ภาคผนวก

ภาคผนวก ก
โค๊ดโปรแกรม

FORM 1

```
Dim HW32 As Long            ' Handle for device driver
Dim ActiveHW As Boolean     ' Treiber gestartet Flag
Dim PORTADR As Long
Dim OutA, OutB, OutC As Integer

Private Sub Command1_Click()
If MsgBox("Do you want to read theory?", vbQuestion + vbOKCancel, "Stop") = vbOK Then

LiInd = List1.ListIndex

Select Case LiInd
   Case 0
 If Option1.TabStop Then
   Text3.text = "system1"
   ElseIf Option2.TabStop Then
   Text3.text = "system2"
   ElseIf Option3.TabStop Then
   Text3.text = "system3"
  ElseIf Option4.TabStop Then
   Text3.text = "system4"
   End If
   Form2.Show
'-----------------------------------------------------------------
   Case 1
 If Option1.TabStop Then
   Text3.text = "system5"
   ElseIf Option2.TabStop Then
   Text3.text = "system6"
   ElseIf Option3.TabStop Then
```

```
    Text3.text = "system7"
     ElseIf Option4.TabStop Then
    Text3.text = "system8"
    End If
    Form2.Show
 '-------------------------------------------------------------------------
    Case 2
 If Option1.TabStop Then
    Text3.text = "system9"
ElseIf Option2.TabStop Then
    Text3.text = "system10"
    ElseIf Option3.TabStop Then
    Text3.text = "system11"
    ElseIf Option4.TabStop Then
    Text3.text = "system12"
   End If
     Form2.Show

     '-------------------------------------------------------------------------
    Case 3
 If Option1.TabStop Then
    Text3.text = "system13"
    ElseIf Option2.TabStop Then
    Text3.text = "system14"
    ElseIf Option3.TabStop Then
    Text3.text = "system15"
    ElseIf Option4.TabStop Then
    Text3.text = "system16"
     End If
    Form2.Show
```

```
'****************************************
   Case 4
 If Option1.TabStop Then
   Text3.text = "system17"
ElseIf Option2.TabStop Then
   Text3.text = "system18"
ElseIf Option3.TabStop Then
   Text3.text = "system19"
   ElseIf Option4.TabStop Then
   Text3.text = "system20"
    End If
     Form2.Show
   '*****************************************
   Case 5
 If Option1.TabStop Then
    Text3.text = "system21"
   ElseIf Option2.TabStop Then
   Text3.text = "system22"
   ElseIf Option3.TabStop Then
   Text3.text = "system33"
   ElseIf Option4.TabStop Then
   Text3.text = "system24"
   End If
    Form2.Show
'*****************************************
   Case 6
 If Option1.TabStop Then
   Text3.text = "system25"
   ElseIf Option2.TabStop Then
   Text3.text = "system26"
```

```
   ElseIf Option3.TabStop Then
    Text3.text = "system27"
     ElseIf Option4.TabStop Then
    Text3.text = "system28"
     End If
     Form2.Show
'*********************************************
    Case 7
 If Option1.TabStop Then
     Text3.text = "system29"
    ElseIf Option2.TabStop Then
    Text3.text = "system30"
   Form2.Show
    ElseIf Option3.TabStop Then
    Text3.text = "system31"
    ElseIf Option4.TabStop Then
     Text3.text = "system32"
   End If
     Form2.Show
    Case Else
    OutA = 0
End Select

End If

PORTADR = &HF30C
s = "&H80"
Call SetPortByte(HW32, PORTADR, Val(s))

PORTADR = &HF300
```

```
s = OutA
Call SetPortByte(HW32, PORTADR, Val(s))

PORTADR = &HF304
s = OutB
Call SetPortByte(HW32, PORTADR, Val(s))
PORTADR = &HF308
s = OutC
Call SetPortByte(HW32, PORTADR, Val(s))
End Sub

Private Sub Command2_Click()
If MsgBox("Stop simmulate?", vbQuestion + vbOKCancel, "Stop") = vbOK Then
PORTADR = &HF30C
s = "&H80"
Call SetPortByte(HW32, PORTADR, Val(s))

PORTADR = &HF300
s = "&H0"
Call SetPortByte(HW32, PORTADR, Val(s))

PORTADR = &HF304
s = "&H0"
Call SetPortByte(HW32, PORTADR, Val(s))
End If
End Sub

Private Sub Command3_Click()
If MsgBox("Are you sure?", vbQuestion + vbOKCancel + vbDefaultButton2, "Exit") = vbOK
Then
```

```
PORTADR = &HF30C
s = "&H80"
Call SetPortByte(HW32, PORTADR, Val(s))

PORTADR = &HF300
s = "&H0"
Call SetPortByte(HW32, PORTADR, Val(s))

PORTADR = &HF304
s = "&H0"
Call SetPortByte(HW32, PORTADR, Val(s))
End
End If
End Sub

Private Sub List1_Click()
LiInd = List1.ListIndex
Select Case LiInd
   Case 0
     OutA = &H1
   Option1.Caption = "Bad Fuel Injecter"
   Option2.Caption = "Bad Fuel Pump"
   Option3.Caption = "Clogg Fuel Filter"
   Option4.Caption = "Idle Control not operative"


   Case 1
   OutA = &H2
   Option1.Caption = "Bad Temp Senser"
   Option2.Caption = "Bad Fuel Pump"
```

```
Option3.Caption = "Deflective Cole start injecter"
Option4.Caption = "Hall senser not function"
Case 2
OutA = &H4
Option1.Caption = "IG Switch faulty"
Option2.Caption = "Bad dicharge fuse"
Option3.Caption = "Starter faulty"
Option4.Caption = "Alternater Regulater faulty"
Case 3
OutA = &H8
Option1.Caption = "Broken vacuum hose"
Option2.Caption = "Deflective brake master cylinder"
Option3.Caption = "Leaky Brake line"
Option4.Caption = "Deflective vacuum booster"
Case 4
OutA = &H10
Option1.Caption = "Bad A/C Compressor Clutch"
Option2.Caption = "Bad coolant fan motor"
Option3.Caption = "Bad Blower motor"
Option4.Caption = "Bad Low pressure switch"
Case 5
OutA = &H20
Option1.Caption = "Deflective wiring in Blower Motor"
Option2.Caption = ""
Option3.Caption = ""
Option4.Caption = ""
Case 6
OutA = &H40
Option1.Caption = ""
Option2.Caption = ""
```

```
    Option3.Caption = "Bad thermostet"
    Option4.Caption = "Bad Temp sensor"
    Case 7
    OutA = &H80
    Option1.Caption = "Primary circuit not function"
    Option2.Caption = "IG coil not function"
    Option3.Caption = "Defective spark plug"
    Option4.Caption = "Defective crankshaft sensor"
    Case 8
    OutC = &H1
    Option1.Caption = ""
    Option2.Caption = ""
    Option3.Caption = ""
    Option4.Caption = ""
    Case Else
    OutA = 0
End Select
Text1.text = Hex$(OutA)
End Sub
Private Sub Form_Load()
    ActiveHW = False
    'HW32 = 0
    'x = Form1.Width
    'y = Form1.Height
    'Form1.Show
    Form1.Caption = "RealCar_Simmulation"

    HW32 = OpenTVicHW32(HW32, "KLIBDRV", "KLIBDevice0")
    ActiveHW = GetActiveHW(HW32)
    If Not ActiveHW Then
```

```
    Call MsgBox("Can't open the driver!", 0, "Warning!")
    End If
End Sub

Private Sub Form_Terminate()
 HW32 = CloseTVicHW32(HW32)
  ActiveHW = False
  Unload Form1
End Sub



Private Sub Option1_Click()
OutB = 1
 Text2.text = Hex$(OutB)
End Sub

Private Sub Option2_Click()
OutB = 2
 Text2.text = Hex$(OutB)
End Sub

Private Sub Option3_Click()
OutB = 4
 Text2.text = Hex$(OutB)
End Sub

Private Sub Option4_Click()
OutB = 8
 Text2.text = Hex$(OutB)
```

```
End Sub

Private Sub Option5_Click()
OutB = 16
Text2.text = Hex$(OutB)
2End Sub
```

FORM 2

```
Dim str As String
Dim text As String
Dim textss As String
Dim txtStream As TextStream
Dim Myfso  As New FileSystemObject, Mytxtfile

Private Sub Command1_Click()
Unload Me
End Sub

Private Sub Form_Load()
textss = Form1.Text3.text
str = "D:\New Folder\ของจริง\0123\" & textss & ".txt"
Set Mytxtfile = Myfso.GetFile(Myfso.GetFileName(str))
Set txtStream = Mytxtfile.OpenAsTextStream(ForReading)
text = txtStream.ReadAll
Text1.text = text
Text2.text = str
End Sub
```

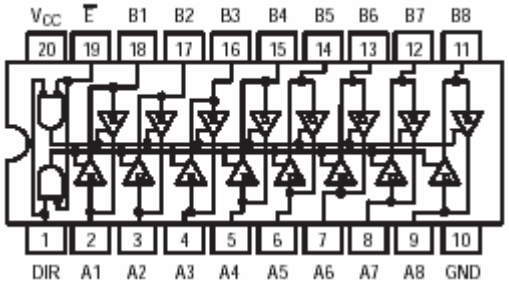
ภาคผนวก ข
คุณสมบัติ อุปกรณ์อิเล็กทรอนิกส์

SN74LS245

The SN74LS245 is an Octal Bus Transmitter/Receiver designed for8-line asynchronous 2-way data communication between data buses.Direction Input (DR) controls transmission of Data from bus A to busB or bus B to bus A depending upon its logic level. The Enable input(E) can be used to isolate the buses.

- Hysteresis Inputs to Improve Noise Immunity
- 2-Way Asynchronous Data Bus Communication
- Input Diodes Limit High-Speed Termination Effects
- ESD > 3500 Volts

LOGIC AND CONNECTION DIAGRAMS DIP (TOP VIEW)



PLASTIC
N SUFFIX
CASE 738

TRUTH TABLE

INPUTS		OUTPUT
$\overline{E}$	DIR	
L	L	Bus B Data to Bus A
L	H	Bus A Data to Bus B
H	X	Isolation

H = HIGH Voltage Level
L = LOW Voltage Level
X = Immaterial

SOIC
DW SUFFIX
CASE 751D

GUARANTEED OPERATING RANGES

Symbol	Parameter	Min	Typ	Max	Unit
V_{CC}	Supply Voltage	4.75	5.0	5.25	V
T_A	Operating Ambient Temperature Range	0	25	70	°C
I_{OH}	Output Current – High			–3.0	mA
				–15	mA
I_{OL}	Output Current – Low			24	mA

ORDERING INFORMATION

Device	Package	Shipping
SN74LS245N	16 Pin DIP	1440 Units/Box
SN74LS245DW	16 Pin	2500/Tape & Reel

DC CHARACTERISTICS OVER OPERATING TEMPERATURE RANGE (unless otherwise specified)

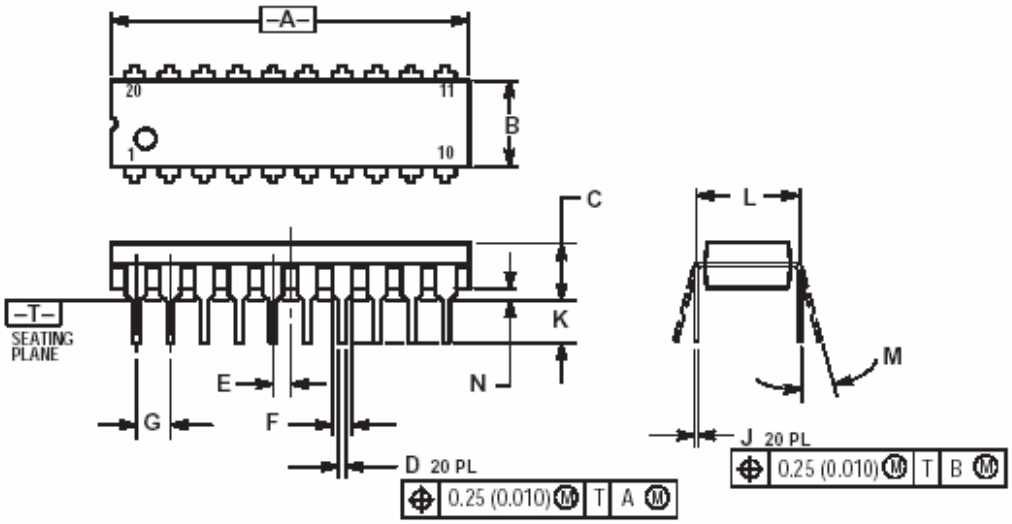
Symbol	Parameter		Limits Min	Typ	Max	Unit	Test Conditions	
V_{IH}	Input HIGH Voltage		2.0			V	Guaranteed Input HIGH Voltage for All Inputs	
V_{IL}	Input LOW Voltage				0.8	V	Guaranteed Input LOW Voltage for All Inputs	
$V_{T+}–V_{T-}$	Hysteresis		0.2	0.4		V	V_{CC} = MIN	
V_{IK}	Input Clamp Diode Voltage			–0.65	–1.5	V	V_{CC} = MIN, I_{IN} = –18 mA	
V_{OH}	Output HIGH Voltage		2.4	3.4		V	V_{CC} = MIN, I_{OH} = –3.0 mA	
			2.0			V	V_{CC} = MIN, I_{OH} = MAX	
V_{OL}	Output LOW Voltage			0.25	0.4	V	I_{OL} = 12 mA	V_{CC} = V_{CC} MIN, V_{IN} = V_{IL} or V_{IH} per Truth Table
				0.35	0.5	V	I_{OL} = 24 mA	
I_{OZH}	Output Off Current HIGH				20	µA	V_{CC} = MAX, V_{OUT} = 2.7 V	
I_{OZL}	Output Off Current LOW				–200	µA	V_{CC} = MAX, V_{OUT} = 0.4 V	
I_{IH}	Input HIGH Current	A or B, DR or $\overline{E}$			20	µA	V_{CC} = MAX, V_{IN} = 2.7 V	
		DR or $\overline{E}$			0.1	mA	V_{CC} = MAX, V_{IN} = 7.0 V	
		A or B			0.1	mA	V_{CC} = MAX, V_{IN} = 5.5 V	
I_{IL}	Input LOW Current				–0.2	mA	V_{CC} = MAX, V_{IN} = 0.4 V	
I_{OS}	Output Short Circuit Current (Note 1)		–40		–225	mA	V_{CC} = MAX	
I_{CC}	Power Supply Current Total, Output HIGH				70	mA	V_{CC} = MAX	
	Total, Output LOW				90			
	Total at HIGH Z				95			

Note 1:Not more than one output should be shorted at a time, nor for more than 1 second.

AC CHARACTERISTICS (T_A = 25°C, V_{CC} = 5.0 V, T_{RISE} / T_{FALL} ≤ 6.0 ns)

Symbol	Parameter	Limits Min	Typ	Max	Unit	Test Conditions
t_{PLH} t_{PHL}	Propagation Delay, Data to Output		8.0 8.0	12 12	ns	C_L = 45 pF, R_L = 667 Ω
t_{PZH}	Output Enable Time to HIGH Level		25	40	ns	
t_{PZL}	Output Enable Time to LOW Level		27	40	ns	
t_{PLZ}	Output Disable Time from LOW Level		15	25	ns	C_L = 5.0 pF, R_L = 667 Ω
t_{PHZ}	Output Disable Time from HIGH Level		15	25	ns	

N SUFFIX
PLASTIC PACKAGE
CASE 738–03
ISSUE E



NOTES:

1. DIMENSIONING AND TOLERANCING PER ANSIY14.5M, 1982.

2. CONTROLLING DIMENSION: INCH.

3. DIMENSION L TO CENTER OF LEAD WHENFORMED PARALLEL.

4. DIMENSION B DOES NOT INCLUDE MOLDFLASH.

	INCHES		MILLIMETERS	
DIM	MIN	MAX	MIN	MAX
A	1.010	1.070	25.66	27.17
B	0.240	0.260	6.10	6.60
C	0.150	0.180	3.81	4.57
D	0.015	0.022	0.39	0.55
E	0.050 BSC		1.27 BSC	
F	0.050	0.070	1.27	1.77
G	0.100 BSC		2.54 BSC	
J	0.008	0.015	0.21	0.38
K	0.110	0.140	2.80	3.55
L	0.300 BSC		7.62 BSC	
M	0°	15°	0°	15°
N	0.020	0.040	0.51	1.01

BD139

FEATURES

- High current (max. 1.5 A)
- Low voltage (max. 80 V).

APPLICATIONS

- Driver stages in hi-fi amplifiers and television circuits.

DESCRIPTION

NPN power transistor in a TO-126; SOT32 plastic package. PNP complements: BD136, BD138 and BD140.

PINNING

PIN	DESCRIPTION
1	emitter
2	collector, connected to metal part of mounting surface
3	base

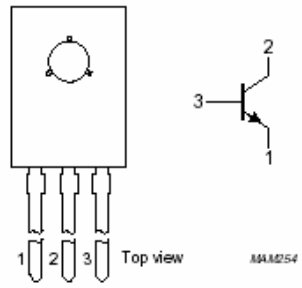


Fig.1 Simplified outline (TO-126; SOT32) and symbol.

LIMITING VALUES

In accordance with the Absolute Maximum Rating System (IEC 134).

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
V_{CBO}	collector-base voltage	open emitter			
	BD135		–	45	V
	BD137		–	60	V
	BD139		–	100	V
V_{CEO}	collector-emitter voltage	open base			
	BD135		–	45	V
	BD137		–	60	V
	BD139		–	80	V
V_{EBO}	emitter-base voltage	open collector	–	5	V
I_C	collector current (DC)		–	1.5	A
I_{CM}	peak collector current		–	2	A
I_{BM}	peak base current		–	1	A
P_{tot}	total power dissipation	$T_{mb} \leq 70$ °C	–	8	W
T_{stg}	storage temperature		–65	+150	°C
T_j	junction temperature		–	150	°C
T_{amb}	operating ambient temperature		–65	+150	°C

THERMAL CHARACTERISTICS

SYMBOL	PARAMETER	CONDITIONS	VALUE	UNIT
$R_{th\ j\text{-}a}$	thermal resistance from junction to ambient	note 1	100	K/W
$R_{th\ j\text{-}mb}$	thermal resistance from junction to mounting base		10	K/W

Note

1. Refer to TO-126; SOT32 standard mounting conditions.

CHARACTERISTICS

T_j = 25 °C unless otherwise specified.

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
I_{CBO}	collector cut-off current	I_E = 0; V_{CB} = 30 V	–	–	100	nA
		I_E = 0; V_{CB} = 30 V; T_j = 125 °C	–	–	10	µA
I_{EBO}	emitter cut-off current	I_C = 0; V_{EB} = 5 V	–	–	100	nA
h_{FE}	DC current gain	V_{CE} = 2 V; (see Fig.2)				
		I_C = 5 mA	40	–	–	
		I_C = 150 mA	63	–	250	
		I_C = 500 mA	25	–	–	
	DC current gain	I_C = 150 mA; V_{CE} = 2 V;				
	BD135-10; BD137-10; BD139-10	(see Fig.2)	63	–	160	
	BD135-16; BD137-16; BD139-16		100	–	250	
V_{CEsat}	collector-emitter saturation voltage	I_C = 500 mA; I_B = 50 mA	–	–	0.5	V
V_{BE}	base-emitter voltage	I_C = 500 mA; V_{CE} = 2 V	–	–	1	V
f_T	transition frequency	I_C = 50 mA; V_{CE} = 5 V; f = 100 MHz	–	190	–	MHz
$\frac{h_{FE1}}{h_{FE2}}$	DC current gain ratio of the complementary pairs	$\lvert I_C \rvert$ = 150 mA; $\lvert V_{CE} \rvert$ = 2 V	–	1.3	1.6	

C 7805

Features

• Output Current up to 1A

• Output Voltages of 5, 6, 8, 9, 10, 12, 15, 18, 24V

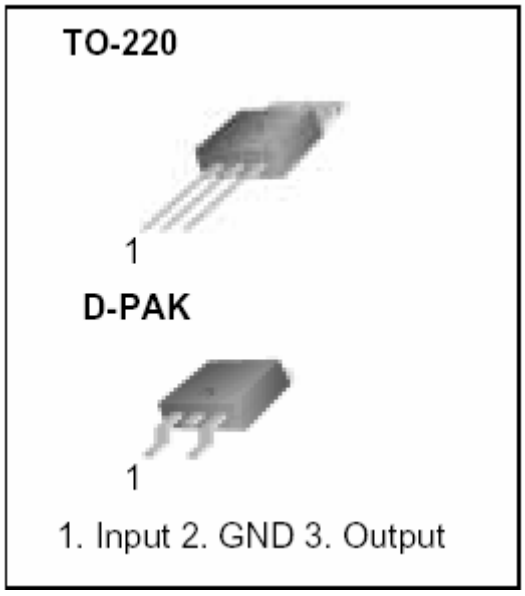
• Thermal Overload Protection

• Short Circuit Protection

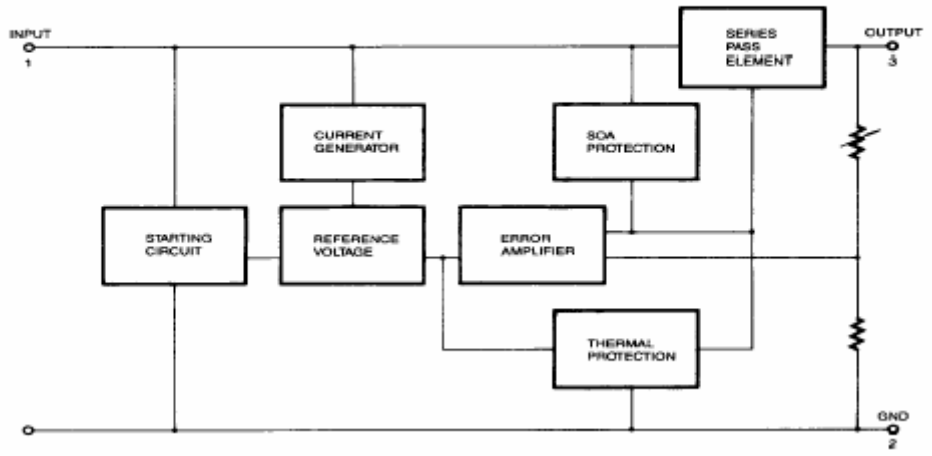
• Output Transistor Safe Operating Area Protection

Description

The MC78XX/LM78XX/MC78XXA series of three terminal positive regulators are available in theTO-220/D-PAK package and with several fixed output voltages, making them useful in a wide range of applications. Each type employs internal current limiting, thermal shut down and safe operating area protection, making it essentially indestructible. If adequate heat sinking is provided, they can deliver over 1A output current. Although designed primarily as fixed voltage regulators, these devices can be used with external components to obtain adjustable voltages and currents.



Internal Block Digram



Absolute Maximum Ratings

Parameter	Symbol	Value	Unit
Input Voltage (for V_O = 5V to 18V) (for V_O = 24V)	V_I V_I	35 40	V V
Thermal Resistance Junction-Cases (TO-220)	$R_{\theta JC}$	5	°C/W
Thermal Resistance Junction-Air (TO-220)	$R_{\theta JA}$	65	°C/W
Operating Temperature Range	T_{OPR}	0 ~ +125	°C
Storage Temperature Range	T_{STG}	-65 ~ +150	°C

Electrical Characteristics (MC7805/LM7805)

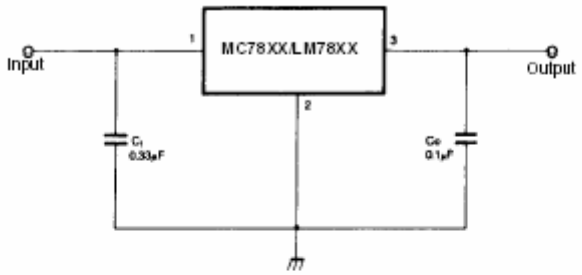
(Refer to test circuit ,0°C < T_J < 125°C, I_O = 500mA, V_I = 10V, C_I= 0.33µF, C_O= 0.1µF, unless otherwise specified)

Parameter	Symbol	Conditions		MC7805/LM7805			Unit
				Min.	Typ.	Max.	
Output Voltage	V_O	T_J =+25 °C		4.8	5.0	5.2	V
		5.0mA ≤ I_O ≤ 1.0A, P_O ≤ 15W V_I = 7V to 20V		4.75	5.0	5.25	
Line Regulation (Note1)	Regline	T_J=+25 °C	V_O = 7V to 25V	-	4.0	100	mV
			V_I = 8V to 12V	-	1.6	50	
Load Regulation (Note1)	Regload	T_J=+25 °C	I_O = 5.0mA to1.5A	-	9	100	mV
			I_O =250mA to 750mA	-	4	50	
Quiescent Current	I_Q	T_J =+25 °C		-	5.0	8.0	mA
Quiescent Current Change	ΔI_Q	I_O = 5mA to 1.0A		-	0.03	0.5	mA
		V_I= 7V to 25V		-	0.3	1.3	
Output Voltage Drift	$\Delta V_O/\Delta T$	I_O= 5mA		-	-0.8	-	mV/ °C
Output Noise Voltage	V_N	f = 10Hz to 100KHz, T_A=+25 °C		-	42	-	µV/Vo
Ripple Rejection	RR	f = 120Hz V_O = 8V to 18V		62	73	-	dB
Dropout Voltage	V_{Drop}	I_O = 1A, T_J =+25 °C		-	2	-	V
Output Resistance	r_O	f = 1KHz		-	15	-	mΩ
Short Circuit Current	I_{SC}	V_I = 35V, T_A =+25 °C		-	230	-	mA
Peak Current	I_{PK}	T_J =+25 °C		-	2.2	-	A

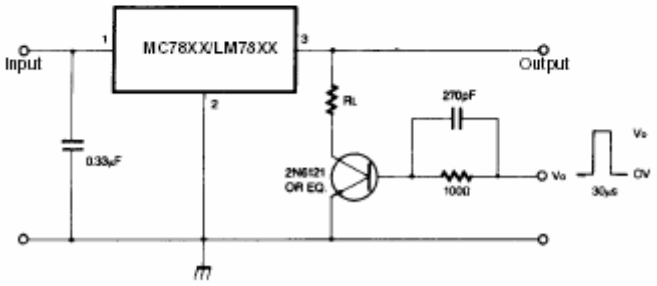
Note:

1. Load and line regulation are specified at constant junction temperature. Changes in Vo due to heating effects must be taken into account separately. Pulse testing with low duty is used.

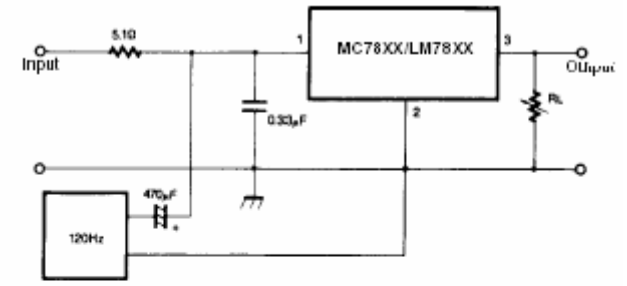
Typical Applications



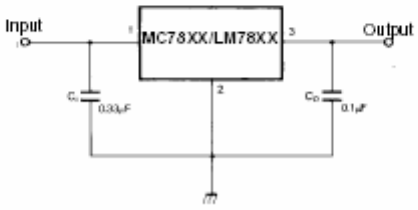
DC Parameters



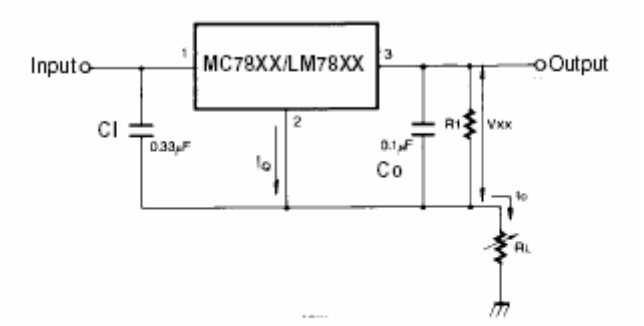
Load Regulation



Ripple Rejection



Fixed Output Regulator



$$I_o = \frac{Vxx}{R1} + I_Q$$

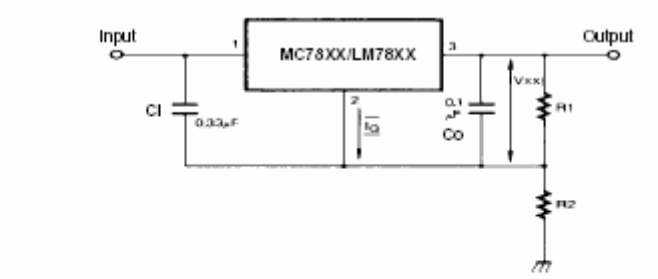
Constant Current Regulator

Notes:

(1) To specify an output voltage. substitute voltage value for "XX." A common ground is required between the input and the Output voltage. The input voltage must remain typically 2.0V above the output voltage even during the low point on the input ripple voltage.

(2) CI is required if regulator is located an appreciable distance from power Supply filter.

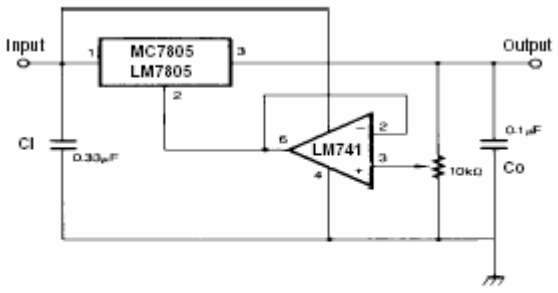
(3) CO improves stability and transient response.



$I_{RI} \geq 5IQ$

$V_O = V_{XX}(1+R_2/R_1)+I_QR_2$

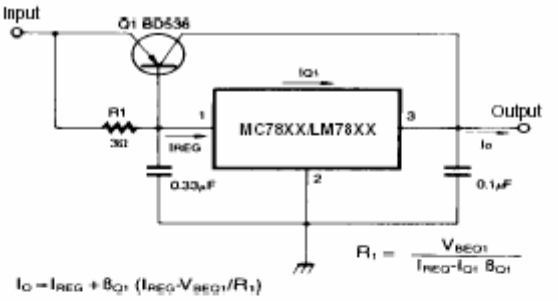
Circuit for Increasing Output Voltage



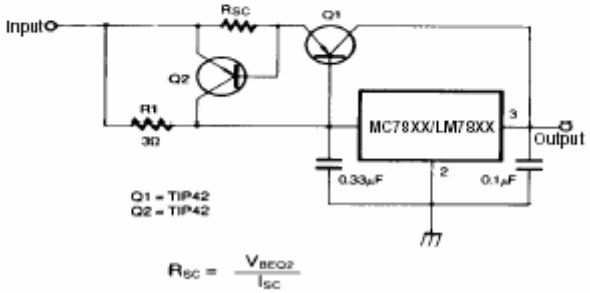
$I_{RI} \geq 5\ I_Q$

$V_O = V_{XX}(1+R_2/R_1)+I_QR_2$

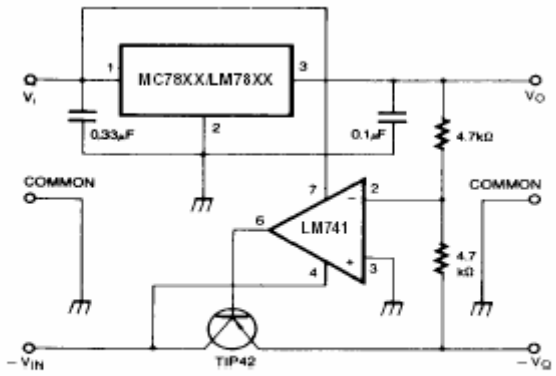
Adjustable Output Regulator (7 to 30V)



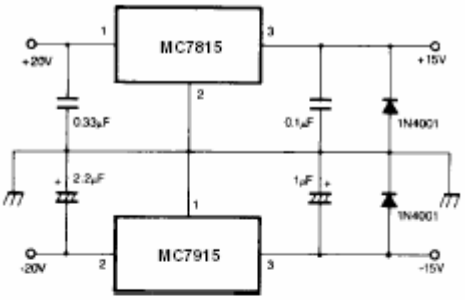
High Current Voltage Regulator



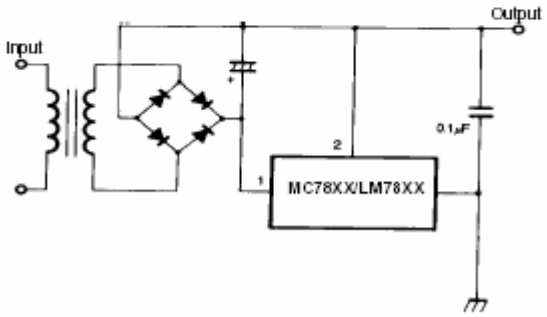
High Output Current with Short Circuit Protection



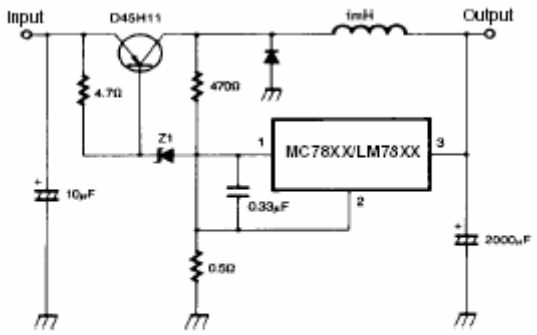
Tracking Voltage Regulator



Split Power Supply (±15V-1A)

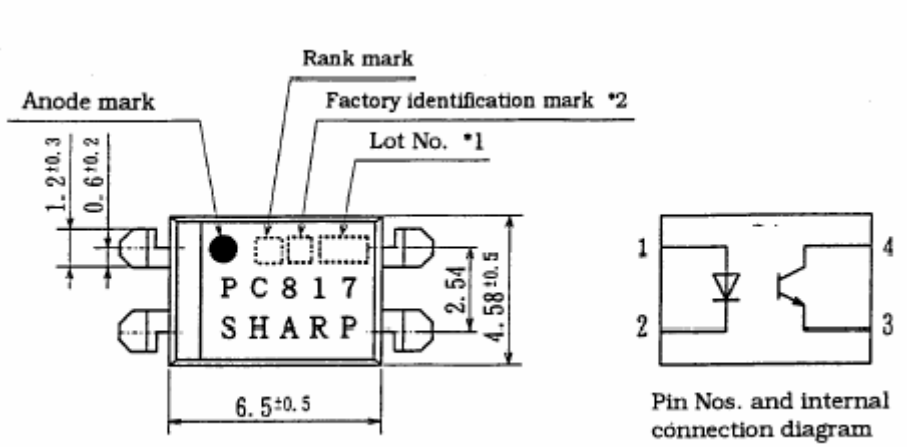


Negative Output Voltage Circuit

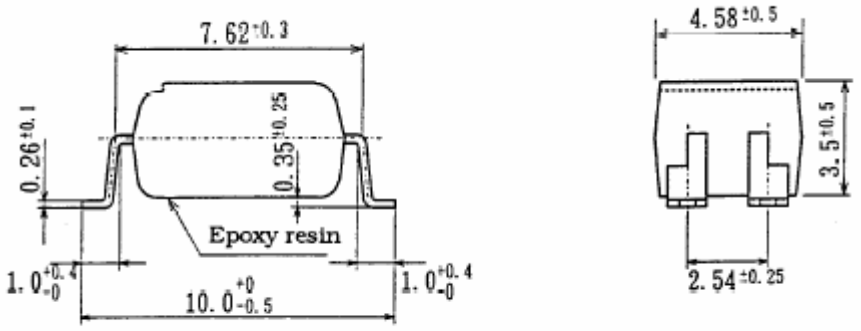


Switching Regulator

PC 817



Pin Nos. and internal connection diagram



Business dealing name

("○" mark indicates business dealing name of ordered product)

Ordered product	Business dealing name	Rank mark	Ic (mA)
○	PC817XI	A, B, C, D or no mark	2.5 to 30
	PC817XI1	A	4.0 to 8.0
	PC817XI2	B	6.5 to 13
	PC817XI3	C	10 to 20
	PC817XI4	D	15 to 30
	PC817XI5	A or B	4.0 to 13
	PC817XI6	B or C	6.5 to 20
	PC817XI7	C or D	10 to 30
	PC817XI8	A, B or C	4.0 to 20
	PC817XI9	B, C or D	6.5 to 30
	PC817XI0	A, B, C or D	4.0 to 30

Test conditions
I_F=5mA
V_{CE}=5V
Ta=25℃

Ratings and characteristics

Absolute maximum ratings

Ta=25℃

Parameter		Symbol	Rating	Unit
Input	*1 Forward current	I_F	50	mA
	*2 Peak forward current	I_{FM}	1	A
	Reverse voltage	V_R	6	V
	*1 Power dissipation	P	70	mW
Output	Collector-emitter voltage	V_{CEO}	35	V
	Emitter-collector voltage	V_{ECO}	6	V
	Collector current	Ic	50	mA
	*1 Collector power dissipation	Pc	150	mW
*1 Total power dissipation		Ptot	200	mW
*3 Isolation voltage		Viso	5	kVrms
Operating temperature		Topr	-30 to +100	℃
Storage temperature		Tstg	-55 to +125	℃
*4 Soldering temperature		Tsol	260	℃

Notes:

1. Pulse width_IlOO ,us, Duty ratio : 0.001 (Refer to Fig. 5)

2. AC for 1 min, 40 to 6O%RH

3. For 10s

Electro-optical characteristics

Parameter		Symbol	Condition	MIN.	TYP.	MAX.	Unit
Input	Forward voltage	V_F	I_F=20mA	-	1.2	1.4	V
	Peak forward voltage	V_{FM}	I_{FM}=0.5A	-	-	3.0	V
	Reverse current	I_R	V_R=4V	-	-	10	μA
	Terminal capacitance	Ct	V=0, f=1kHz	-	30	250	pF
Output	Dark current	I_{CEO}	V_{CE}=20V, I_F=0	-	-	100	nA
	Collector-emitter breakdown voltage	BV_{CEO}	Ic=0.1mA I_F=0	35	-	-	V
	Emitter-collector breakdown voltage	BV_{ECO}	I_E=10 μA, I_F=0	6	-	-	V
Transfer characteristics	Collector current	Ic	I_F=5mA, V_{CE}=5V	2.5	-	30	mA
	Collector-emitter saturation voltage	$V_{CE(sat)}$	I_F=20mA Ic=1mA	-	0.1	0.2	V
	Isolation resistance	R_{ISO}	DC500V 40 to 60%RH	5×10^{10}	10^{11}	-	Ω
	Floating capacitance	Cf	V=0, f=1MHz	-	0.6	1.0	pF
	Cut-off frequency	fc	V_{CE}=5V, Ic=2mA R_L=100 Ω, -3dB	-	80	-	kHz
	Rise time	tr	V_{CE}=2V Ic=2mA R_L=100 Ω	-	4	18	μs
	Fall time	tf		-	3	18	μs