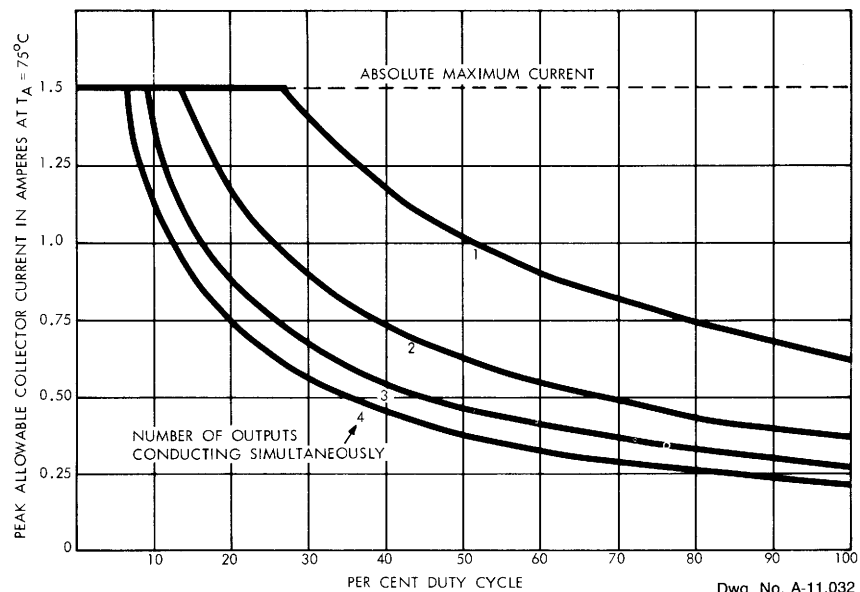
ALLOWABLE PEAK COLLECTOR CURRENT
AS A FUNCTION OF DUTY CYCLE

AT $T_A = +50^\circ\text{C}$



Dwg. No. A-11,031

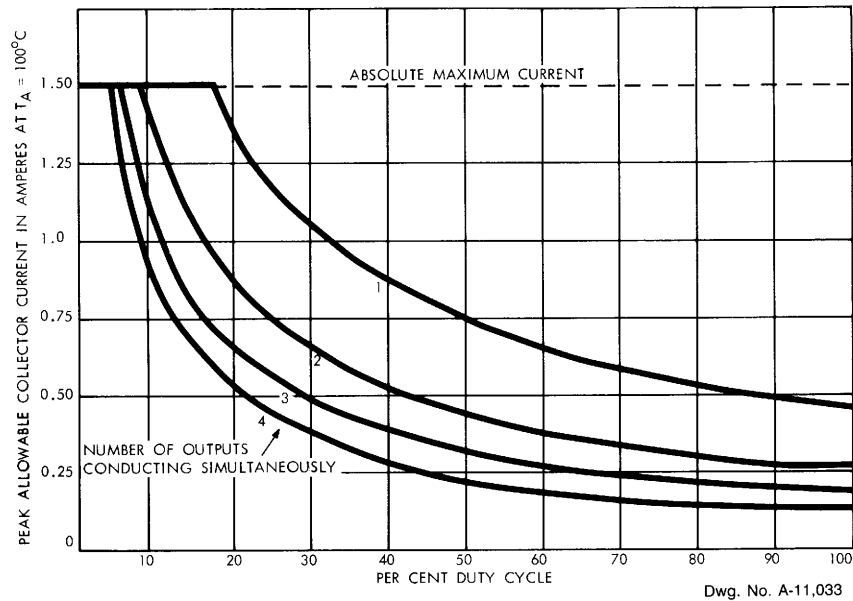
AT $T_A = +75^\circ\text{C}$



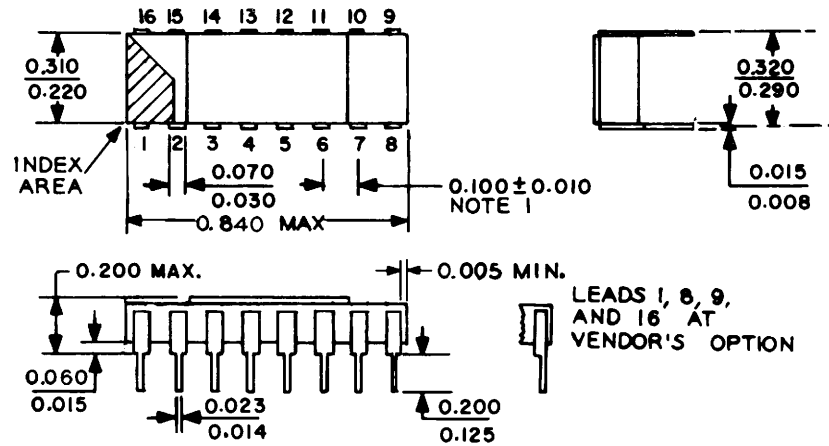
Dwg. No. A-11,032

ALLOWABLE PEAK COLLECTOR CURRENT
AS A FUNCTION OF DUTY CYCLE

AT $T_A = +100^\circ\text{C}$



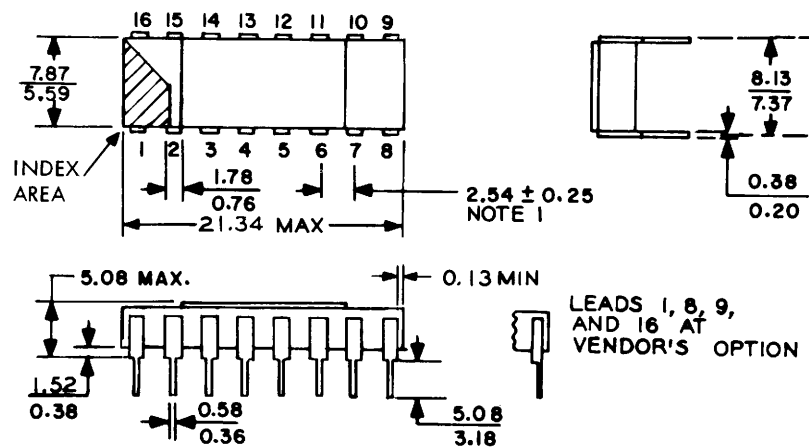
DIMENSIONS IN INCHES



Dwg. No. A-10,210C IN

DIMENSIONS IN MILLIMETERS

(Based on 1" = 25.4 mm)



Dwg. No. A-10,211B MM

This package conforms to military specification MIL-M-38510, case outline D-2, Configuration 3.

NOTES:

1. Lead spacing tolerances is non-cumulative.
2. Exact body and lead configuration at vendor's option within limits shown.
3. Lead gauge plane is 0.030" (0.76 mm), maximum below seating plane.

SALES OFFICES

UNITED STATES
ALABAMA

EPI Inc.
 Suite 13 — 9694 Hwy. 20 W
 Madison 35758
 Tel. 205/461-7000

Electramark Inc.
 Suite 21
 3322 South Memorial Parkway
 Huntsville 35801
 Tel. 205/883-9948

ARIZONA

Sprague Electric Company
 Suite 209 — 1819 S. Dobson Rd.
 Mesa 85202 — 0590
 Tel. 602/244-0154
 Tel. 602/831-6762

Sprague Electric Company
 Suite 601
 1150 E. Pennsylvania Street
 Tucson 85714 — 1640
 Tel. 602/746-0955

CALIFORNIA (Metro. L.A.)

Sprague Electric Company
 Suite 150 — 3100 S. Harbor Blvd.
 Santa Ana 92704
 Tel. 714/549-9913

Sprague Electric Company
 Suite 459
 15350 Sherman Way
 Van Nuys 91406
 Tel. 818/994-6500

Sprague Electric Company
 Suite 126
 4300 Stevens Creek Boulevard
 San Jose 95129 — 1249
 Tel. 408/241-7111

(Northern)

William J. Purdy Company
 770 Airport Blvd.
 Burlingame 94010 — 1927
 Tel. 415/347-7701

(San Diego)

Miner Associates, Inc.
 Suite 117 — 10721 Treana Street
 San Diego 92131 — 1009
 Tel. 619/566-9891

COLORADO

William J. Purdy Company
 5570 E. Yale Ave.
 Denver 80222 — 6907
 Tel. 303/753-6800

Todd & Fry Associates

P.O. Box 1689
 Longmont 80502 — 1689
 Tel. 303/776-7331

CONNECTICUT

Sprague Electric Company
 88 Main Street South
 Southbury 06488
 Tel. 203/264-9595

Sprague Electric Company
 120 Hartford Turnpike South
 P.O. Box 578
 Wallingford 06492 — 0578
 Tel. 203/284-8300

Data Mark Inc.
 47 Clapboard Hill Road
 Guilford 06437 — 2261
 Tel. 203/453-0575

DIST. OF COLUMBIA

Sprague Electric Company
 Suite 311
 14333 Laurel-Bowie Road
 Laurel, MD 20708 — 1130
 Tel. 301/953-1717
 Trinkle Sales Inc.
 P.O. Box 5320
 Cherry Hill, NJ 08034 — 0460
 Tel. 609/795-4200

FLORIDA

Sprague Electric Company
 P.O. Box 1410
 Altamonte Springs 32715 — 1410
 Tel. 305/831-3636

Sprague Electric Company
 Suite 419 — 1500 N.W. 62nd Street
 Ft. Lauderdale 33309 — 1802
 Tel. 305/491-7411

Sprague Electric Company
 Suite T, Building 501
 8001 North Dale Mabry
 Tampa 33614 — 3265
 Tel. 813/935-8203

GEORGIA

Electramark Inc.
 6030 — I Unity Drive
 Norcross 30071 — 3583
 Tel. 404/446-7915

Electronic Marketing Associates
 Suite 101
 6695 Peachtree Industrial Blvd.
 Atlanta 30360 — 2116
 Tel. 404/448-1215

ILLINOIS (Northern)

Sprague Electric Company
 Suite 410 — 1480 Renaissance Dr.
 Park Ridge 60068 — 1386
 Tel. 312/296-6620

(Southern)

EPI Inc.
 Suite 201 — 103 W. Lockwood
 St. Louis, MO 63119 — 2915
 Tel. 314/962-1411

INDIANA

Sprague Electric Company
 Suite 290 — 8200 Haverstick Road
 Indianapolis 46240
 Tel. 317/253-4247

IOWA

J. R. Sales Engineering, Inc.
 1930 St. Andrews, N. E.
 Cedar Rapids 52402
 Tel. 319/393-2232

KANSAS

EPI Inc.
 Suite 201 — 103 W. Lockwood
 St. Louis, MO 63119 — 2915
 Tel. 314/962-1411

MARYLAND

Sprague Electric Company
 Suite 311
 14333 Laurel-Bowie Road
 Laurel 20708 — 1130
 Tel. 301/792-4890

Trinkle Sales Inc.
 P.O. Box 5320
 Cherry Hill, NJ 08034 — 0460
 Tel. 609/795-4200

MASSACHUSETTS

Sprague Electric Company
 10 Burr St.
 Framingham 01701 — 4617
 Tel. 617/875-3200

Ray Perron & Co., Inc.
 P.O. Box 389
 Needham 02192 — 0009
 Tel. 617/449-6162

MICHIGAN

Sprague Electric Company
 Suite 301 — 2155 Jackson Road
 Ann Arbor 48103 — 3917
 Tel. 313/761-2014

MINNESOTA

HMR, Inc.
 9065 Lyndale Ave. South
 Minneapolis 55420 — 3520
 Tel. 612/888-2122

MISSISSIPPI

EPI Inc.
 Suite 64
 3322 South Memorial Pkwy
 Huntsville, AL 35801 — 5335
 Tel. 205/883-0520

MISSOURI

EPI Inc.
 Suite 201 — 103 W. Lockwood
 St. Louis 63119 — 2915
 Tel. 314/962-1411

NEBRASKA

J. R. Sales Engineering, Inc.
 1930 St. Andrews, N. E.
 Cedar Rapids, Iowa 52402
 Tel. 319/393-2232

NEW HAMPSHIRE

Ray Perron & Co., Inc.
 1 Elm St.
 Dover 03820 — 3910
 Tel. 603/742-2321

NEW JERSEY (Northern)

Sprague Electric Company
 P.O. Box 1612
 Wayne 07470 — 0701
 Tel. 201/696-8200

(Southern)

Trinkle Sales Inc.
 P.O. Box 5320
 Cherry Hill 08034 — 0460
 Tel. 609/795-4200

NEW MEXICO

William J. Purdy Company
 120 LaVeta Drive NE
 Albuquerque 87108 — 1613
 Tel. 505/266-7959

NEW YORK (Downstate)

Sprague Electric Company
 2001 Palmer Ave.
 Larchmont 10538 — 2420
 Tel. 914/834-4439

(Long Island)

Sprague Electric Company
 P.O. Box 541
 Central Islip 11722 — 0541
 Tel. 516/234-8700

(Upstate)

Sprague Electric Company
 2002 Teal Ave.
 Syracuse 13206 — 1542
 Tel. 315/437-7311

Paston-Hunter Co., Inc.

2002 Teal Ave.
 Syracuse 13206 — 1596
 Tel. 315/437-2843

NORTH CAROLINA

Sprague Electric Company
 9741-M Southern Pine Blvd.
 Charlotte 28210 — 5560
 Tel. 704/527-1306

Electronic Marketing Associates

9225 Honeycutt Creek Rd.
 Raleigh 27609 — 1523
 Tel. 919/847-8800

OHIO

Sprague Electric Company
 Suite 330 — 555 Metro Place North
 Dublin 43017 — 1375
 Tel. 614/761-1881

OREGON

Sprague Electric Company
 Suite H
 16111 S.E. McGilivray Boulevard
 Vancouver, WA 98664 — 9025
 Tel. 503/225-0493
 Tel. 206/892-0361

OREGON (continued)

William J. Purdy Company
 7799 Southwest Cirrus Drive
 Beaverton 97005 — 5945
 Tel. 503/641-9373

PENNSYLVANIA

Trinkle Sales Inc.
 P.O. Box 5320
 Cherry Hill, NJ 08034 — 0460
 Tel. Phila. 215/922-2080

SOUTH CAROLINA

Electronic Marketing Associates
 210 W. Stone Ave.
 Greenville 29609 — 5499
 Tel. 803/233-4637

TENNESSEE (Eastern)

Electronic Marketing Associates
 9225 Honeycutt Creek Road
 Raleigh, NC 27609 — 1523
 Tel. 919/847-8800

(Western)

EPI Inc.
 Suite 13 — 9694 Hwy. 20 W
 Madison, AL 35758
 Tel. 205/461-7000

TEXAS

Sprague Electric Company
 Suite 220
 9319 LBJ Freeway
 Dallas 75243 — 3403
 Tel. 214/235-1256

Sprague Electric Company
 Suite 350W — 1106 Clayton Lane
 Austin 78723 — 1033
 Tel. 512/458-2514

UTAH

William J. Purdy Company
 5570 E. Yale Avenue
 Denver, CO 80222 — 6907
 Tel. 303/753-6800

VIRGINIA

Sprague Electric Company
 1 East Preston St.
 Lexington 24450 — 2324
 Tel. 703/463-9161

Sprague Electric Company

Suite 311
 14333 Laurel-Bowie Road
 Laurel, MD 20708 — 1130
 Tel. 301/953-1717

Trinkle Sales Inc.

P.O. Box 5320
 Cherry Hill, NJ 08034 — 0460
 Tel. 609/795-4200

WASHINGTON

Sprague Electric Company
 3826 Woodland Park, North
 Seattle 98103 — 7996
 Tel. 206/632-7761

Sprague Electric Company

Suite H
 16111 S.E. McGilivray Blvd.
 Vancouver 98664
 Tel. 206/892-0361
 Tel. 503/225-0493

William J. Purdy Company

4082-148th Ave. N.E.
 Redmond 98052 — 5165
 Tel. 206/882-3144

WISCONSIN

D. Dolin Sales
 131 West Layton Ave.
 Milwaukee 53207 — 5991
 Tel. 414/482-1111

CANADA

Sprague Electric of Canada, Ltd.
 Suite 220
 2375 Steeles Avenue, W
 Downsview, Ontario M3J 3A8
 Tel. 416/665-6066

CANADA (continued)

Sprague Electric of Canada, Ltd.
 Suite 1610 — 85 Albert St.
 Ottawa, Ont. K1P 6A4
 Tel. 613/238-2542

Lenbrook Electronics

Suite No. 2
 13696 104th Ave
 Surrey, B.C. V3T1W4
 Tel. 604/585-9599

EUROPE

Sprague World Trade Corp.
 18 Avenue Louis Casar
 1209 Geneva
 Switzerland
 Tel. 98-4021
 TLX 845 23469

Sprague Benelux

Excelsiorlaan 21
 Bus 3
 1930 Zaventem
 Belgium
 Tel. 02/721 48 60
 TLX 62897

Sprague Electric (U.K.) Ltd.

Airtech No. 2
 Fleming Way
 Crawley West Sussex RH 102 YQ
 England
 Tel. 293-51-78-78
 TLX 877813

Sprague France S.A.R.L.

3 Rue Camille Desmoulins
 9430 Cachan
 France
 Tel. (1) 547-6600
 TLX 250697

Sprague Elektronik GmbH

Postfach 700 848
 D-6 Frankfurt/M
 West Germany
 Tel. 069-60551
 TLX 414008

Sprague Italiana S.p.A.

Via G. DeCastro 4
 20144 Milano
 Italy
 Tel. 02-498-7891
 TLX 332321

Sprague Scandinavia AB

Box 54
 S-182 71 Stocksund
 Sweden
 Tel. (04) 08-8502 20
 TLX 854 15239

FAR EAST

Sprague World Trade Corp.
 Eastern Branch
 G.P.O. Box 4289
 Hong Kong
 Tel. 0-283188
 TLX 43395

Sprague Japan K.K.

Shinjuku KB Bldg.
 11-3, Nishi-Shinjuku 6-Chome
 Shinjuku-ku, Tokyo 160
 Japan
 Tel. (03) 348-5221
 TLX J23328

Tecnomic Ltd.

Sprague Korea Branch
 4th Fl., Daiyoung Bldg.,
 44-1, Yoido-Dong
 Youngdunpo-Ku, Seoul, Korea
 Tel. (2) 783-9784
 TLX 78726186

Sprague World Trade Corp.

Singapore Office
 11th Floor, 450/452 Inchoape House
 Alexandra Road
 Singapore 0511
 Tel. 475-1826
 TLX RS 26384

Sprague Taiwan Branch/

Tecnomic, Ltd.
 8/F, 142, Sec. 4
 Chung Hsiao East Road
 Taipei, Taiwan, R.O.C.
 Tel. 771-9582
 TLX 21422

In the construction of the components described, the full intent of the specification will be met. The Sprague Electric Company, however, reserves the right to make, from time to time, such departures from the detail specifications as may be required to permit improvements in the design of its products. Components made under military approvals will be in accordance with the approval requirements.

The information included herein is believed to be accurate and reliable. However, the Sprague Electric Company assumes no responsibility for its use; nor for any infringements of patents or other rights of third parties which may result from its use.

8348