LAMPIRAN

A

```
/*****************************************************
Project                 :Tugas Akhir
Version                 :1.00
Date                    :7/12/2010
Author                  :Yudi Scotland A
Company                 : Unknown

Chip type               : ATmega16
Program type            : Application
Clock frequency         : 11.059200 MHz
Memory model            : Small
External SRAM size      : 0
Data Stack size         : 256
*****************************************************/
#include <mega16.h>
#include<delay.h>
#include<stdio.h>

// Alphanumeric LCD Module functions
#asm
.equ __lcd_port=0x15 ;PORTC
#endasm
#include <lcd.h>

// Declare your global variables here
int count,deteksi1,deteksi2,deteksi3,deteksi4,deteksi5,deteksi6,deteksi7,deteksi8;
int data1,data2,data3,data4,data5,data6,data7,data8;
int start;
int index,j;

unsigned char password[6];

void Pintu_Tutup()
{
PORTB=1;
delay_ms(50);
//PORTB=3;
//delay_ms(50);
PORTB=2;
delay_ms(50);
//PORTB=6;
//delay_ms(50);
PORTB=4;
delay_ms(50);
//PORTB=12;
//delay_ms(50);
```

```
PORTB=8;
delay_ms(50);
//PORTB=9;
//delay_ms(50);
}

void Pintu_Buka()
{
//PORTB=9;
//delay_ms(50);
PORTB=8;
delay_ms(50);
//PORTB=12;
//delay_ms(50);
PORTB=4;
delay_ms(50);
//PORTB=6;
//delay_ms(50);
PORTB=2;
delay_ms(50);
//PORTB=3;
//delay_ms(50);
PORTB=1;
delay_ms(50);
}

void main(void)
{
// Declare your local variables here
// Input/Output Ports initialization
// Port A initialization
// Func7=In Func6=In Func5=In Func4=In Func3=In Func2=In Func1=In
Func0=In
// State7=T State6=T State5=T State4=T State3=T State2=T State1=T State0=P
PORTA=0x31;
DDRA=0x00;

// Port B initialization
// Func7=In Func6=In Func5=In Func4=In Func3=Out Func2=Out Func1=Out
Func0=Out
// State7=T State6=T State5=T State4=T State3=0 State2=0 State1=0 State0=0
PORTB=0x00;
DDRB=0x0F;
```

```
// Port C initialization
// Func7=In Func6=In Func5=In Func4=In Func3=In Func2=In Func1=In
Func0=In
// State7=T State6=T State5=T State4=T State3=T State2=T State1=T State0=T
PORTC=0x00;
DDRC=0x00;

// Port D initialization
// Func7=In Func6=In Func5=In Func4=In Func3=In Func2=In Func1=In
Func0=In
// State7=T State6=T State5=T State4=T State3=T State2=T State1=T State0=T
PORTD=0x00;
DDRD=0x00;

// Timer/Counter 0 initialization
// Clock source: System Clock
// Clock value: Timer 0 Stopped
// Mode: Normal top=FFh
// OC0 output: Disconnected
TCCR0=0x00;
TCNT0=0x00;
OCR0=0x00;

// Timer/Counter 1 initialization
// Clock source: System Clock
// Clock value: Timer 1 Stopped
// Mode: Normal top=FFFFh
// OC1A output: Discon.
// OC1B output: Discon.
// Noise Canceler: Off
// Input Capture on Falling Edge
// Timer 1 Overflow Interrupt: Off
// Input Capture Interrupt: Off
// Compare A Match Interrupt: Off
// Compare B Match Interrupt: Off
TCCR1A=0x00;
TCCR1B=0x00;
TCNT1H=0x00;
TCNT1L=0x00;
ICR1H=0x00;
ICR1L=0x00;
OCR1AH=0x00;
OCR1AL=0x00;
OCR1BH=0x00;
OCR1BL=0x00;
```

```
// Timer/Counter 2 initialization
// Clock source: System Clock
// Clock value: Timer 2 Stopped
// Mode: Normal top=FFh
// OC2 output: Disconnected
ASSR=0x00;
TCCR2=0x00;
TCNT2=0x00;
OCR2=0x00;
// External Interrupt(s) initialization
// INT0: Off
// INT1: Off
// INT2: Off
MCUCR=0x00;
MCUCSR=0x00;
// Timer(s)/Counter(s) Interrupt(s) initialization
TIMSK=0x00;
// Analog Comparator initialization
// Analog Comparator: Off
// Analog Comparator Input Capture by Timer/Counter 1: Off
ACSR=0x80;
SFIOR=0x00;

// LCD module initialization
lcd_init(16);
j=0;
lcd_gotoxy(0,0);
lcd_putsf("Password=");

while (1)
{
// Place your code herewhile (1)
while (PINA.0==1) {};
while (PINA.0==0)
{
delay_us(100);
count++;
};
```

```
start=count;
count=0;
if (start>=24 && start<=27)
{
while (PINA.0==1) {};
while (PINA.0==0)
{
delay_us(100);
count++;
};
deteksi1=count;
count=0;
while (PINA.0==1) {};
while (PINA.0==0)
{
delay_us(100);
count++;
};
deteksi2=count;
count=0;
while (PINA.0==1) {};
while (PINA.0==0)
{
delay_us(100);
count++;
};
deteksi3=count;
count=0;
while (PINA.0==1) {};
while (PINA.0==0)
{
delay_us(100);
count++;
};
deteksi4=count;
count=0;
while (PINA.0==1) {};
while (PINA.0==0)
{
delay_us(100);
count++;
};
deteksi5=count;
count=0;
while (PINA.0==1) {};
while (PINA.0==0)
```

```
{
delay_us(100);
count++;
};
deteksi6=count;
count=0;
while (PINA.0==1) {};
while (PINA.0==0)
{
delay_us(100);
count++;
};
deteksi7=count;
count=0;
while (PINA.0==1) {};
while (PINA.0==0)
{
delay_us(100);
count++;
};
deteksi8=count;
count=0;

//======================CEK 8 DATA======================
    data1=((deteksi1/5)-1)*1;//data hasil deteksi pulsa dibagi 5 dikurangi 1
    data2=((deteksi2/5)-1)*2;//jadi  jika datanya 6 maka outputnya akan = 0
    data3=((deteksi3/5)-1)*4;//sedangkan jika datanya 12 maka outputnya = 1
    data4=((deteksi4/5)-1)*8;//lalu hasil tersebut dikalikan dengan nilai2 bit
    data5=((deteksi5/5)-1)*16;
    data6=((deteksi6/5)-1)*32;
    data7=((deteksi7/5)-1)*64;
    data8=((deteksi8/5)-1)*128;

//==================PENJUMLAHAN 8 DATA================
index=data8+data7+data6+data5+data4+data3+data2+data1;
if(index==128) //tombol 1
{
password[j]='1';
lcd_gotoxy(0,0);
lcd_putsf("Password=");
lcd_gotoxy(j+9,0);
lcd_putchar('*');
delay_ms(600);
}
```

```
if(index==129)  //tombol 2
{
password[j]='2';
lcd_gotoxy(0,0);
lcd_putsf("Password=");
lcd_gotoxy(j+9,0);
lcd_putchar('*');
delay_ms(600);
}
if(index==130) //tombol 3
{
password[j]='3';
lcd_gotoxy(0,0);
lcd_putsf("Password=");
lcd_gotoxy(j+9,0);
lcd_putchar('*');
delay_ms(600);
}
if(index==131)   //tombol 4
{
password[j]='4';
lcd_gotoxy(0,0);
lcd_putsf("Password=");
lcd_gotoxy(j+9,0);
lcd_putchar('*');
delay_ms(600);
}

if(index==132)   //tombol 5
{
password[j]='5';
lcd_gotoxy(0,0);
lcd_putsf("Password=");
lcd_gotoxy(j+9,0);
lcd_putchar('*');
delay_ms(600);
}
if(index==133)   //tombol 6
{
password[j]='6';
lcd_gotoxy(0,0);
lcd_putsf("Password=");
lcd_gotoxy(j+9,0);
lcd_putchar('*');
delay_ms(600);
}
```

```
if(index==134)   //tombol 7
{
password[j]='7';
lcd_gotoxy(0,0);
lcd_putsf("Password=");
lcd_gotoxy(j+9,0);
lcd_putchar('*');
delay_ms(600);
}
if(index==135)   //tombol 8
{
password[j]='8';
lcd_gotoxy(0,0);
lcd_putsf("Password=");
lcd_gotoxy(j+9,0);
lcd_putchar('*');
delay_ms(600);
}
if(index==136)   //tombol 9
{
password[j]='9';
lcd_gotoxy(0,0);
lcd_putsf("Password=");
lcd_gotoxy(j+9,0);
lcd_putchar('*');
delay_ms(600);
}
if(index==137)   //tombol 0
{
password[j]='0';
lcd_gotoxy(0,0);
lcd_putsf("Password=");
lcd_gotoxy(j+9,0);
lcd_putchar('*');
delay_ms(600);
}
j++;
}
```

```
if (j==4)
{
if(password[0]=='1' && password[1]=='2'&& password[2]=='3'&&
password[3]=='4')
 {
 lcd_clear();
 lcd_gotoxy(0,0);
 lcd_putsf("Password=");
 lcd_gotoxy(0,1);
 lcd_putsf("Pintu Buka");
 while (PINA.4==1)
 {
 Pintu_Buka();
 }
 }
else if(password[0]=='4' && password[1]=='3'&& password[2]=='2'&&
password[3]=='1')
 {
 lcd_clear();
 lcd_gotoxy(0,0);
 lcd_putsf("Password=");
 lcd_gotoxy(0,1);
 lcd_putsf("Pintu Tutup");
 while(PINA.5==1)
 {
 Pintu_Tutup();
 }
 }
 else
 {
 lcd_clear();
 lcd_gotoxy(0,0);
 lcd_putsf("Password=");
 lcd_gotoxy(0,1);
 lcd_putsf("Password Salah");
 }
 j=0;
 password[0]='';
 password[1]='';
 password[2]='';
 password[3]='';
}

};
}
```

LAMPIRAN
B

Features

- High-performance, Low-power AVR® 8-bit Microcontroller
- Advanced RISC Architecture
  - 131 Powerful Instructions – Most Single-clock Cycle Execution
  - 32 x 8 General Purpose Working Registers
  - Fully Static Operation
  - Up to 16 MIPS Throughput at 16 MHz
  - On-chip 2-cycle Multiplier
- High Endurance Non-volatile Memory segments
  - 16K Bytes of In-System Self-programmable Flash program memory
  - 512 Bytes EEPROM
  - 1K Byte Internal SRAM
  - Write/Erase Cycles: 10,000 Flash/100,000 EEPROM
  - Data retention: 20 years at 85°C/100 years at 25°C[1]
  - Optional Boot Code Section with Independent Lock Bits
    In-System Programming by On-chip Boot Program
    True Read-While-Write Operation
  - Programming Lock for Software Security
- JTAG (IEEE std. 1149.1 Compliant) Interface
  - Boundary-scan Capabilities According to the JTAG Standard
  - Extensive On-chip Debug Support
  - Programming of Flash, EEPROM, Fuses, and Lock Bits through the JTAG Interface
- Peripheral Features
  - Two 8-bit Timer/Counters with Separate Prescalers and Compare Modes
  - One 16-bit Timer/Counter with Separate Prescaler, Compare Mode, and Capture Mode
  - Real Time Counter with Separate Oscillator
  - Four PWM Channels
  - 8-channel, 10-bit ADC
    - 8 Single-ended Channels
    - 7 Differential Channels in TQFP Package Only
    - 2 Differential Channels with Programmable Gain at 1x, 10x, or 200x
  - Byte-oriented Two-wire Serial Interface
  - Programmable Serial USART
  - Master/Slave SPI Serial Interface
  - Programmable Watchdog Timer with Separate On-chip Oscillator
  - On-chip Analog Comparator
- Special Microcontroller Features
  - Power-on Reset and Programmable Brown-out Detection
  - Internal Calibrated RC Oscillator
  - External and Internal Interrupt Sources
  - Six Sleep Modes: Idle, ADC Noise Reduction, Power-save, Power-down, Standby and Extended Standby
- I/O and Packages
  - 32 Programmable I/O Lines
  - 40-pin PDIP, 44-lead TQFP, and 44-pad QFN/MLF
- Operating Voltages
  - 2.7 - 5.5V for ATmega16L
  - 4.5 - 5.5V for ATmega16
- Speed Grades
  - 0 - 8 MHz for ATmega16L
  - 0 - 16 MHz for ATmega16
- Power Consumption @ 1 MHz, 3V, and 25°C for ATmega16L
  - Active: 1.1 mA
  - Idle Mode: 0.35 mA
  - Power-down Mode: < 1 µA

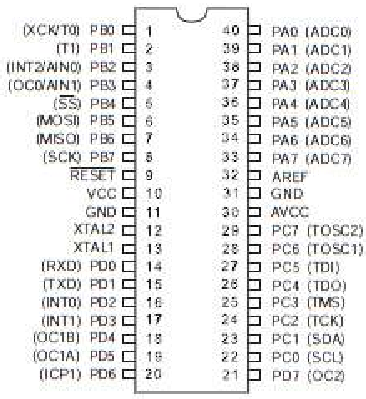
8-bit AVR® Microcontroller with 16K Bytes In-System Programmable Flash

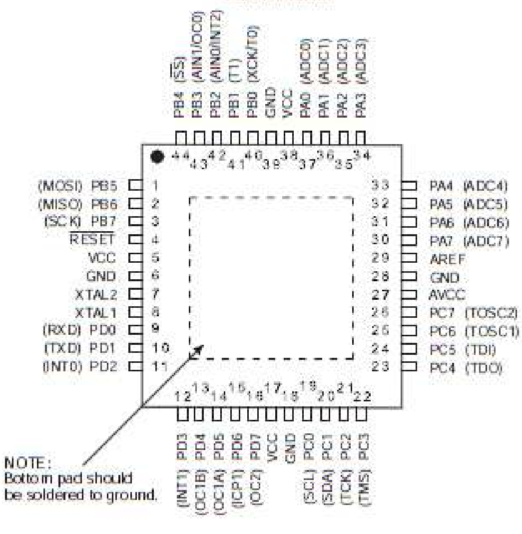
ATmega16
ATmega16L

Note: Not recommended for new designs.

Pin Configurations

Figure 1. Pinout ATmega16





Disclaimer

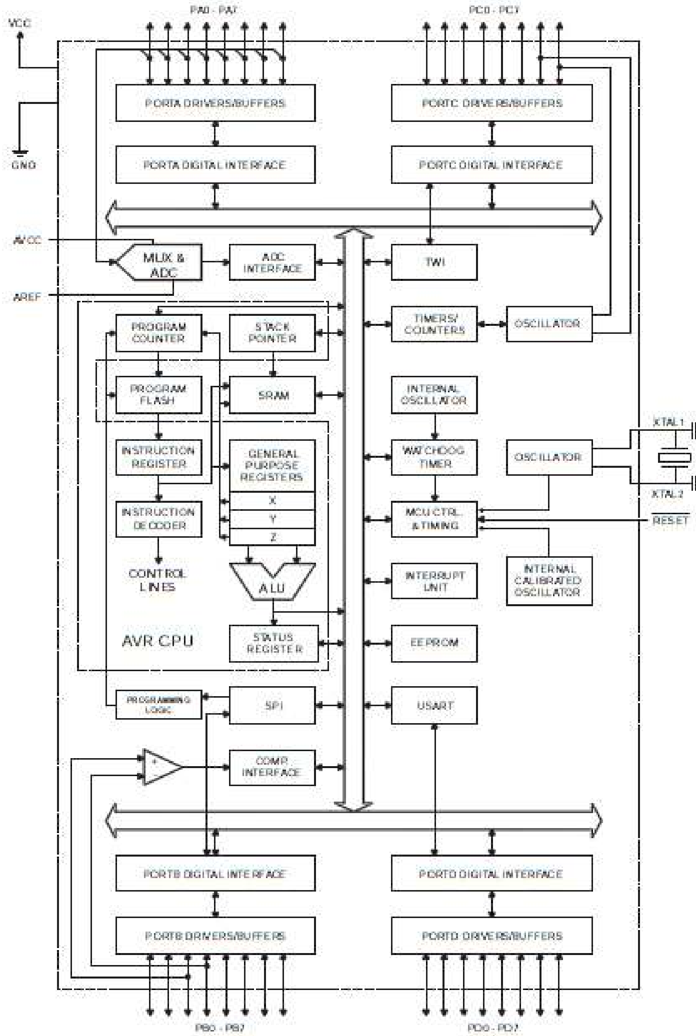
Typical values contained in this datasheet are based on simulations and characterization of other AVR microcontrollers manufactured on the same process technology. Min and Max values will be available after the device is characterized.

Overview

The ATmega16 is a low-power CMOS 8-bit microcontroller based on the AVR enhanced RISC architecture. By executing powerful instructions in a single clock cycle, the ATmega16 achieves throughputs approaching 1 MIPS per MHz allowing the system designer to optimize power consumption versus processing speed.

Block Diagram

Figure 2. Block Diagram



The AVR core combines a rich instruction set with 32 general purpose working registers. All the 32 registers are directly connected to the Arithmetic Logic Unit (ALU), allowing two independent registers to be accessed in one single instruction executed in one clock cycle. The resulting architecture is more code efficient while achieving throughputs up to ten times faster than conventional CISC microcontrollers.

The ATmega16 provides the following features: 16K bytes of In-System Programmable Flash Program memory with Read-While-Write capabilities, 512 bytes EEPROM, 1K byte SRAM, 32 general purpose I/O lines, 32 general purpose working registers, a JTAG interface for Boundary-scan, On-chip Debugging support and programming, three flexible Timer/Counters with compare modes, Internal and External Interrupts, a serial programmable USART, a byte oriented Two-wire Serial Interface, an 8-channel, 10-bit ADC with optional differential input stage with programmable gain (TQFP package only), a programmable Watchdog Timer with Internal Oscillator, an SPI serial port, and six software selectable power saving modes. The Idle mode stops the CPU while allowing the USART, Two-wire interface, A/D Converter, SRAM, Timer/Counters, SPI port, and interrupt system to continue functioning. The Power-down mode saves the register contents but freezes the Oscillator, disabling all other chip functions until the next External Interrupt or Hardware Reset. In Power-save mode, the Asynchronous Timer continues to run, allowing the user to maintain a timer base while the rest of the device is sleeping. The ADC Noise Reduction mode stops the CPU and all I/O modules except Asynchronous Timer and ADC, to minimize switching noise during ADC conversions. In Standby mode, the crystal/resonator Oscillator is running while the rest of the device is sleeping. This allows very fast start-up combined with low-power consumption. In Extended Standby mode, both the main Oscillator and the Asynchronous Timer continue to run.

The device is manufactured using Atmel's high density nonvolatile memory technology. The On-chip ISP Flash allows the program memory to be reprogrammed in-system through an SPI serial interface, by a conventional nonvolatile memory programmer, or by an On-chip Boot program running on the AVR core. The boot program can use any interface to download the application program in the Application Flash memory. Software in the Boot Flash section will continue to run while the Application Flash section is updated, providing true Read-While-Write operation. By combining an 8-bit RISC CPU with In-System Self-Programmable Flash on a monolithic chip, the Atmel ATmega16 is a powerful microcontroller that provides a highly-flexible and cost-effective solution to many embedded control applications.

The ATmega16 AVR is supported with a full suite of program and system development tools including: C compilers, macro assemblers, program debugger/simulators, in-circuit emulators, and evaluation kits.

Pin Descriptions

VCC

Digital supply voltage.

GND

Ground.

Port A (PA7..PA0)

Port A serves as the analog inputs to the A/D Converter.

Port A also serves as an 8-bit bi-directional I/O port, if the A/D Converter is not used. Port pins can provide internal pull-up resistors (selected for each bit). The Port A output buffers have symmetrical drive characteristics with both high sink and source capability. When pins PA0 to PA7 are used as inputs and are externally pulled low, they will source current if the internal pull-up resistors are activated. The Port A pins are tri-stated when a reset condition becomes active, even if the clock is not running.

Port B (PB7..PB0)

Port B is an 8-bit bi-directional I/O port with internal pull-up resistors (selected for each bit). The Port B output buffers have symmetrical drive characteristics with both high sink and source capability. As inputs, Port B pins that are externally pulled low will source current if the pull-up resistors are activated. The Port B pins are tri-stated when a reset condition becomes active, even if the clock is not running.

Port B also serves the functions of various special features of the ATmega16 as listed on page 58.

Port C (PC7..PC0)

Port C is an 8-bit bi-directional I/O port with internal pull-up resistors (selected for each bit). The Port C output buffers have symmetrical drive characteristics with both high sink and source capability. As inputs, Port C pins that are externally pulled low will source current if the pull-up resistors are activated. The Port C pins are tri-stated when a reset condition becomes active, even if the clock is not running. If the JTAG interface is enabled, the pull-up resistors on pins PC5(TDI), PC3(TMS) and PC2(TCK) will be activated even if a reset occurs.

Port C also serves the functions of the JTAG interface and other special features of the ATmega16 as listed on page 61.

Port D (PD7..PD0)

Port D is an 8-bit bi-directional I/O port with internal pull-up resistors (selected for each bit). The Port D output buffers have symmetrical drive characteristics with both high sink and source capability. As inputs, Port D pins that are externally pulled low will source current if the pull-up resistors are activated. The Port D pins are tri-stated when a reset condition becomes active, even if the clock is not running.

Port D also serves the functions of various special features of the ATmega16 as listed on page 63.

$\overline{\text{RESET}}$

Reset Input. A low level on this pin for longer than the minimum pulse length will generate a reset, even if the clock is not running. The minimum pulse length is given in Table 15 on page 38. Shorter pulses are not guaranteed to generate a reset.

XTAL1

Input to the inverting Oscillator amplifier and input to the internal clock operating circuit.

XTAL2

Output from the inverting Oscillator amplifier.

AVCC

AVCC is the supply voltage pin for Port A and the A/D Converter. It should be externally connected to V_{CC}, even if the ADC is not used. If the ADC is used, it should be connected to V_{CC} through a low-pass filter.

AREF

AREF is the analog reference pin for the A/D Converter.

LAMPIRAN
C

SGS-THOMSON
MICROELECTRONICS

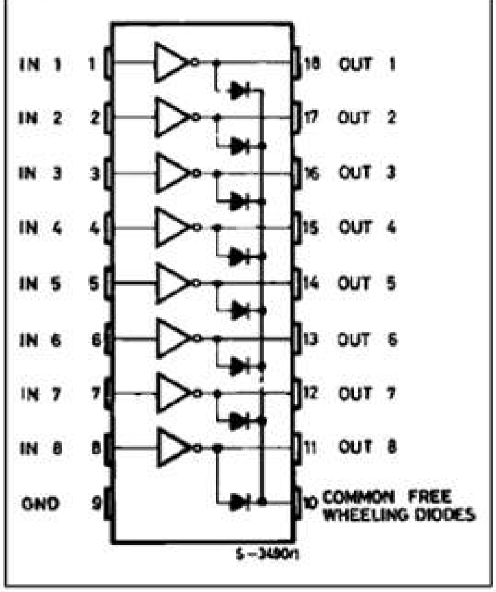
ULN2801A
ULN2802A - ULN2803A
ULN2804A - ULN2805A

EIGHT DARLINGTON ARRAYS

- EIGHT DARLINGTONS WITH COMMON EMITTERS
- OUTPUT CURRENT TO 500 mA
- OUTPUT VOLTAGE TO 50 V
- INTEGRAL SUPPRESSION DIODES
- VERSIONS FOR ALL POPULAR LOGIC FAMILIES
- OUTPUT CAN BE PARALLELED
- INPUTS PINNED OPPOSITE OUTPUTS TO SIMPLIFY BOARD LAYOUT

DIP18

PIN CONNECTION (top view)



DESCRIPTION

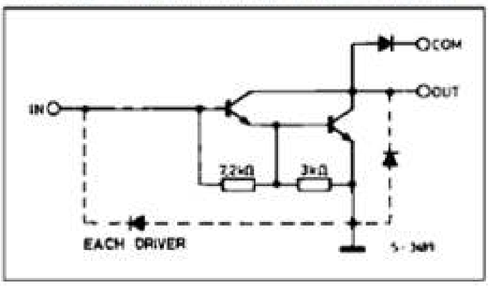
The ULN2801A-ULN2805A each contain eight darlington transistors with common emitters and integral suppression diodes for inductive loads. Each darlington features a peak load current rating of 600mA (500mA continuous) and can withstand at least 50V in the off state. Outputs may be paralleled for higher current capability.

Five versions are available to simplify interfacing to standard logic families : the ULN2801A is designed for general purpose applications with a current limit resistor ; the ULN2802A has a 10.5kΩ input resistor and zener for 14-25V PMOS ; the ULN2803A has a 2.7kΩ input resistor for 5V TTL and CMOS ; the ULN2804A has a 10.5kΩ input resistor for 6-15V CMOS and the ULN2805A is designed to sink a minimum of 350mA for standard and Schottky TTL where higher output current is required.

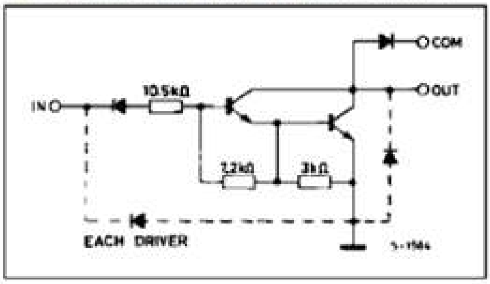
All types are supplied in a 18-lead plastic DIP with a copperlead from and featurethe convenientinput-opposite-outputpinout to simplify board layout.

SCHEMATIC DIAGRAM AND ORDER CODES

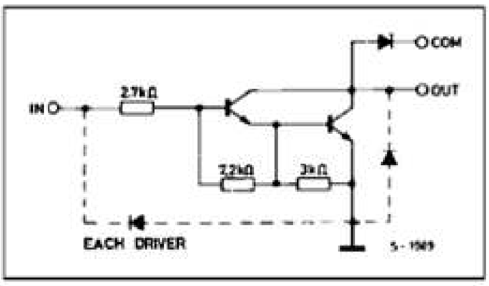
For ULN2801A (each driver for PMOS-CMOS)



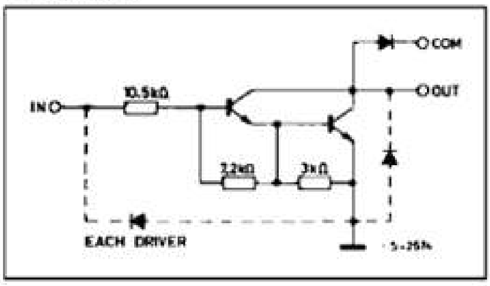
For ULN2802A (each driver for 14-15 V PMOS)



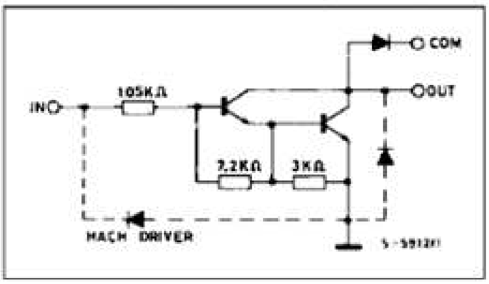
For ULN2803A (each driver for 5 V, TTL/CMOS)



For ULN2804A (each driver for 6-15 V CMOS/PMOS



For ULN2805A (each driver for high out TTL)



ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
V_o	Output Voltage	50	V
V_i	Input Voltage for ULN2802A, UL2803A, ULN2804A for ULN2805A	 30 15	V
I_C	Continuous Collector Current	500	mA
I_B	Continuous Base Current	25	mA
P_{tot}	Power Dissipation (one Darlington pair) (total package)	 1.0 2.25	W
T_{amb}	Operating Ambient Temperature Range	– 20 to 85	°C
T_{stg}	Storage Temperature Range	– 55 to 150	°C
T_j	Junction Temperature Range	– 20 to 150	°C

THERMAL DATA

Symbol	Parameter		Value	Unit
$R_{th\ j\text{-}amb}$	Thermal Resistance Junction-ambient	Max.	55	°C/W

ELECTRICAL CHARACTERISTICS (T_{amb} = 25°C unless otherwise specified)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit	Fig.
I_{CEX}	Output Leakage Current	V_{CE} = 50V T_{amb} = 70°C, V_{CE} = 50V T_{amb} = 70°C for ULN2802A V_{CE} = 50V, V_i = 6V for ULN2804A V_{CE} = 50V, V_i = 1V			50 100 500 500	µA µA µA µA	1a 1a 1b 1b
$V_{CE(sat)}$	Collector-emitter Saturation Voltage	I_C = 100mA, I_B = 250µA I_C = 200mA, I_B = 350µA I_C = 350mA, I_B = 500µA		0.9 1.1 1.3	1.1 1.3 1.6	V V V	2
$I_{i(on)}$	Input Current	for ULN2802A V_i = 17V for ULN2803A V_i = 3.85V for ULN2804A V_i = 5V V_i = 12V for ULN2805A V_i = 3V		0.82 0.93 0.35 1 1.5	1.25 1.35 0.5 1.45 2.4	mA mA mA mA mA	3
$I_{i(off)}$	Input Current	T_{amb} = 70°C, I_C = 500µA	50	65		µA	4
$V_{i(on)}$	Input Voltage	V_{CE} = 2 V for ULN2802A I_C = 300mA for ULN2803A I_C = 200mA I_C = 250mA I_C = 300mA for ULN2804A I_C = 125mA I_C = 200mA I_C = 275mA I_C = 350mA for ULN2805A I_C = 350mA			13 2.4 2.7 3 5 6 7 8 2.4	V V V V V V V V V	5
h_{FE}	DC Forward Current Gain	for ULN2801A V_{CE} = 2V, I_C = 350mA	1000			–	2
C_i	Input Capacitance			15	25	pF	–
t_{PLH}	Turn-on Delay Time	0.5 V_i to 0.5 V_o		0.25	1	µs	–
t_{PHL}	Turn-off Delay Time	0.5 V_i to 0.5 V_o		0.25	1	µs	–
I_R	Clamp Diode Leakage Current	V_R = 50V T_{amb} = 70°C, V_R = 50V			50 100	µA µA	6 6
V_F	Clamp Diode Forward Voltage	I_F = 350mA		1.7	2	V	7

TEST CIRCUITS

Figure 1a.

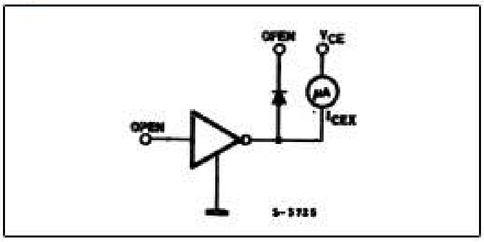


Figure 1b.

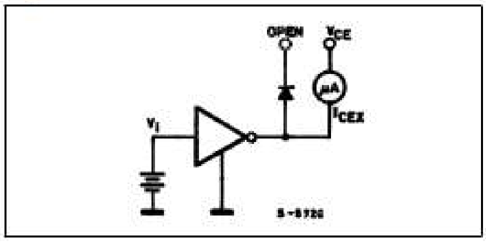


Figure 2.

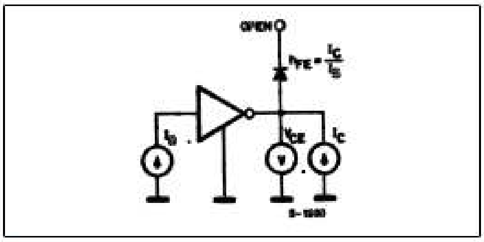


Figure 3.

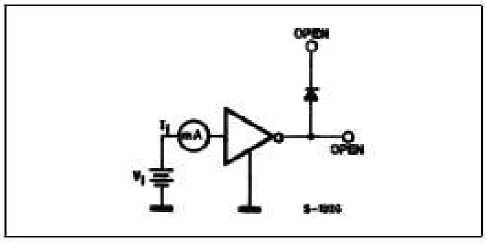


Figure 4.

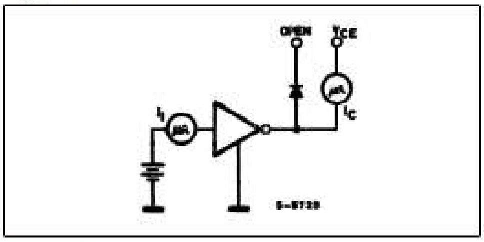


Figure 5.

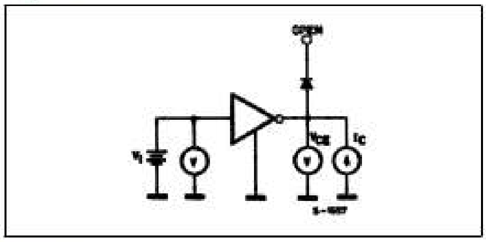


Figure 6.

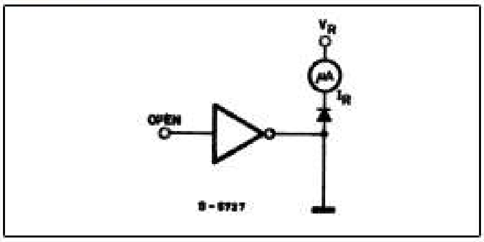


Figure 7.

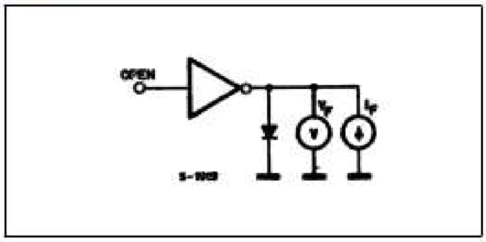


Figure 8 : Collector Current as a Function of Saturation Voltage.

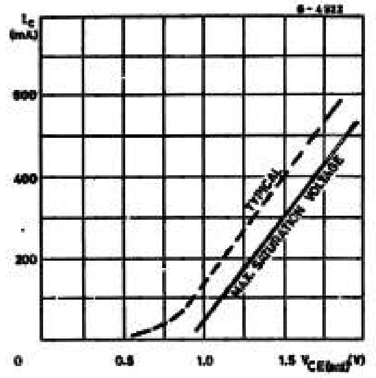


Figure 9 : Collector Current as a Function of Input Current.

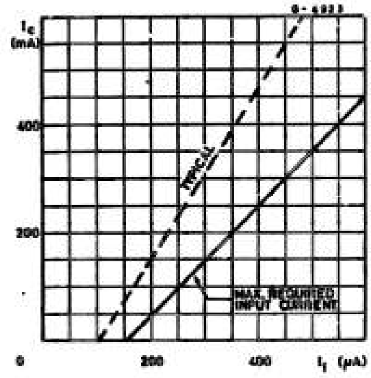


Figure 10 : Allowable Average Power Dissipation as a Function of Ambient Temperature.

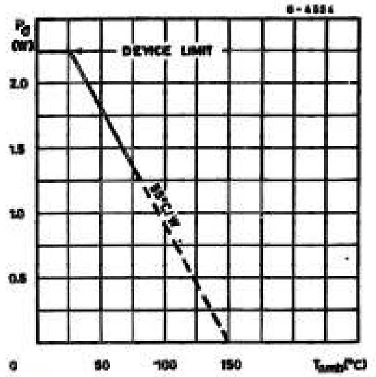


Figure 11 : Peak Collector Current as a Function of Duty Cycle.

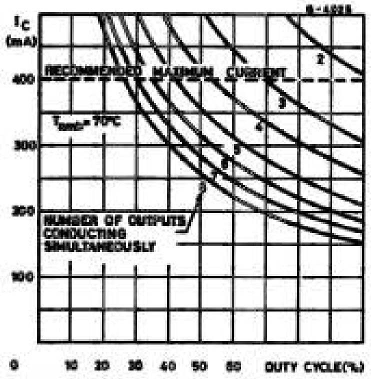


Figure 12 : Peak Collector Current as a Function of Duty.

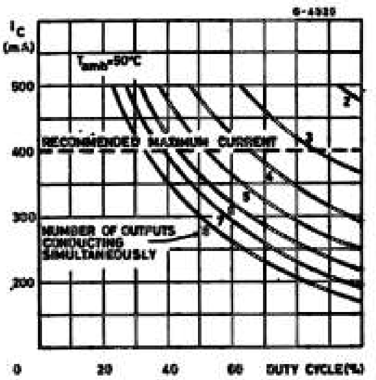


Figure 13 : Input Current as a Function of Input Voltage (for ULN2802A).

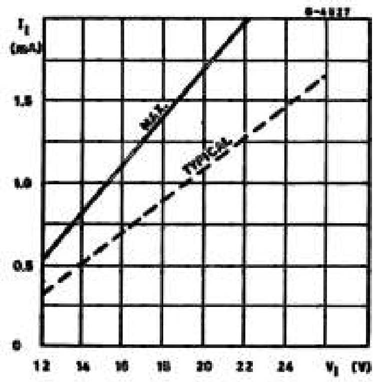


Figure 14 : Input Current as a Function of Input Voltage (for ULN2804A)

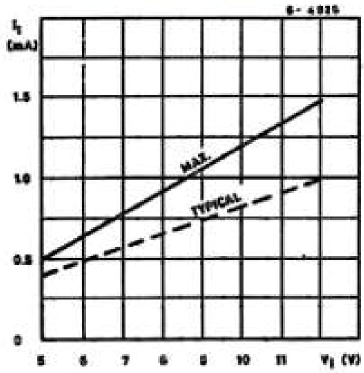


Figure 15 : Input Current as a Function of Input Voltage (for ULN2803A)

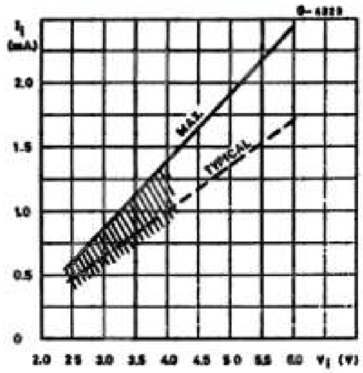
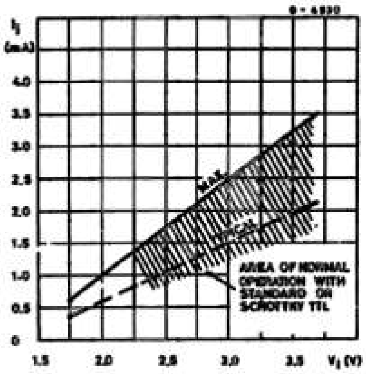


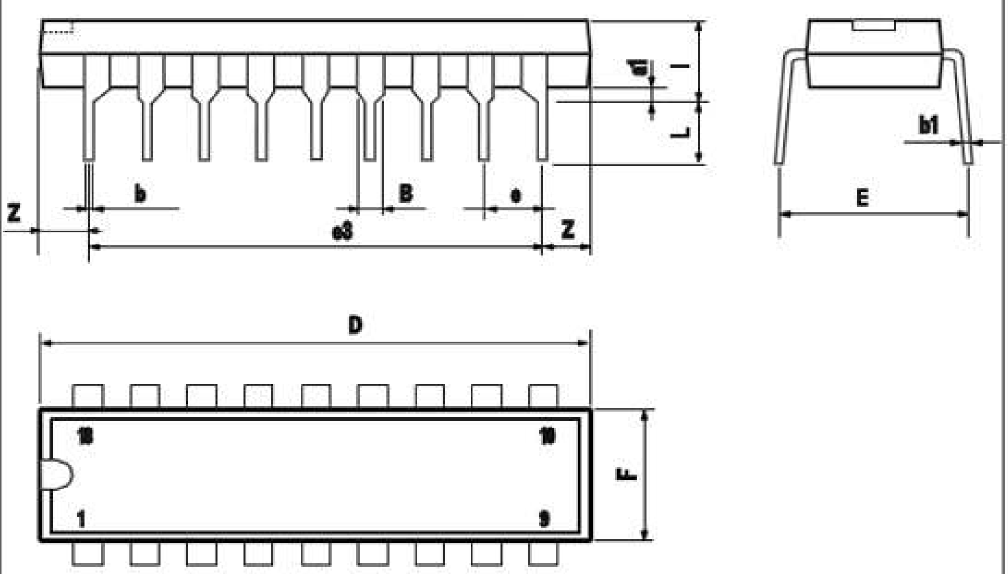
Figure 16 : Input Current as a Function of Input Voltage (for ULN2805A)



DIM.	mm			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
a1	0.254			0.010		
B	1.39		1.65	0.055		0.065
b		0.46			0.018	
b1		0.25			0.010	
D			23.24			0.915
E		8.5			0.335	
e		2.54			0.100	
e3		20.32			0.800	
F			7.1			0.280
I			3.93			0.155
L		3.3			0.130	
Z		1.27	1.59		0.050	0.063

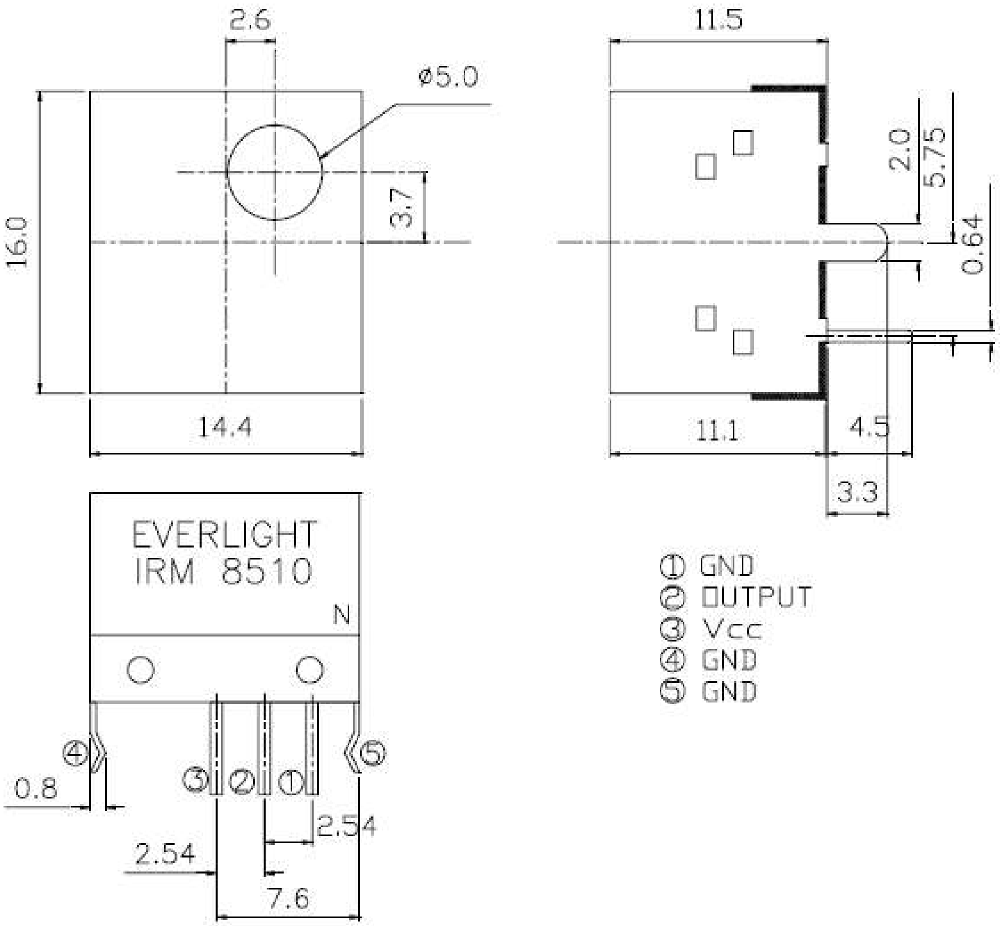
OUTLINE AND MECHANICAL DATA

DIP18



LAMPIRAN D

■ PACKAGE DIMENSIONS :



OFFICE: NO 25,Lane 76,Chung Yang Rd, Sec.3 Tucheng, Taipei 236, Taiwan, R.O.C.
TEL : 886-2-2267-2000,2266-9936 (22 Lines)
FAX : 886-2-2267-6189
http://www.everlight.com

■ NOTES：

1. This drawing measure is a standard value. All dimensions are in millimeter.
2. In case of designation is tolerance ± 0.3mm.
3. Lead spacing is measured where the lead emerge from the package.
4. Above specification may be changed without notice. EVERLIGHT will reserve authority on material change for above specification.
5. These specification sheets include materials protected under copyright of EVERLIGHT corporation. Please don't reproduce or cause anyone to reproduce them without EVERLIGHT consent.
6. When using this produce, please observe the absolute maximum ratings and the instructions for use outlined in these specification sheets. EVERLIGHT assumes no responsibility for any damage resulting from use of the product which does not comply with the absolute maximum ratings and the instructions included in these specification sheets.

Description：

1. The module is a small type infrared remote control system receiver which has been developed and designed by utilizing the latest hybrid technology.
2. This single unit type module incorporates a photo diode and a receiving preamplifier IC.
3. The demodulated output signal can directly be decoded by a microprocessor.

Feature：

1. High protection ability to EMI and metal case can be customized.
2. Mold type and metal case type to meet the design of front panel.
3. Elliptic lens to improve the characteristic against
4. Line-up for various center carrier frequencies.
5. Low voltage and low power consumption.
6. High immunity against ambient light.
7. Photodiode with integrated circuit.
8. TTL and CMOS compatibility.
9. Long reception distance.
10. High sensitivity.

Application：

1. Optical switch
2. Light detecting portion of remote control
   - AV instruments such as Audio, TV, VCR, CD, MD, etc.
   - Home appliances such as Air-conditioner, Fan , etc.
   - The other equipments with wireless remote control.
   - CATV set top boxes
   - Multi-media Equipment

Absolute maximum ratings : (Ta=25℃)

Parameter	Symbol	Ratings	Unit	Notice
Supply Voltage	Vcc	4.3~5.7	V	
Operating Temperature	Topr	-10～+60	℃	
Storage Temperature	Tstg	-20～+70	℃	
Soldering Temperature	Tsol	260	℃	4mm from mold body less than 5 seconds

Electro Optical Characteristics : (Ta=25℃)

Parameter	Symbol	MIN	TYP	MAX	Unit	Condition
Supply Voltage	Vcc	4.7	5	5.3	V	DC voltage
Supply Current	Icc	-	-	3	mA	No signal input
B.P.F Center Frequency	fo	-	37.9	-	KHz	
Peak Wavelength	λ p	-	940	-	nm	
Transmission Distance	L_0	5	-	-	m	At the ray axis *1
	L_{45}	2.5	-			
Half Angle	θ	-	45	-	deg	
High Level Pulse Width	T_H	400	-	800	µs	At the ray axis *2
Low Level Pulse Width	T_L	400	-	800	µs	
High Level Output Voltage	V_H	4.5	-	-	V	
Low Level Output Voltage	V_L			0.5	V	

*1:The ray receiving surface at a vertex and relation to the ray axis in the range of ϕ= 0° and ϕ=45°.

*2:A range from 30cm to the arrival distance. Average value of 50 pulses.

■ TEST METHOD：

The specified electro-optical characteristics is satisfied under the following Conditions at the controllable distance.

①Measurement place

A place that is nothing of extreme light reflected in the room.

②External light

Project the light of ordinary white fluorescent lamps which are not high Frequency lamps and must be less then 10 Lux at the module surface. (Ee≦10Lux)

③Standard transmitter

A transmitter whose output is so adjusted as to Vo=400mVp-p and the output Wave form shown in Fig.-1.According to the measurement method shown in Fig.-2 the standard transmitter is specified. However, the infrared photodiode to be used for the transmitter should be λp=940nm, $\Delta\lambda$=50nm. Also, photo diode is used of PD438B (V_R=5V).
(Standard light / Light source temperature 2856°K).

④Measuring system

According to the measuring system shown in Fig.-3

■ Module schematic & circuit：

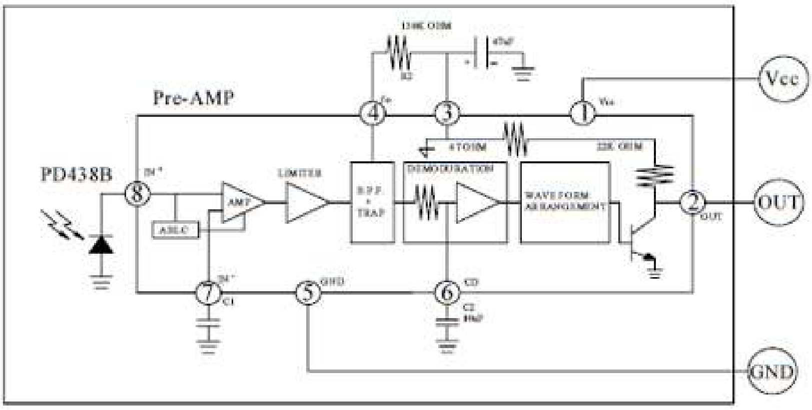
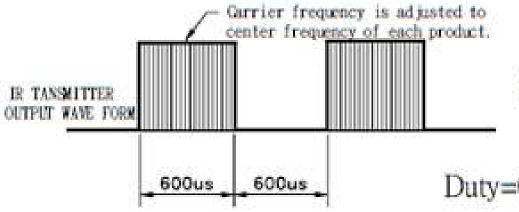
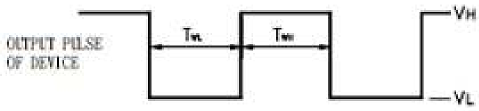


Fig.-1 Transmitter Wave Form



D.U.T Output Pulse



Duty=0.5

Fig.-2 Measuring Method

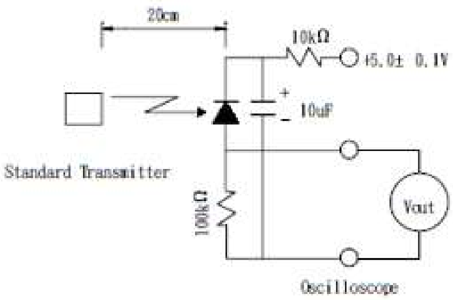
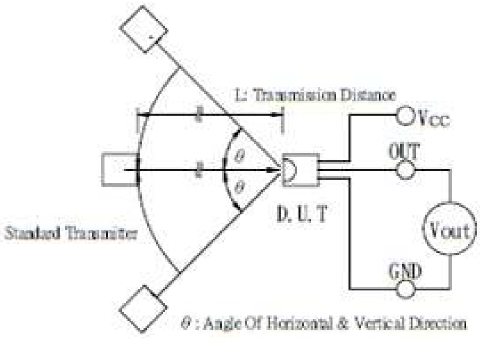


Fig.-3 Measuring System



TYPICAL ELECTRICAL/OPTICAL/CHARACTERISTICS CURVES

Fig.-4 Relative Spectral Sensitivity vs. Wavelength

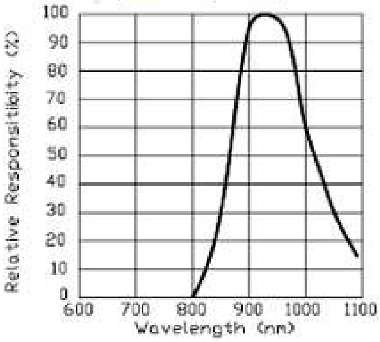


Fig.-5 Relative Transmission Distance vs. Direction

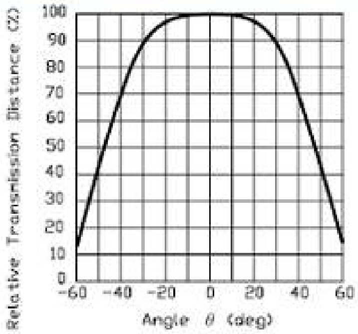


Fig.-6 Output Pulse Length vs. Arrival Distance

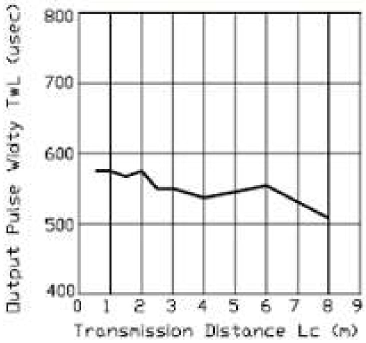


Fig.-7 Arrival Distance vs. Supply Voltage

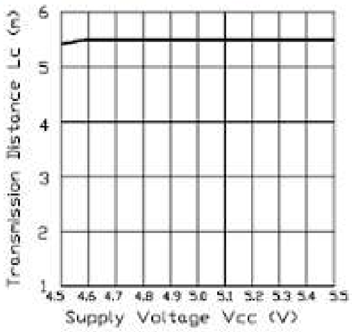


Fig.-8 Relative Transmission Distance
vs. Center Carrier Frequency

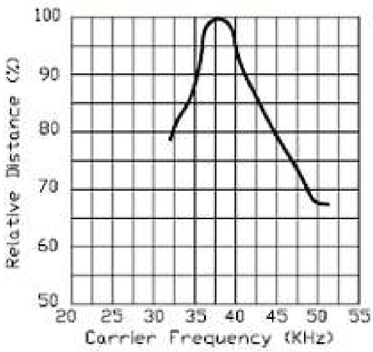
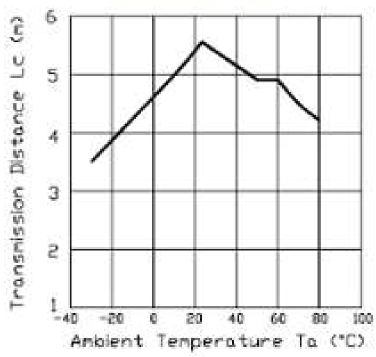
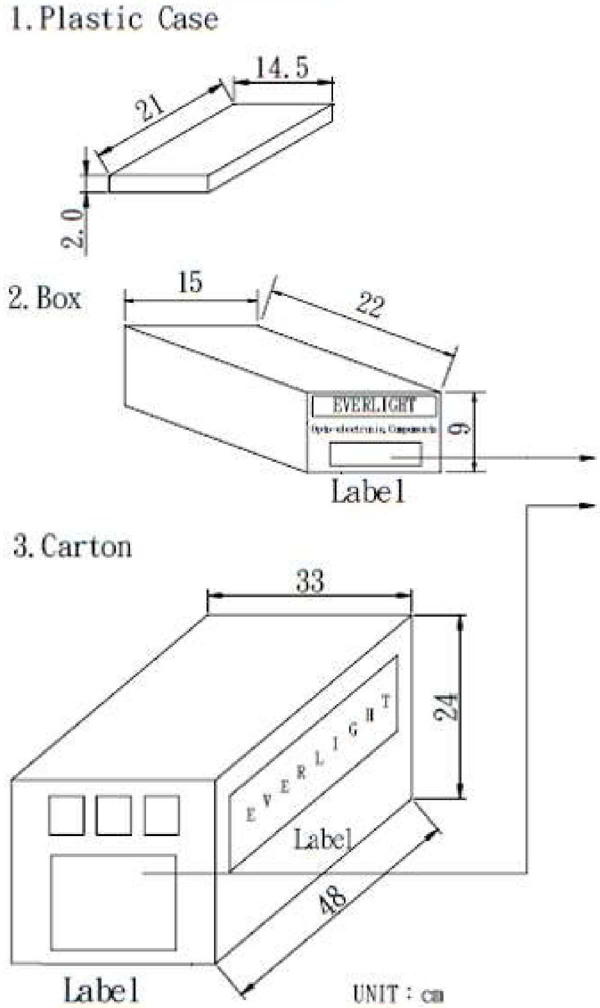


Fig.-9 Arrival Distance
vs. Ambient Temperature



Packing Specifications



CPN : Customer's Production Number
P/N : Production Number
QTY : Packing Quantity
CAT : Ranks
HUE : Peak Wavelength
REF : Reference
LOT NO : Lot Number
MADE IN TAIWAN : Production place

Packing Quantity Specification

1. 40 Pcs/1Plastic Case，4Plastic Cases/1Box
2. 10 Boxes/1Carton