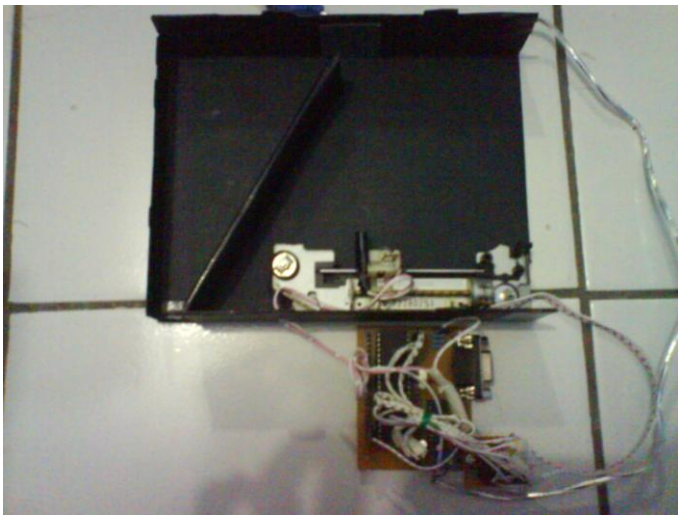
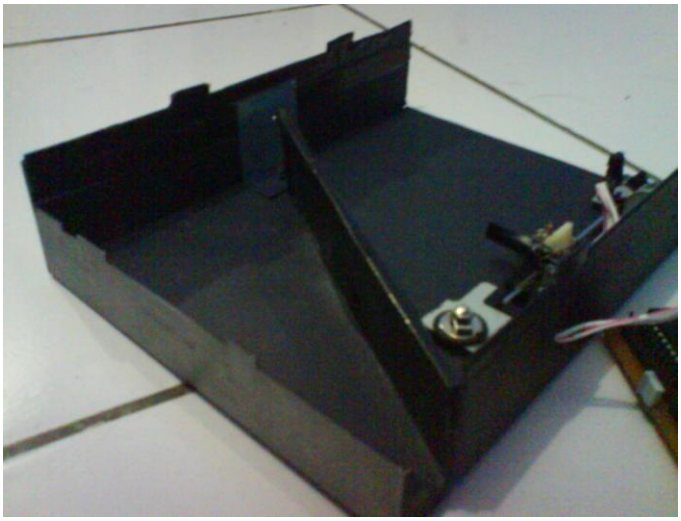
LAMPIRAN A

Perancangan Alat dan Hasil Pemantulan

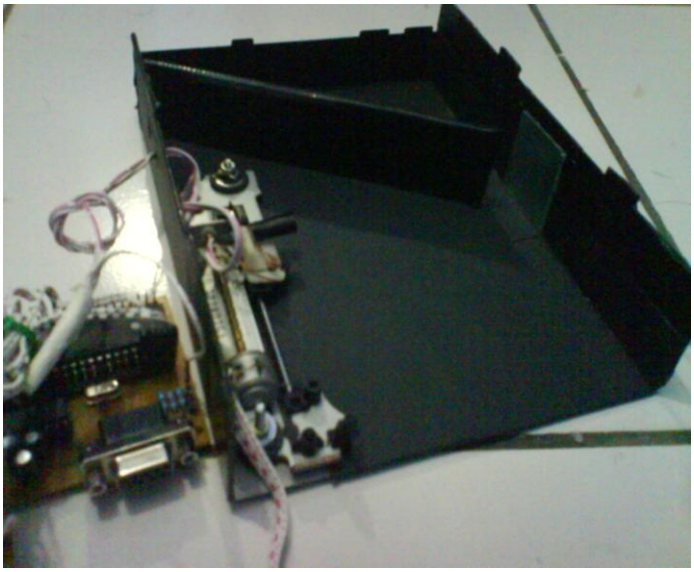
Gambar awal perancangan alat



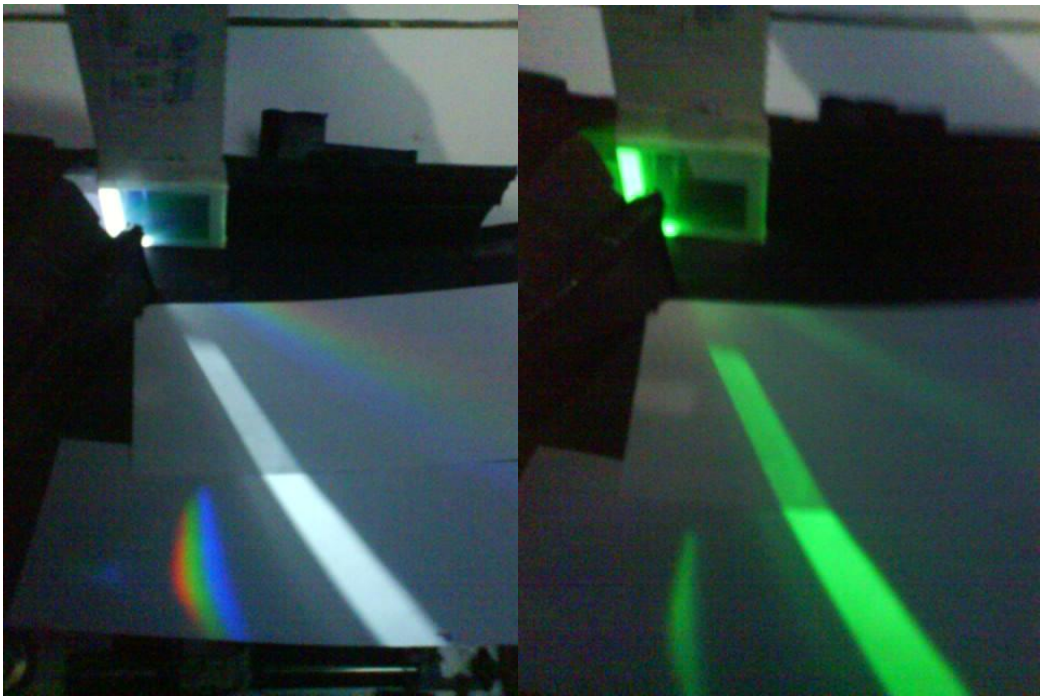
Gambar keseluruhan alat yang dibuat tampak dari atas



Gambar tampak samping kiri dari alat, tempat sumber cahaya masuk



Gambar tampak samping kanan dari alat



Gambar hasil pemantulan dari kepingan CD

Gambar hasil dari penggunaan kisi difraksi

LAMPIRAN B

List Pemograman Codevision AVR

```
/*****************************************************
This program was produced by the CodeWizardAVR V2.03.4 Standard
Automatic Program Generator © Copyright 1998-2008 Pavel Haiduc, HP InfoTech s.r.l.
http://www.hpinfotech.com
Project :
Version :
Date    : 8/9/2009
Author  :
Company :
Comments:
Chip type           : ATmega16
Program type        : Application
Clock frequency     : 11.059200 MHz
Memory model        : Small
External RAM size   : 0
Data Stack size     : 256
*****************************************************/
#include <mega16.h>
#include <delay.h>
#include <gun.h>

#include <stdio.h>
#include <delay.h>

int start_acc;
```

```
#define RXB8 1
#define TXB8 0
#define UPE 2
#define OVR 3
#define FE 4
#define UDRE 5
#define RXC 7

#define FRAMING_ERROR (1<<FE)
#define PARITY_ERROR (1<<UPE)
#define DATA_OVERRUN (1<<OVR)
#define DATA_REGISTER_EMPTY (1<<UDRE)
#define RX_COMPLETE (1<<RXC)

// USART Receiver buffer
#define RX_BUFFER_SIZE 8
char rx_buffer[RX_BUFFER_SIZE];

#if RX_BUFFER_SIZE<256
unsigned char rx_wr_index,rx_counter;
#else
unsigned int rx_wr_index,rx_rd_index,rx_counter;
#endif
```

```
// This flag is set on USART Receiver buffer overflow
bit rx_buffer_overflow;

// USART Receiver interrupt service routine
interrupt [USART_RXC] void usart_rx_isr(void)
{
char status,data;
status=UCSRA;
data=UDR;
if ((status & (FRAMING_ERROR | PARITY_ERROR | DATA_OVERRUN))==0)
   {
   rx_buffer[rx_wr_index]=data;
   if (++rx_wr_index == RX_BUFFER_SIZE) rx_wr_index=0;
   if (++rx_counter == RX_BUFFER_SIZE)
      {
      rx_counter=0;
      rx_buffer_overflow=1;
      };
   };
if(data == 'S') start_acc = 1;
if(data == 'R') start_acc = 2;
}
int dat_ldr;
#define ADC_VREF_TYPE 0x40
```

```
// Read the AD conversion result
unsigned int read_adc(unsigned char adc_input)
{
ADMUX=adc_input | (ADC_VREF_TYPE & 0xff);
// Delay needed for the stabilization of the ADC input voltage
delay_us(10);
// Start the AD conversion
ADCSRA|=0x40;
// Wait for the AD conversion to complete
while ((ADCSRA & 0x10)==0);
ADCSRA|=0x10;
return ADCW;
}

void main(void)
{

DDRD.3 = 1;
DDRD.4 = 1;
DDRD.5 = 1;
DDRD.6 = 1;

// USART initialization
// Communication Parameters: 8 Data, 1 Stop, No Parity
// USART Receiver: On
```

```
// USART Transmitter: On
// USART Mode: Asynchronous
// USART Baud Rate: 9600
UCSRA=0x00;
UCSRB=0x98;
UCSRC=0x86;
UBRRH=0x00;
UBRRL=0x47;

// Global enable interrupts
#asm("sei")
ACSR=0x80;
SFIOR=0x00;

ADMUX=ADC_VREF_TYPE & 0xff;
ADCSRA=0x84;

reset_motor1();

while (1)
      {
      // Place your code here
if (start_acc==1)
{
for (i=0;i<200;i++)
```

```
{
a++;
 geser(a);
 delay_ms(100);
 dat_ldr=read_adc(0);
 putchar(dat_ldr/4);
 delay_ms(100);
if(a > 4)a=0;
};
reset_motor();
start_acc=0;
};
if (start_acc==2)
{
reset_motor1();
start_acc=0;
};
      delay_ms(100);
      };
}
```

LAMPIRAN C

List Pemograman Tampilan Visual Basic

FORM UTAMA TAMPILAN VISUAL BASIC

```
Private Declare Function OSWinHelp% Lib "user32" Alias "WinHelpA" (ByVal
hwnd&, ByVal HelpFile$, ByVal wCommand%, dwData As Any)


Private Sub MDIForm_Load()
    Dim frmD As frmDocument
    Set frmD = New frmDocument
    frmD.Caption = "OSA"
    frmD.Show

End Sub


Private Sub MDIForm_Unload(Cancel As Integer)
    If Me.WindowState <> vbMinimized Then
        SaveSetting App.Title, "Settings", "MainLeft", Me.Left
        SaveSetting App.Title, "Settings", "MainTop", Me.Top
        SaveSetting App.Title, "Settings", "MainWidth", Me.Width
        SaveSetting App.Title, "Settings", "MainHeight", Me.Height
    End If
End Sub


Private Sub sbStatusBar_PanelClick(ByVal Panel As MSComctlLib.Panel)


End Sub
```

```
Private Sub tbToolBar_ButtonClick(ByVal Button As MSComctlLib.Button)
    On Error Resume Next
    Select Case Button.Key
        Case "Save"
            mnuFileSave_Click
        Case "Print"
            mnuFilePrint_Click
    End Select
End Sub

Private Sub mnuFileExit_Click()
    Unload Me
End Sub

Private Sub mnuFilePrint_Click()
    On Error Resume Next
    If ActiveForm Is Nothing Then Exit Sub
    With dlgCommonDialog
        .DialogTitle = "Print"
        .CancelError = True
        .Flags = cdlPDReturnDC + cdlPDNoPageNums
        If ActiveForm.rtfText.SelLength = 0 Then
```

```
            .Flags = .Flags + cdlPDAllPages
        Else
            .Flags = .Flags + cdlPDSelection
        End If
        .ShowPrinter
        If Err <> MSComDlg.cdlCancel Then
            frmDocument.PrintForm
        End If
    End With
End Sub

Private Sub mnuFileSave_Click()
    Dim sFile As String
        With dlgCommonDialog
            .DialogTitle = "Save"
            .CancelError = False
            'ToDo: set the flags and attributes of the common dialog control
            .Filter = "All Files (*.csv)|*.csv"
            .ShowSave
            sFile = .FileName
        End With
        ActiveForm.rtfText.SaveFile sFile
End Sub
```

FORM UNTUK TIAP TOMBOL TAMPILAN

```
Public a As Integer


Private Sub connect_Click()
MSComm1.CommPort = 1
If MSComm1.PortOpen = False Then MSComm1.PortOpen = True
End Sub

Private Sub DISCONNECT_Click()
If MSComm1.PortOpen = True Then MSComm1.PortOpen = False
Timer1.Enabled = False
End Sub

Private Sub EXIT_Click()
End
End Sub

Private Sub Form_Load()
Timer1.Enabled = False
End Sub


Private Sub Start_Click()
```

```
If MSComm1.PortOpen = True Then MSComm1.Output = "S"

Timer1.Enabled = True

End Sub


Private Sub Print_Click()

PrintForm

End Sub


Private Sub Stop_Click()

Timer1.Enabled = False

End Sub


Private Sub Timer1_Timer()

If MSComm1.PortOpen = True Then Text1.Text = Asc(MSComm1.Input) / 2.5 *
Val(Text3.Text)

rtfText.Text = rtfText.Text + "," + Text1.Text + Chr$(13)

MSChart1.Data = (Text1.Text)

If a > 98 Then

Timer1.Enabled = False

a = 0

End If

a = a + 1

Text2.Text = a

End Sub
```

LAMPIRAN D

Data Sheet

SGS-THOMSON MICROELECTRONICS

L293D
L293DD

PUSH-PULL FOUR CHANNEL DRIVER WITH DIODES

- 600mA OUTPUT CURRENT CAPABILITY PER CHANNEL
- 1.2A PEAK OUTPUT CURRENT (non repetitive) PER CHANNEL
- ENABLE FACILITY
- OVERTEMPERATURE PROTECTION
- LOGICAL "0" INPUT VOLTAGE UP TO 1.5 V (HIGH NOISE IMMUNITY)
- INTERNAL CLAMP DIODES

SO(12+4+4)

Powerdip (12+2+2)

ORDERING NUMBERS:

L293DD L293D

DESCRIPTION

The Device is a monolithic integrated high voltage, high current four channel driver designed to accept standard DTL or TTL logic levels and drive inductive loads (such as relays solenoides, DC and stepping motors) and switching power transistors.

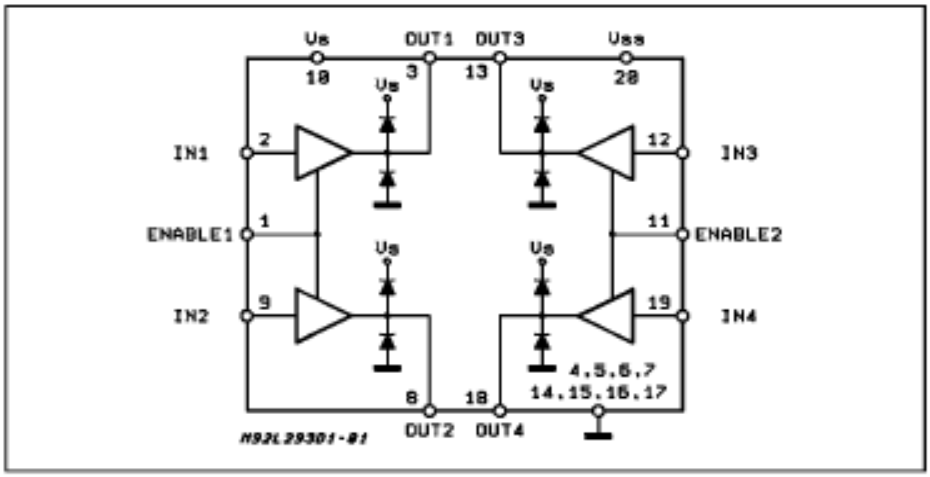
To simplify use as two bridges each pair of channels is equipped with an enable input. A separate supply input is provided for the logic, allowing operation at a lower voltage and internal clamp diodes are included.

This device is suitable for use in switching applications at frequencies up to 5 kHz.

The L293D is assembled in a 16 lead plastic packaage which has 4 center pins connected together and used for heatsinking

The L293DD is assembled in a 20 lead surface mount which has 8 center pins connected together and used for heatsinking.

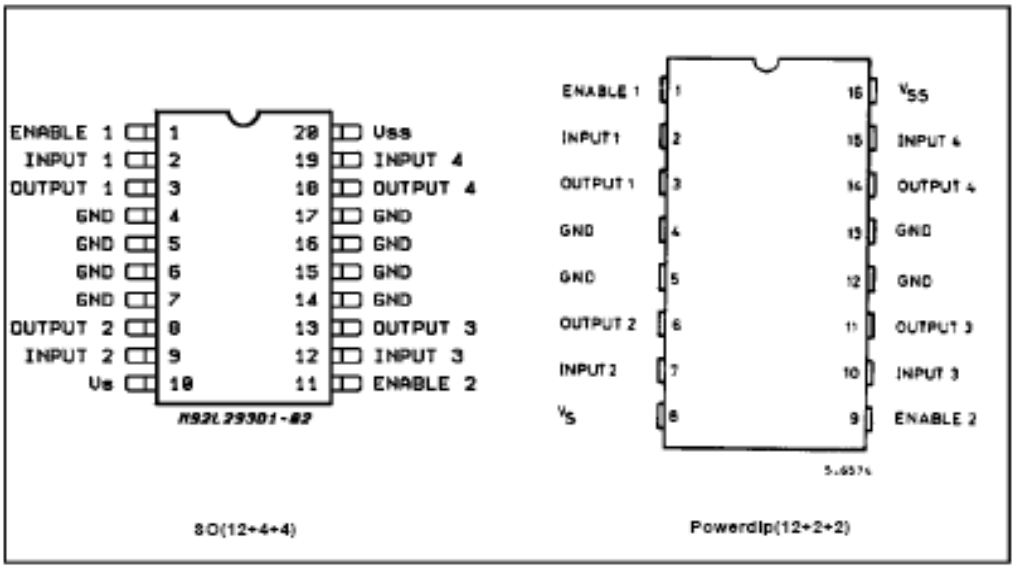
BLOCK DIAGRAM



ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
V_S	Supply Voltage	36	V
V_{SS}	Logic Supply Voltage	36	V
V_i	Input Voltage	7	V
V_{en}	Enable Voltage	7	V
I_o	Peak Output Current (100 μs non repetitive)	1.2	A
P_{tot}	Total Power Dissipation at T_{pins} = 90 °C	4	W
T_{stg}, T_j	Storage and Junction Temperature	– 40 to 150	°C

PIN CONNECTIONS (Top view)



SO(12+4+4) Powerdip(12+2+2)

THERMAL DATA

Symbol	Decription		DIP	SO	Unit
$R_{th\,j\text{-}pins}$	Thermal Resistance Junction-pins	max.	–	14	°C/W
$R_{th\,j\text{-}amb}$	Thermal Resistance junction-ambient	max.	80	50 (*)	°C/W
$R_{th\,j\text{-}case}$	Thermal Resistance Junction-case	max.	14	–	

(*) With 6sq. cm on board heatsink.

ELECTRICAL CHARACTERISTICS (for each channel, V_S = 24 V, V_{SS} = 5 V, T_{amb} = 25 °C, unless otherwise specified)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V_S	Supply Voltage (pin 10)		V_{SS}		36	V
V_{SS}	Logic Supply Voltage (pin 20)		4.5		36	V
I_S	Total Quiescent Supply Current (pin 10)	V_i = L ; I_O = 0 ; V_{en} = H		2	6	mA
		V_i = H ; I_O = 0 ; V_{en} = H		16	24	mA
		V_{en} = L			4	mA
I_{SS}	Total Quiescent Logic Supply Current (pin 20)	V_i = L ; I_O = 0 ; V_{en} = H		44	60	mA
		V_i = H ; I_O = 0 ; V_{en} = H		16	22	mA
		V_{en} = L		16	24	mA
V_{IL}	Input Low Voltage (pin 2, 9, 12, 19)		− 0.3		1.5	V
V_{IH}	Input High Voltage (pin 2, 9, 12, 19)	$V_{SS} \leq 7$ V	2.3		V_{SS}	V
		$V_{SS} > 7$ V	2.3		7	V
I_{IL}	Low Voltage Input Current (pin 2, 9, 12, 19)	V_{IL} = 1.5 V			− 10	µA
I_{IH}	High Voltage Input Current (pin 2, 9, 12, 19)	2.3 V ≤ V_{IH} ≤ V_{SS} − 0.6 V		30	100	µA
$V_{en\,L}$	Enable Low Voltage (pin 1, 11)		− 0.3		1.5	V
$V_{en\,H}$	Enable High Voltage (pin 1, 11)	$V_{SS} \leq 7$ V	2.3		V_{SS}	V
		$V_{SS} > 7$ V	2.3		7	V
$I_{en\,L}$	Low Voltage Enable Current (pin 1, 11)	$V_{en\,L}$ = 1.5 V		− 30	− 100	µA
$I_{en\,H}$	High Voltage Enable Current (pin 1, 11)	2.3 V ≤ $V_{en\,H}$ ≤ V_{SS} − 0.6 V			± 10	µA
$V_{CE(sat)H}$	Source Output Saturation Voltage (pins 3, 8, 13, 18)	I_O = − 0.6 A		1.4	1.8	V
$V_{CE(sat)L}$	Sink Output Saturation Voltage (pins 3, 8, 13, 18)	I_O = + 0.6 A		1.2	1.8	V
V_F	Clamp Diode Forward Voltage	I_O = 600mA		1.3		V
t_r	Rise Time (*)	0.1 to 0.9 V_O		250		ns
t_f	Fall Time (*)	0.9 to 0.1 V_O		250		ns
t_{on}	Turn-on Delay (*)	0.5 V_i to 0.5 V_O		750		ns
t_{off}	Turn-off Delay (*)	0.5 V_i to 0.5 V_O		200		ns

(*) See fig. 1.

TRUTH TABLE (one channel)

Input	Enable (*)	Output
H	H	H
L	H	L
H	L	Z
L	L	Z

Z = High output impedance
(*) Relative to the considered channel

Figure 1: Switching Times

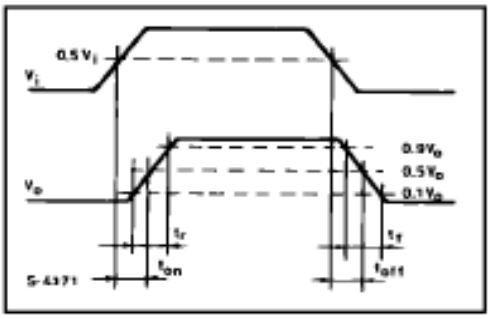
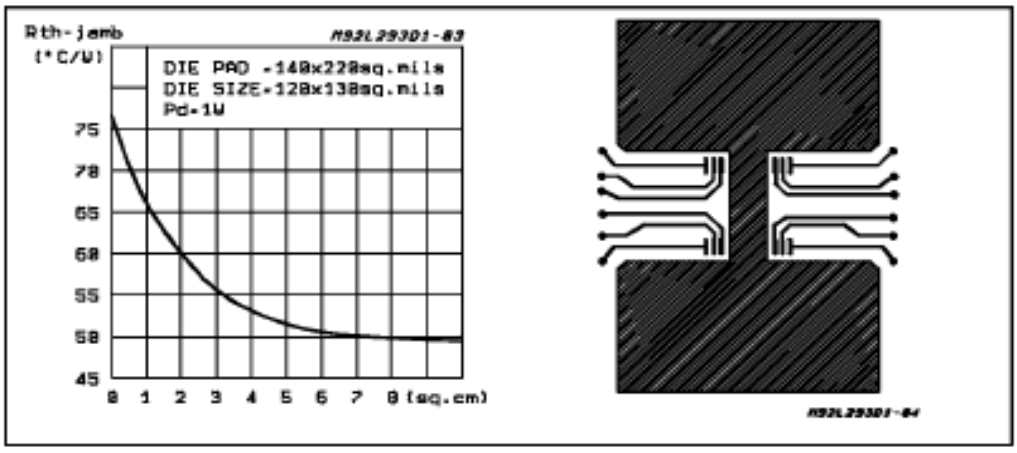
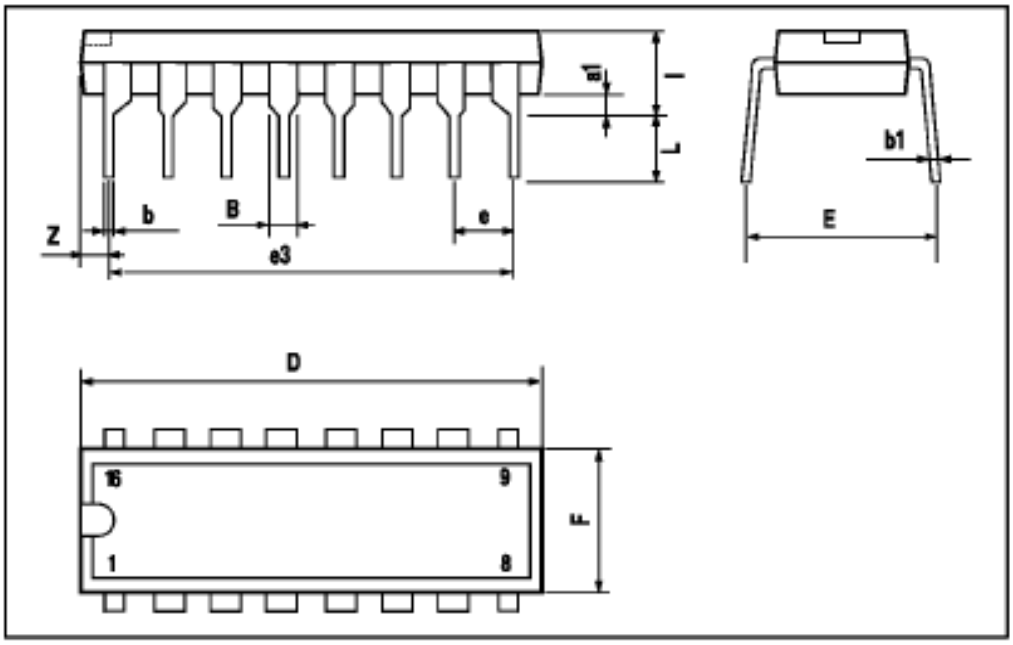


Figure 2: Junction to ambient thermal resistance vs. area on board heatsink (SO12+4+4 package)



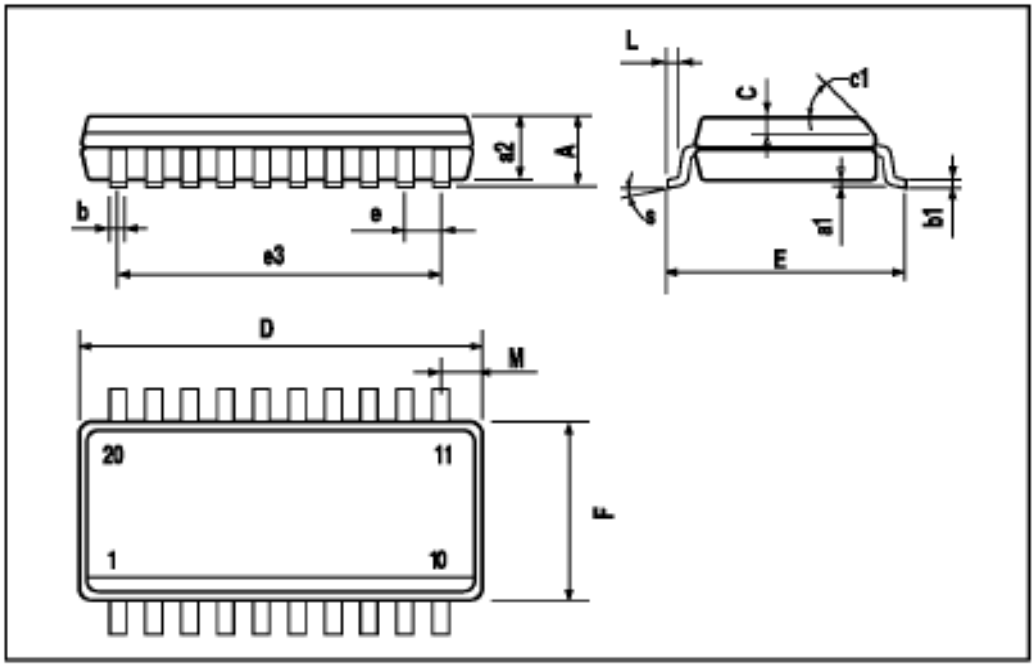
POWERDIP16 PACKAGE MECHANICAL DATA

DIM.	mm			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
a1	0.51			0.020		
B	0.85		1.40	0.033		0.055
b		0.50			0.020	
b1	0.38		0.50	0.015		0.020
D			20.0			0.787
E		8.80			0.346	
e		2.54			0.100	
e3		17.78			0.700	
F			7.10			0.280
I			5.10			0.201
L		3.30			0.130	
Z			1.27			0.050



SO20 PACKAGE MECHANICAL DATA

DIM.	mm			Inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A			2.65			0.104
a1	0.1		0.2	0.004		0.008
a2			2.45			0.096
b	0.35		0.49	0.014		0.019
b1	0.23		0.32	0.009		0.013
C		0.5			0.020	
c1		45			1.772	
D		1	12.6		0.039	0.496
E	10		10.65	0.394		0.419
e		1.27			0.050	
e3		11.43			0.450	
F		1	7.4		0.039	0.291
G	8.8		9.15	0.346		0.360
L	0.5		1.27	0.020		0.050
M			0.75			0.030
S	8° (max.)					



ICL232

June 2001

+5V Powered, Dual RS-232 Transmitter/Receiver

Features

- Meets All RS-232C and V.28 Specifications
- Requires Only Single +5V Power Supply
- Onboard Voltage Doubler/Inverter
- Low Power Consumption
- 2 Drivers
  - ±9V Output Swing for +5V Input
  - 300Ω Power-off Source Impedance
  - Output Current Limiting
  - TTL/CMOS Compatible
  - 30V/µs Maximum Slew Rate
- 2 Receivers
  - ±30V Input Voltage Range
  - 3kΩ to 7kΩ Input Impedance
  - 0.5V Hysteresis to Improve Noise Rejection
- All Critical Parameters are Guaranteed Over the Entire Commercial, Industrial and Military Temperature Ranges

Applications

- Any System Requiring RS-232 Communications Port
  - Computer - Portable and Mainframe
  - Peripheral - Printers and Terminals
  - Portable Instrumentation
  - Modems
- Dataloggers

Description

The ICL232 is a dual RS-232 transmitter/receiver interface circuit that meets all EIA RS-232C and V.28 specifications. It requires a single +5V power supply, and features two onboard charge pump voltage converters which generate +10V and -10V supplies from the 5V supply.

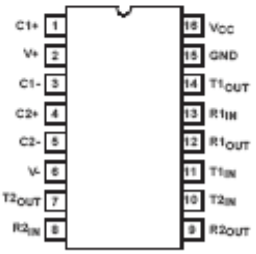
The drivers feature true TTL/CMOS input compatibility, slew-rate-limited output, and 300Ω power-off source impedance. The receivers can handle up to +30V, and have a 3kΩ to 7kΩ input impedance. The receivers also have hysteresis to improve noise rejection.

Ordering Information

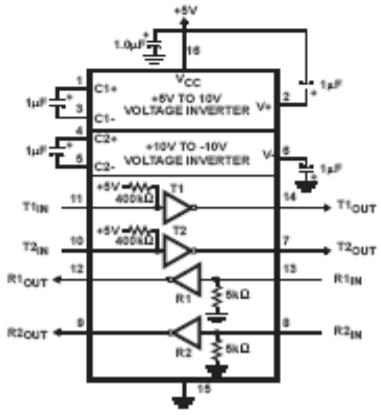
PART NUMBER	TEMP. RANGE (°C)	PACKAGE	PKG. NO.
ICL232CPE	0 to 70	16 Ld PDIP	E16.3
ICL232CBE	0 to 70	16 Ld SOIC	M16.3
ICL232IPE	-40 to 85	16 Ld PDIP	E16.3
ICL232IBE	-40 to 85	16 Ld SOIC	M16.3
ICL232MJE	-55 to 125	16 Ld CERDIP	F16.3

Pinout

ICL232 (PDIP, CERDIP, SOIC)
TOP VIEW



Functional Diagram



File Number 3020.6

Absolute Maximum Ratings

V_{CC} to Ground . . . . . (GND -0.3V) < V_{CC} < 6V
V+ to Ground . . . . . (V_{CC} -0.3V) < V+ < 12V
V- to Ground . . . . . -12V < V- < (GND +0.3V)
Input Voltages
$T1_{IN}$, $T2_{IN}$ . . . . . (V- -0.3V) < V_{IN} < (V+ +0.3V)
$R1_{IN}$, $R2_{IN}$ . . . . . ±30V
Output Voltages
$T1_{OUT}$, $T2_{OUT}$ . . . . . (V- -0.3V) < V_{TXOUT} < (V+ +0.3V)
$R1_{OUT}$, $R2_{OUT}$ . . . . . (GND -0.3V) < V_{RXOUT} < (V_{CC} +0.3V)
Short Circuit Duration
$T1_{OUT}$, $T2_{OUT}$ . . . . . Continuous
$R1_{OUT}$, $R2_{OUT}$ . . . . . Continuous

Operating Conditions

Temperature Ranges
ICL232C . . . . . 0°C to 70°C
ICL232I . . . . . -40°C to 85°C
ICL232M . . . . . -55°C to 125°C

Thermal Information

Thermal Resistance (Typical, Note 1)	θ_{JA} (°C/W)	θ_{JC} (°C/W)
CERDIP Package	80	18
PDIP Package	100	N/A
SOIC Package	100	N/A

Maximum Junction Temperature
Plastic Packages . . . . . 150°C
Ceramic Package . . . . . 175°C
Maximum Storage Temperature Range . . . . . -65°C to 150°C
Maximum Lead Temperature (Soldering 10s) . . . . . 300°C

CAUTION: Stresses above those listed in "Absolute Maximum Ratings" may cause permanent damage to the device. This is a stress only rating and operation of the device at these or any other conditions above those indicated in the operational sections of this specification is not implied.

NOTE:

1. θ_{JA} is measured with the component mounted on an evaluation PC board in free air.

Electrical Specifications

Test Conditions: V_{CC} = +5V ±10%, T_A = Operating Temperature Range. Test Circuit as in Figure 8 Unless Otherwise Specified

PARAMETER	TEST CONDITIONS	MIN	TYP	MAX	UNITS
Transmitter Output Voltage Swing, T_{OUT}	$T1_{OUT}$ and $T2_{OUT}$ Loaded with 3kΩ to Ground	±5	±9	±10	V
Power Supply Current, I_{CC}	Outputs Unloaded, T_A = 25°C	-	5	10	mA
T_{IN}, Input Logic Low, V_{IL}		-	-	0.8	V
T_{IN}, Input Logic High, V_{IH}		2.0	-	-	V
Logic Pullup Current, I_P	$T1_{IN}$, $T2_{IN}$ = 0V	-	15	200	µA
RS-232 Input Voltage Range, V_{IN}		-30	-	+30	V
Receiver Input Impedance, R_{IN}	V_{IN} = ±3V	3.0	5.0	7.0	kΩ
Receiver Input Low Threshold, V_{IN} (H-L)	V_{CC} = 5V, T_A = 25°C	0.8	1.2	-	V
Receiver Input High Threshold, V_{IN} (L-H)	V_{CC} = 5V, T_A = 25°C	-	1.7	2.4	V
Receiver Input Hysteresis, V_{HYST}		0.2	0.5	1.0	V
TTL/CMOS Receiver Output Voltage Low, V_{OL}	I_{OUT} = 3.2mA	-	0.1	0.4	V
TTL/CMOS Receiver Output Voltage High, V_{OH}	I_{OUT} = -1.0mA	3.5	4.6	-	V
Propagation Delay, t_{PD}	RS-232 to TTL	-	0.5	-	µs
Instantaneous Slew Rate, SR	C_L = 10pF, R_L = 3kΩ, T_A = 25°C (Notes 2, 3)	-	-	30	V/µs
Transition Region Slew Rate, SR_T	R_L = 3kΩ, C_L = 2500pF Measured from +3V to -3V or -3V to +3V	-	3	-	V/µs
Output Resistance, R_{OUT}	V_{CC} = V+ = V- = 0V, V_{OUT} = ±2V	300	-	-	Ω
RS-232 Output Short Circuit Current, I_{SC}	$T1_{OUT}$ or $T2_{OUT}$ Shorted to GND	-	±10	-	mA

NOTES:

2. Guaranteed by design.
3. See Figure 4 for definition.

Test Circuits

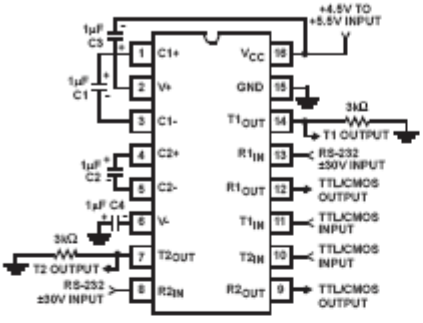


FIGURE 1. GENERAL TEST CIRCUIT

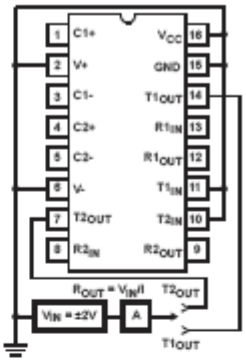


FIGURE 2. POWER-OFF SOURCE RESISTANCE CONFIGURATION

Typical Performance Curves

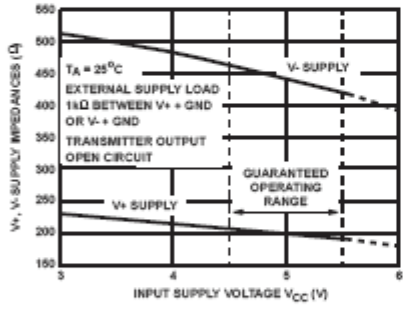


FIGURE 3. V+, V- OUTPUT IMPEDANCES vs V_{CC}

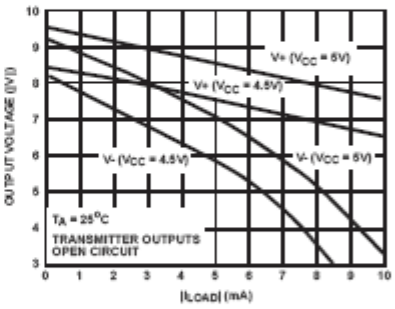


FIGURE 4. V+, V- OUTPUT VOLTAGES vs LOAD CURRENT

Pin Descriptions

PDIP, CERDIP	SOIC	PIN NAME	DESCRIPTION
1	1	C1+	External capacitor "+" for internal voltage doubler.
2	2	V+	Internally generated +10V (typical) supply.
3	3	C1-	External capacitor "-" for internal voltage doubler.
4	4	C2+	External capacitor "+" internal voltage inverter.
5	5	C2-	External capacitor "-" internal voltage inverter.
6	6	V-	Internally generated -10V (typical) supply.
7	7	$T2_{OUT}$	RS-232 Transmitter 2 output ±10V (typical).
8	8	$R2_{IN}$	RS-232 Receiver 2 input, with internal 5K pulldown resistor to GND.
9	9	R2out	Receiver 2 TTL/CMOS output.
10	10	$T2_{IN}$	Transmitter 2 TTL/CMOS input, with internal 400K pullup resistor to V_{CC}.

Pin Descriptions (Continued)

PDIP, CERDIP	SOIC	PIN NAME	DESCRIPTION
11	11	$T1_{IN}$	Transmitter 1 TTL/CMOS input, with internal 400K pullup resistor to V_{CC}.
12	12	$R1_{OUT}$	Receiver 1 TTL/CMOS output.
13	13	$R1_{IN}$	RS-232 Receiver 1 input, with internal 5K pulldown resistor to GND.
14	14	$T1_{OUT}$	RS-232 Transmitter 1 output ±10V (typical).
15	15	GND	Supply Ground.
16	16	V_{CC}	Positive Power Supply +5V ±10%

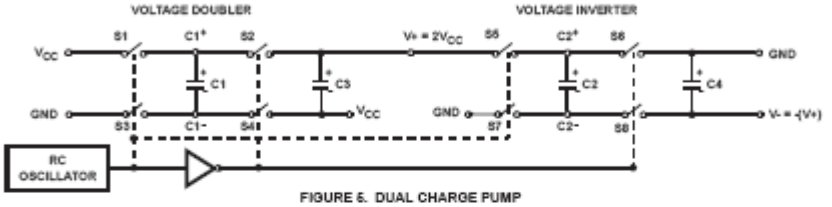


FIGURE 5. DUAL CHARGE PUMP

Detailed Description

The ICL232 is a dual RS-232 transmitter/receiver powered by a single +5V power supply which meets all EIA RS232C specifications and features low power consumption. The functional diagram illustrates the major elements of the ICL232. The circuit is divided into three sections: a voltage doubler/inverter, dual transmitters, and dual receivers Voltage Converter.

An equivalent circuit of the dual charge pump is illustrated in Figure 5.

The voltage quadrupler contains two charge pumps which use two phases of an internally generated clock to generate +10V and -10V. The nominal clock frequency is 16kHz. During phase one of the clock, capacitor C1 is charged to V_{CC}. During phase two, the voltage on C1 is added to V_{CC}, producing a signal across C2 equal to twice V_{CC}. At the same time, C3 is also charged to $2V_{CC}$, and then during phase one, it is inverted with respect to ground to produce a signal across C4 equal to $-2V_{CC}$. The voltage converter accepts input voltages up to 5.5V. The output impedance of the doubler (V+) is approximately 200Ω, and the output impedance of the inverter (V-) is approximately 450Ω. Typical graphs are presented which show the voltage converters output vs input voltage and output voltages vs load characteristics. The test circuit (Figure 3) uses 1µF capacitors for C1-C4, however, the value is not critical. Increasing the values of C1 and C2 will lower the output impedance of the voltage doubler and inverter, and increasing the values of the reservoir capacitors, C3 and C4, lowers the ripple on the V+ and V- supplies.

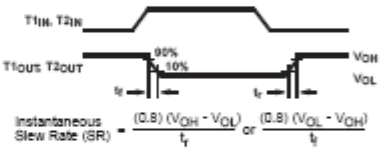


FIGURE 6. SLEW RATE DEFINITION

Transmitters

The transmitters are TTL/CMOS compatible inverters which translate the inputs to RS-232 outputs. The input logic threshold is about 26% of V_{CC}, or 1.3V for V_{CC} = 5V. A logic 1 at the input results in a voltage of between -5V and V- at the output, and a logic 0 results in a voltage between +5V and (V+ - 0.6V). Each transmitter input has an internal 400kΩ pullup resistor so any unused input can be left unconnected and its output remains in its low state. The output voltage swing meets the RS-232C specification of ±5V minimum with the worst case conditions of: both transmitters driving 3kΩ minimum load impedance, V_{CC} = 4.5V, and maximum allowable operating temperature. The transmitters have an internally limited output slew rate which is less than 30V/µs. The outputs are short circuit protected and can be shorted to ground indefinitely. The powered down output impedance is a minimum of

300Ω with ±2V applied to the outputs and V_{CC} = 0V.

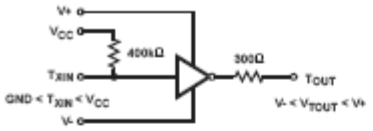


FIGURE 7. TRANSMITTER

Receivers

The receiver inputs accept up to ±30V while presenting the required 3kΩ to 7kΩ input impedance even if the power is off (V_{CC} = 0V). The receivers have a typical input threshold of 1.3V which is within the ±3V limits, known as the transition region, of the RS-232 specification. The receiver output is 0V to V_{CC}. The output will be low whenever the input is greater than 2.4V and high whenever the input is floating or driven between +0.8V and -30V. The receivers feature 0.5V hysteresis to improve noise rejection.

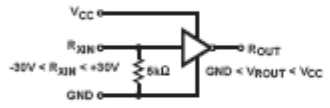


FIGURE 8. RECEIVER

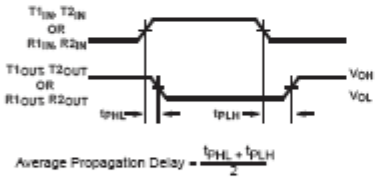


FIGURE 9. PROPAGATION DELAY DEFINITION

Applications

The ICL232 may be used for all RS-232 data terminal and communication links. It is particularly useful in applications where ±12V power supplies are not available for conventional RS-232 interface circuits. The applications presented represent typical interface configurations.

A simple duplex RS-232 port with CTS/RTS handshaking is illustrated in Figure 10. Fixed output signals such as DTR (data terminal ready) and DSRS (data signaling rate select) is generated by driving them through a 5kΩ resistor connected to V+.

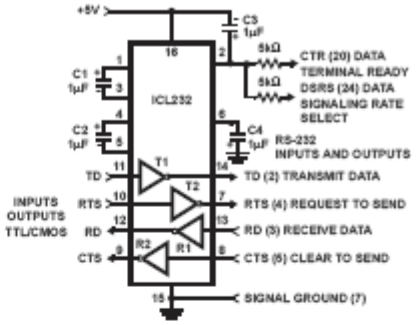


FIGURE 10. SIMPLE DUPLEX RS-232 PORT WITH CTS/RTS HANDSHAKING

In applications requiring four RS-232 inputs and outputs (Figure 11), note that each circuit requires two charge pump capacitors (C1 and C2) but can share common reservoir capacitors (C3 and C4). The benefit of sharing common reservoir capacitors is the elimination of two capacitors and the reduction of the charge pump source impedance which effectively increases the output swing of the transmitters.

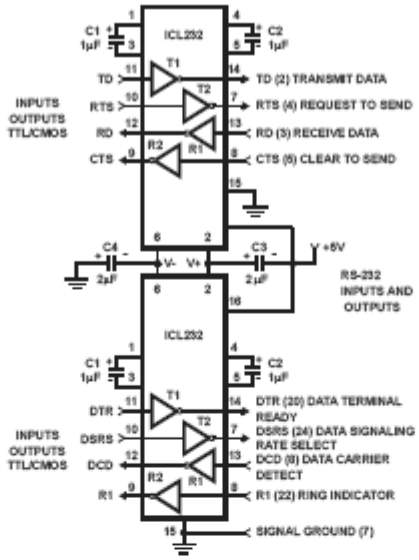


FIGURE 11. COMBINING TWO ICL232s FOR 4 PAIRS OF RS-232 INPUTS AND OUTPUTS

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NORTH AMERICA
Intersil Corporation
2401 Palm Bay Rd.
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Intersil SA
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FAX: (32) 2.724.22.05

ASIA
Intersil Ltd.
8F-2, 96, Sec. 1, Chien-kuo North,
Taipei, Taiwan 104
Republic of China
TEL: 886-2-2515-8508
FAX: 886-2-2515-8369

L.C. LED
Lighting Components LED Corp

Blinking 5mm Green LED Lamp

PRODUCT DESCRIPTION

(1) RoHs Compliant Part
(2) Built in Blinking I.C.
(3) Blinking frequency of 1.5 Hz
(4) Moisture & UV Resistance Epoxy
(5) Rugged design suitable for both indoor & outdoor use

Electro-optical Characteristics (Ta = 25^{0}C)

Part Number	Color	Viewing Angle	Peak Wavelength (nm)	Forward Voltage TYP. (V)	Forward Voltage MAX. (V)	Luminous Intensity Min. (mcd)	Luminous Intensity Max. (mcd)
B500TB4D	Super Blue	30	470	3.1	3.6	1,800	3,500
B500TG4D	Super Green	30	525	3.1	3.6	1,800	3,000
B500JPF4D	Super Red	30	630	1.8	2.3	3,500	5,700
B500JPT4D	Super Amber	30	590	1.7	2.1	2,800	4,500

Absolute Maximum Rating (Ta = 25^{0}C)

PARAMETER	MAXIMUM RATING	UNITS
DC Forward Current	30	mA
Peak Pulse Forward Current (1)	100	mA
Avg. Forward Current (Pulse Operation)	30	mA
Operating Temperature	-30 to +85	^{0}C
Storage Temperature	-40 to +100	^{0}C
Lead Soldering Temperature	260^{0}C for 6 seconds (1.0mm or 0.63 inch from Body)	

(1) Pulse conditions of 1/10 duty and 0.1msec width

DEVICE DRAWING