LOW DROPOUT TRIPLE 1.5 A SINK DRIVER

- WIDE OPERATING SUPPLY VOLTAGE RANGE 6 V TO 32 V
- LOW POWER DISSIPATION Vsat : 0.35 V @ 1.5 A
- SHORT-CIRCUIT AND OVERLOAD PROTECTION
- DESATURATION MONITORING WITH EXTERNALLY PROGRAMMABLE DELAY
- AJUSTABLE CURRENT LIMITATION
- TTL COMPATIBLE INPUTS
- WITHSTAND (60 V-10 ms) V_{CC} TRANSIENTS

DESCRIPTION

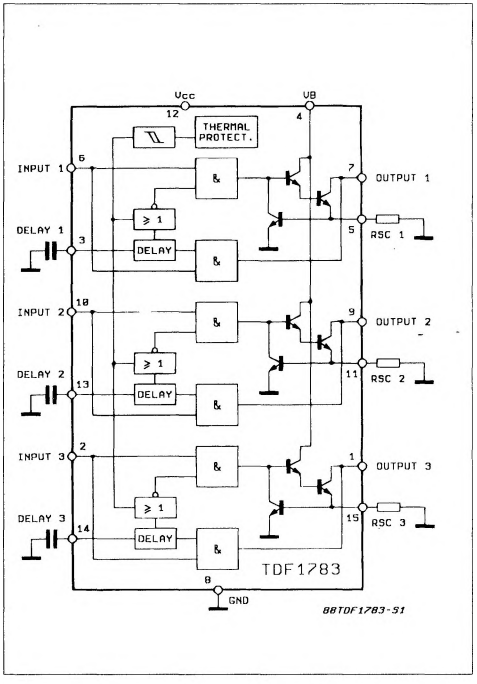
The TDF1783 is a monolithic triple interface circuit designed for high voltage applications. Capable to drive any type of load : inductive, resistive, capacitive.

The device is particulary well protected against destructive overloads. Each output implements a current limit circuitry, a desaturation monitoring unit for the detection of overloads and short-circuits. After disjunction, corresponding output is reactivated by applying a logic low signal to the input. A common thermal protection protects the circuit from overheating.

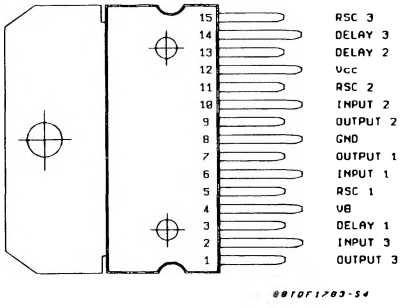
MULTIWATT-15

ORDER CODE : TDF1783SP

BLOCK DIAGRAM



PIN CONNECTION (front view)



1 - Output 3
2 - Input 3
3 - Delay 1
4 - VB
5 - RSC 1
6 - Input 1
7 - Output 1
8 - GND
9 - Output 2
10 - Input 2
11 - RSC 2
12 - V_{CC}
13 - Delay 2
14 - Delay 3
15 - RSC 3

ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
V_{CC}	Supply Voltage	+ 35	V
Vi1 Vi2 Vi3	Input Voltages	− 30 to + 50	V
Vo_{max}	Output Voltage on pin 1, 7, 9 $I_o = 0$	50	V
Ib	Base Current (I pin 4)	300	mA
I_o	Output Current	2.5	A
P_{tot}	Total Power Dissipation	Internally Limited	W
T_{oper}	Operating Free-air Temperature Range	− 40 to + 85	°C
T_j	Junction Temperature	+ 150	°C

THERMAL CHARACTERISTICS

Symbol	Parameter	Value	Unit
$R_{th(j-c)}$	Maximum Junction-case Thermal resistance	3	°C/W
$R_{th(j-a)}$	Maximum Junction-ambient Thermal Resistance	40	°C/W
$T_{(shutdown)}$	Minimum Thermal Shutdown Temperature	145	°C

ELECTRICAL CHARACTERISTICS V_{CC} = + 13 V, − 40 °C ≤ T_j ≤ + 85 °C
(unless otherwise specified)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V_{CC}	Supply Voltage		+ 6		+ 32	V
$I_{CC\ OFF}$ $I_{CC\ ON}$	Supply Current	Off On (I_o = 3•1.5 A)		2 7.5	4 10	mA
I_{ih} I_{io}	Input Current	(all inputs) V_{IH} = 2 V V_{IO} = 0.8 V		30 0	100 10	µA
V_{ih} V_{io}	Input Voltage		2		0.8	V
V_o–V_{rsc}	Output Saturation	Voltage T_j = 85 °C I_o = 0.5 A I_b = 50 mA = 1.5 A " = 2.5 A "		0.35	0.20 0.45 0.90	V
V_b	Base Drive Voltage	I_b = 150 mA (3 drivers on) R_{sc} = 0.39 ohms		2		V
I_{sc}	Short Circuit Output Current,	R_{sc} = 0.39 ohms	2			A
I_{oh}	Output Leakage Current (output high)			30	100	µA
t_d	Delay Time Before Desaturation Turn-off	C = 47 nF, V_{CC} = 13 V	4	10	30	ms
I_o	Available Output Current	R_{sc} = 0.39 ohms	1.5			A
t_r	Minimum Reset Signal Duration	C = 47 nF		20		ms

Figure 1 : Maximum Admissible Power Dissipation.

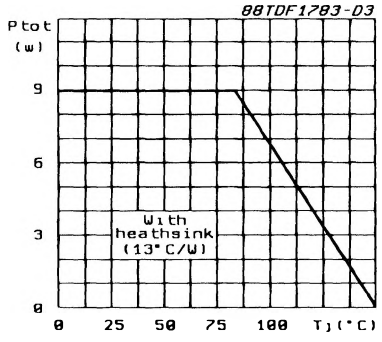


Figure 2 : Safe Operating Area : Desaturation Monitoring Maximum Programmable Delay Versus Vcc.

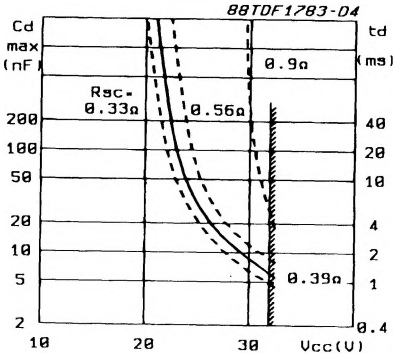


Figure 3 : Output Saturation Voltage Versus Output Current.

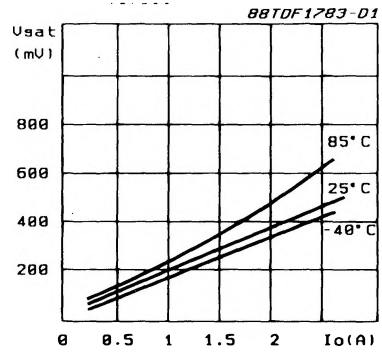
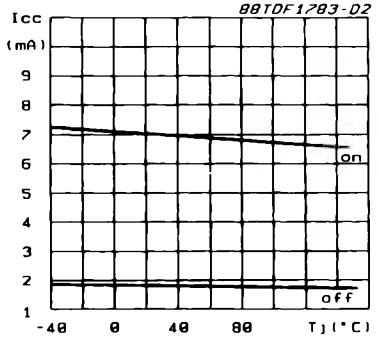
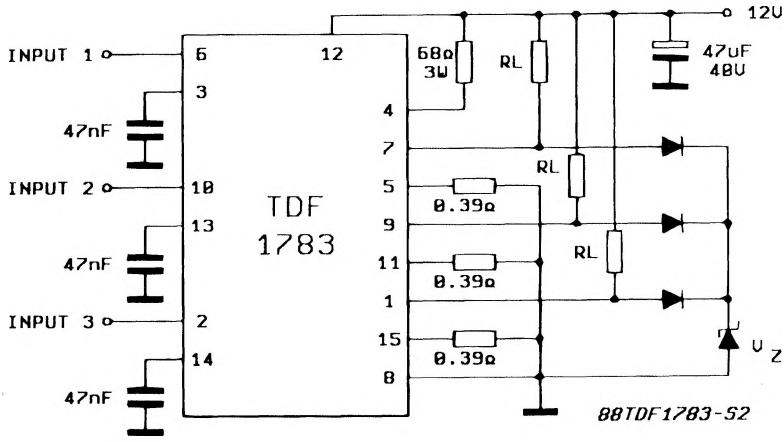


Figure 4 : Supply Current Versus Temperature.



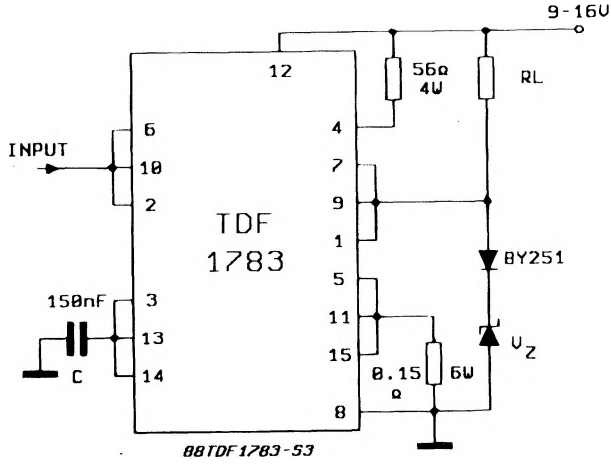
APPLICATIONS

Figure 5 : Typical Application ; Triple 1.5 A Driver.



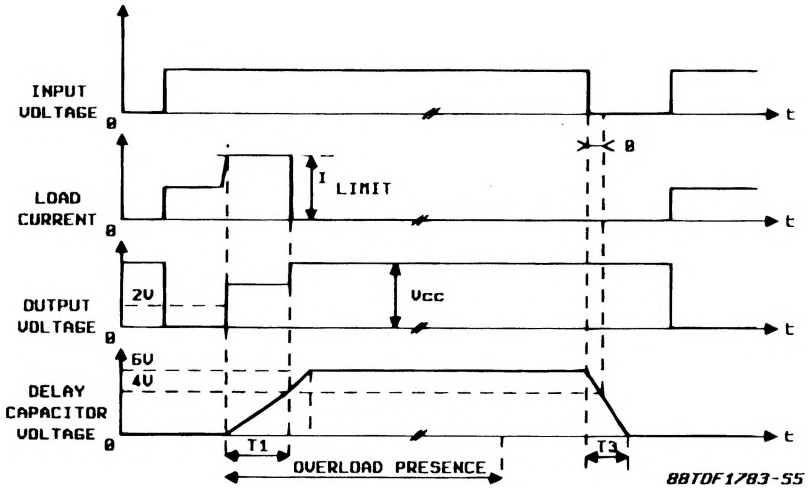
$V_{CC\ max} < V_Z \leq V_{O\ max}$

Figure 6 : Paralell Driving of Loads ; One 6 Amp. Driver.



$V_{CC\ max} < V_Z \leq V_{Z\ max}$

Figure 7 : Operating Waveforms Under Overloads Conditions.

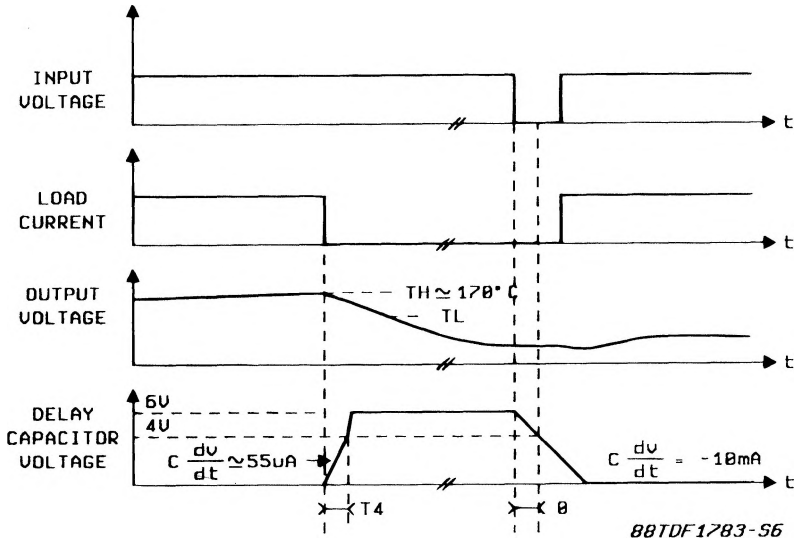


θ : MINIMUM RESET SIGNAL DURATION (θ ≈ 10 µs typ)

$\frac{Cdv}{dt}$ = 20 µA (T_1) ; $\frac{Cdv}{dt}$ = – 10 mA (T3) (typical values)

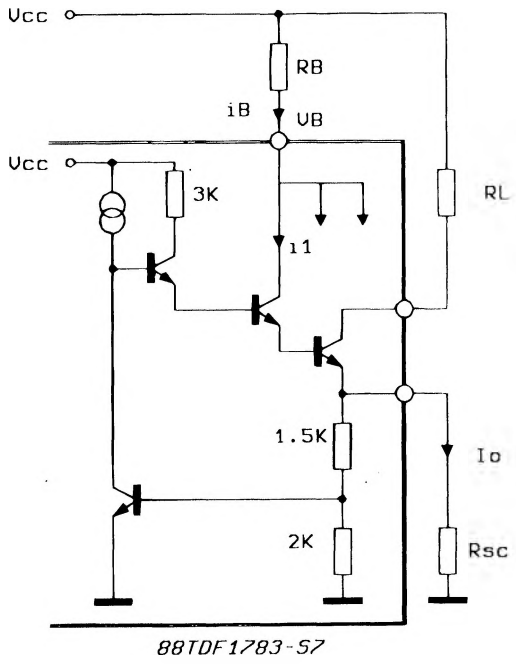
The sequence discribed above will be repeted as long as overload conditions will remain.

Figure 8 : Thermal Shutdown.



The thermal protection turns off the 3 outputs simultaneously (TH - T_L = 30 °C is the thermal hysteresis). Any erratic restarts will be avoided when T_4 is shorter than the duration given by the thermal hysteresis.

Figure 9 : Output Stage and Current Limitation.



* Rsc calculation
  Tj = 150 °C ; VBE = 460 mV
  $(Rsc\ Io) \cdot \frac{2}{3.5} = V_{BE}$ $\Rightarrow$ Rsc . Io = 0.805 V
* R_B calculation
  $R_B = \frac{Vcc - V_B}{3 \cdot i_1}$ (V_B = 2 V, i_1 = 50 µA at Io = 1.5 A)

POWER DISSIPATION OF THE TDF 1783

$P = (V_{cc} \cdot I_{cc}) + n\ (V_{ce\ sat} \cdot I_o) + i_B\ (V_B - RSC \cdot I_o)$
n : number of conducting outputs
$V_{ce\ sat} = V_o - V_{RSC}$
$R_{SC} \cdot I_o = V_{RSC}$

PROTECTION AGAINST ELECTROSTATIC DISCHARGES

The inputs are designed to operate from – 30 to + 50 V. This characteristic, useful in an industrial context, guarantee an electrostatic discharge protection up to 200 V.

Usual cautions have to be taken to protect delay and input pins against parasitic discharges. Other pins are protected up to 2 KV.