

INTERFACE CIRCUIT (RELAY AND LAMP-DRIVER)

The TDE1647, TDE1747, TDE1607 are monolithic amplifiers designed for high current and high voltage applications, specifically to drive lamps, relays, stepping motors.

These devices are essentially blow-out proof. Current limiting is available to limit the peak output current to safe values, the adjustment only requires one external resistor. In addition, thermal shut down is provided to keep the I.C. from overheating. If internal dissipation becomes too great, the driver will shut down to prevent excessive heating. Moreover, TDE1747 has an open ground protection.

The output is also protected from short-circuits with the positive power supply. The device operates over a wide range of supply voltages from standard ± 15 V operational amplifier supplies down to the single +12 V or +24 V used for industrial electronic systems.

- Open ground protection (TDE1747).
- High output current.
- Adjustable short-circuit protection to ground.
- Internal thermal protection with hysteresis to avoid the intermediate output levels.
- Large supply voltage range: +10 V to +45 V.
- Short-circuit protection to V_{CC} .

ORDERING INFORMATION

Hi-Rel versions available - Consult our LINEAR data book.

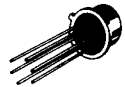
PART NUMBER	TEMPERATURE RANGE	PACKAGE		
		CM	DP	FP
TDE1647	-25°C to +85°C	●	●	
TDE1747	-25°C to +85°C	●	●	●
TDE1607	-25°C to +85°C	●	●	
TDE1647 A	-25°C to +85°C	●	●	

Examples : TDE1647CM, TDE1607DP

INTERFACE CIRCUIT RELAY AND LAMP DRIVER

CASES

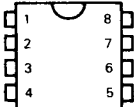
CB-98

**DP SUFFIX
PLASTIC PACKAGE**
CB-107

**CM SUFFIX
METAL CAN**
CB-511

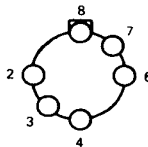
**FP SUFFIX
PLASTIC MICROPACKAGE**

PIN ASSIGNMENT

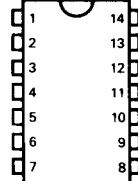
(Top views)

CB-98


- 1 - N.C.
- 2 - Inverting input
- 3 - Non-inverting input
- 4 - GND
- 5 - Output
- 6 - V_{sense}
- 7 - V_{CC}
- 8 - N.C.

CB-107


- 2 - Inverting input
- 3 - Non-inverting input
- 4 - GND
- 6 - Output
- 7 - V_{sense}
- 8 - V_{CC}

CB-511


- 1 - N.C.
- 2 - N.C.
- 3 - N.C.
- 4 - V_{CC}
- 5 - Inverting input
- 6 - N.C.
- 7 - Non-inverting input
- 8 - GND
- 9 - N.C.
- 10 - Output
- 11 - V_{sense}
- 12 - N.C.
- 13 - N.C.
- 14 - N.C.

MAXIMUM RATINGS

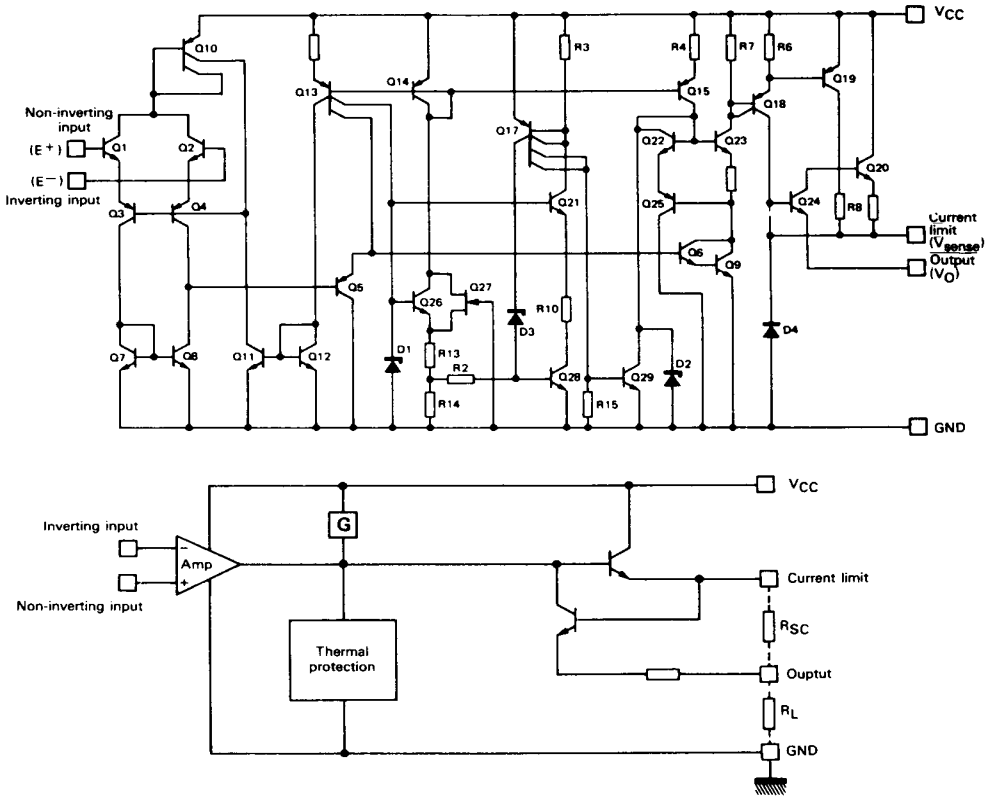
Rating	Symbol	TDE1647.A TDE1747	TDE1607	Unit
Supply voltage	V _{CC}	50*	36	V
Differential input voltage	V _{ID}	50	36	V
Input voltage	V _I	50	36	V
Output current	I _O	1000	500	mA
Power dissipation (T _{amb} = +25°C)	P _{tot}	Internally limited		W
Operating ambient temperature range	T _{oper}	-25 to +85		°C
Storage temperature range	T _{stg}	-65 to +150		°C

* V_{CC} = +60 V, t ≤ 10 ms for TDE1647A

THERMAL CHARACTERISTICS

Characteristic	Symbol	Value	Unit
Junction-case thermal resistance	R _{th(j-c)}	45	°C/W
		50	
Junction-ambient thermal resistance	R _{th(j-a)}	185	°C/W
		120	
Junction-ceramic - Substrate thermal resistance (Case glued to substrate)	CB-511	90	°C/W
Junction-ceramic - Substrate thermal resistance (Case glued to substrate, substrate temperature maintained constant)	CB-511	65	°C/W

SCHEMATIC DIAGRAM



CASE	Inverting input	Non-inverting input	GND	Output	V_{sense}	V_{CC}	N.C.
CB-107	2	3	4	6	7	8	—
CB-98	2	3	4	5	6	7	1.8
CB-511	5	7	8	10	11	4	*

* CB-511 : other pin are not connected

ELECTRICAL CHARACTERISTICS (Note 1) $T_j \leq +150^\circ\text{C}$

TDE1647.A, TDE1747 : $-25^\circ\text{C} \leq T_{\text{amb}} \leq +85^\circ\text{C}$, $+8\text{ V} \leq V_{\text{CC}} \leq +45\text{ V}$, $I_O = 300\text{ mA}$

TDE1607DP-FP : $-25^\circ\text{C} \leq T_{\text{amb}} \leq +85^\circ\text{C}$, $+8\text{ V} \leq V_{\text{CC}} \leq +30\text{ V}$, $I_O = 150\text{ mA}$

TDE1607 CM : $-25^\circ\text{C} \leq T_{\text{amb}} \leq +85^\circ\text{C}$, $+8\text{ V} \leq V_{\text{CC}} \leq +30\text{ V}$, $I_O = 300\text{ mA}$

(Unless otherwise specified)

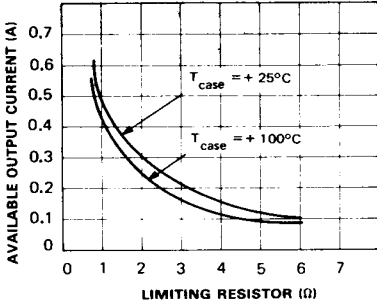
Characteristic	Symbol	TDE1647.A TDE1747			TDE1607CM(a) TDE1607DP, FP			Unit
		Min	Typ	Max	Min	Typ	Max	
Input offset voltage - (Note 2)	V_{IO}	-	2	50	-	2	50	mV
Input bias current	I_{IB}	-	0.1	1.5	-	0.1	1.5	μA
Supply current ($V_{\text{CC}} = +24\text{ V}$, $I_O = 0$)	I_{CC}	-	4	6	-	4	6	mA
High level		-	2	4	-	2	4	
Low level		-	2	4	-	2	4	
Common-mode input voltage range	$V_{I(\text{max})}$	2	-	V_{CC}^{-2}	2	-	V_{CC}^{-2}	V
Short-circuit current limit ($T_{\text{amb}} = +25^\circ\text{C}$, $V_{\text{CC}} = +24\text{ V}$)	I_{SC}	-	-	-	-	-	-	mA
$R_{\text{SC}} = 1.5\ \Omega$	TDE1747	-	480	-	-	-	-	
$R_{\text{SC}} = 1.5\ \Omega$	TDE1647	-	540	-	-	-	-	
$R_{\text{SC}} = 3.3\ \Omega$		-	-	-	-	230	-	
$R_{\text{SC}} = \infty$		-	35	50	-	35	50	
Output saturation voltage (output high) ($R_{\text{SC}} = 0$, $V_1^+ - V_1^- \geq 50\text{ mV}$)	$V_{\text{CC}} - V_O$	-	-	-	-	-	-	V
$I_O = 300\text{ mA}$, $T_j = +25^\circ\text{C}$		-	1.15	1.4	-	1.2 (a)	1.8 (a)	
$T_j = +150^\circ\text{C}$		-	1.05	1.3	-	1.1 (a)	1.5 (a)	
$I_O = 150\text{ mA}$, $T_j = +25^\circ\text{C}$	TDE1607DP, FP	-	-	-	-	1.2	1.8	
$T_j = +150^\circ\text{C}$	TDE1607DP, FP	-	-	-	-	1.1	1.5	
Low level output current ($V_O = 0$, $V_{\text{CC}} = +24\text{ V}$)	I_{OL}	-	-	-	-	0.01	10 (a)	μA
$T_j = +25^\circ\text{C}$	TDE1607DP, FP	-	-	-	-	-	100	
$T_{\text{min}} \leq T_j \leq T_{\text{max}}$	TDE1607DP, FP	-	0.01	10	-	0.01	50 (a)	
	TDE1607DP, FP	-	-	-	-	-	500	

Note 1 : For operating at high temperature, the TDE1607, TDE1747, TDE1647.A must be derated based on a $+150^\circ\text{C}$ maximum junction temperature and a junction-ambient thermal resistance of 185°C/W for the CB-107, 120°C/W for the CB-98 and 100°C/W for the CB-511.

Note 2 : The offset voltage given is the maximum value of input voltage required to drive the output voltage within 2 V of the ground or the supply voltage.

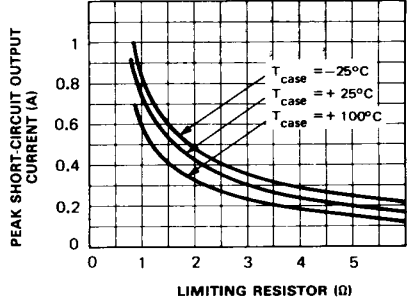
AVAILABLE OUTPUT CURRENT VERSUS LIMITING RESISTOR

TDE1747

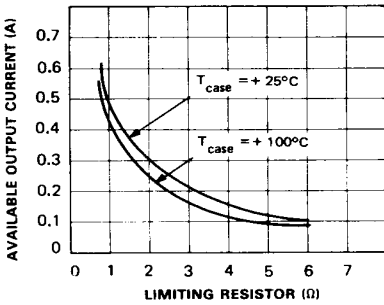


PEAK SHORT-CIRCUIT OUTPUT CURRENT VERSUS LIMITING RESISTOR

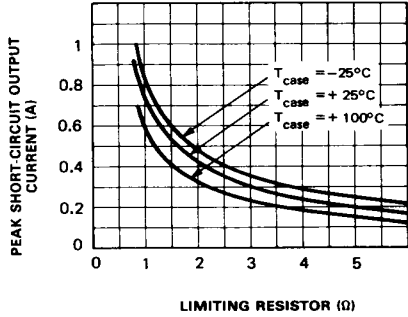
TDE1747



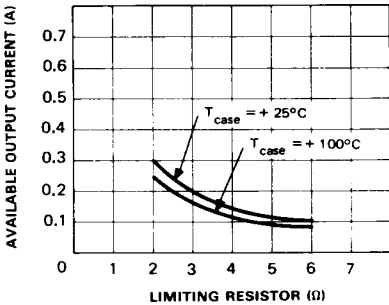
TDE1647, A - TDE1607 CM



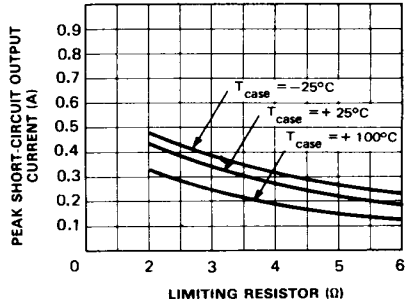
TDE1647, A - TDE1607 CM



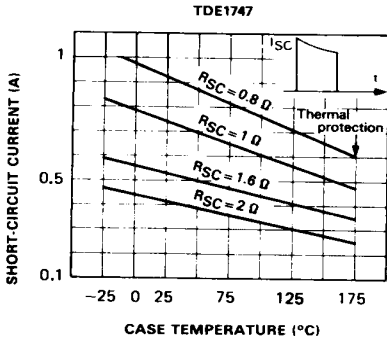
TDE1607 DP, FP



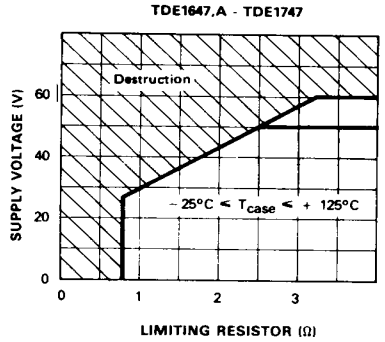
TDE1607 DP, FP



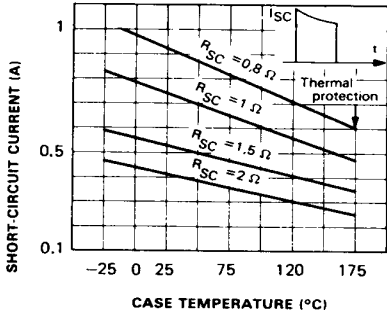
SHORT-CIRCUIT CURRENT VERSUS CASE TEMPERATURE



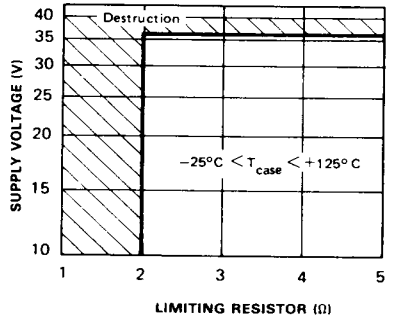
MINIMUM LIMITING RESISTOR VALUE VERSUS SUPPLY VOLTAGE



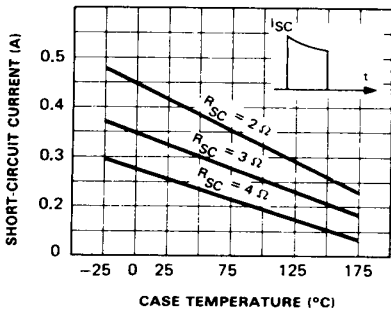
TDE 1647,A - TDE1607 CM



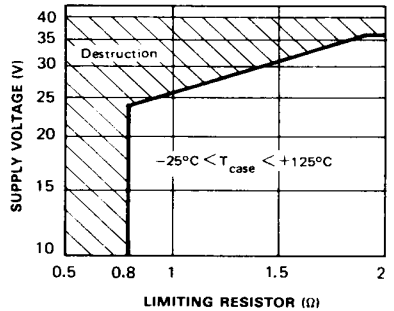
TDE1607 DP, FP



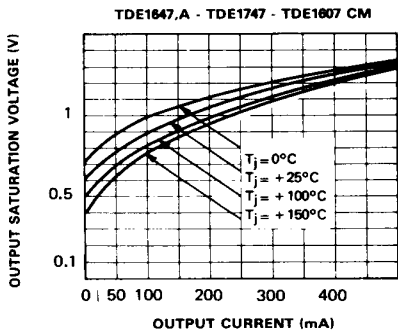
TDE1607 DP, FP



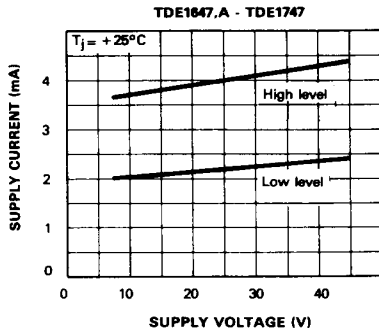
TDE1607 CM



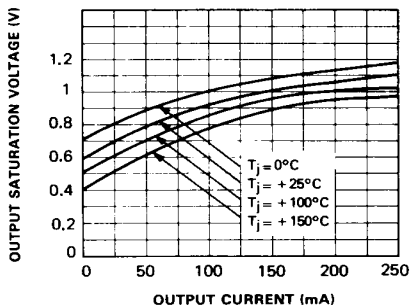
OUTPUT SATURATION VOLTAGE VERSUS CASE TEMPERATURE AND AVAILABLE OUTPUT CURRENT



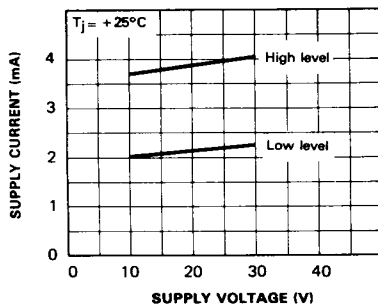
SUPPLY CURRENT VERSUS SUPPLY VOLTAGE



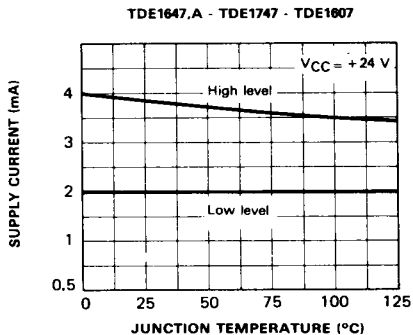
TDE1607 DP, FP



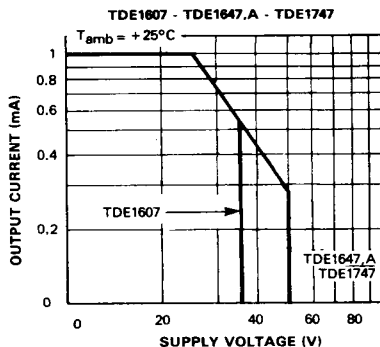
TDE1607 DP, FP, CM



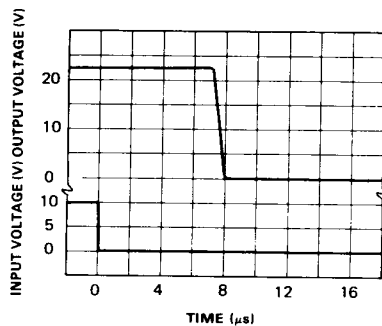
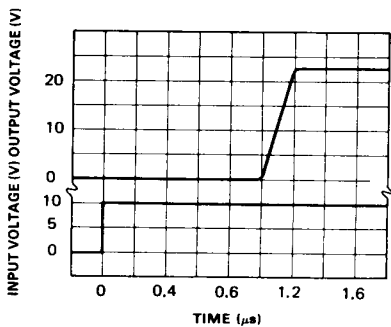
SUPPLY CURRENT VERSUS JUNCTION TEMPERATURE



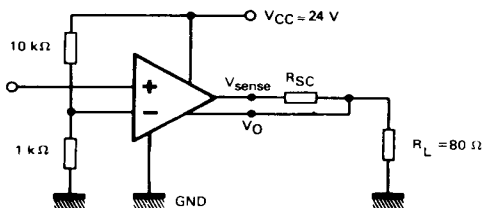
SAFE OPERATING AREA (non repetitive surge)



RESPONSE TIME



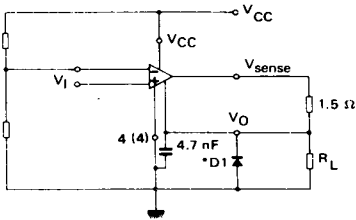
TEST CIRCUIT



TYPICAL APPLICATIONS

TDE1647.A - TDE1747

BASIC CIRCUIT



*D1: required if inductive load

OUTPUT CURRENT EXTENSION (5 A)

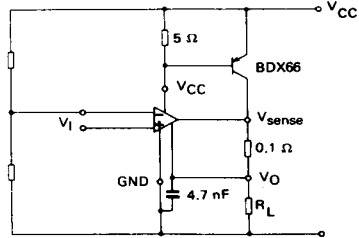
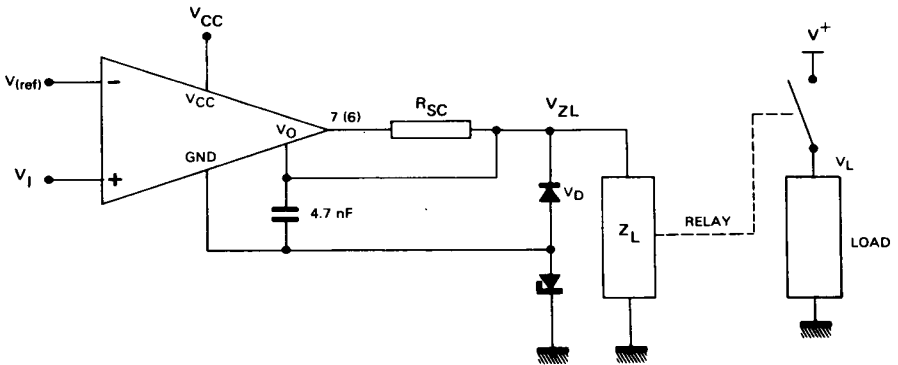
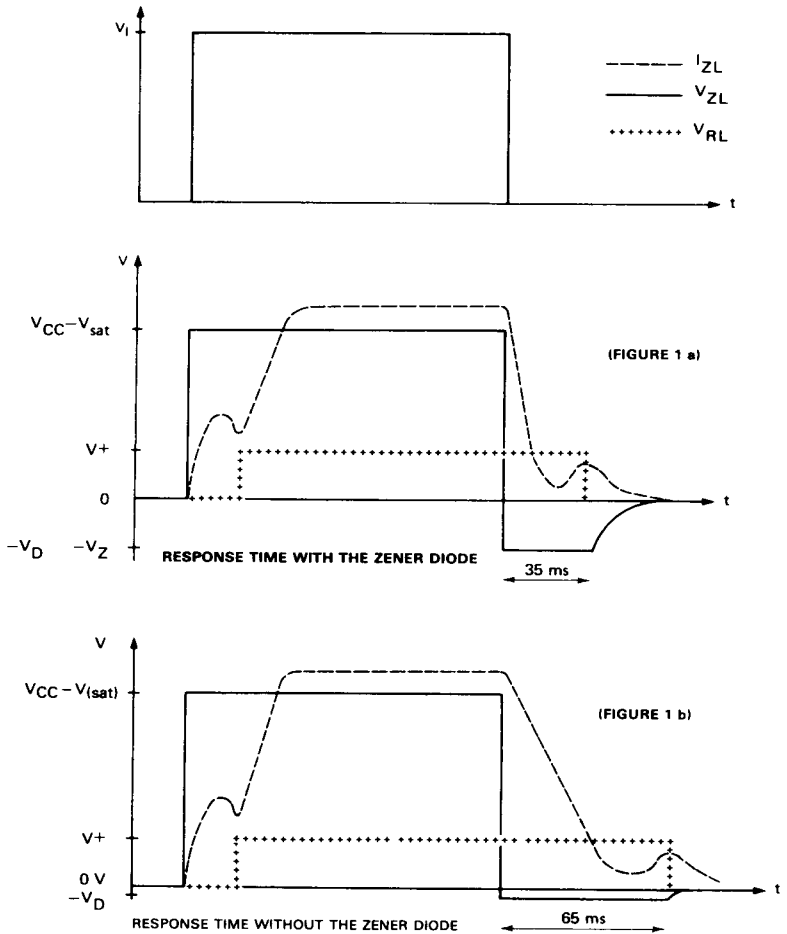


FIGURE 1 - DRIVING LOW IMPEDANCE RELAYS ($I_O = 300$ mA)

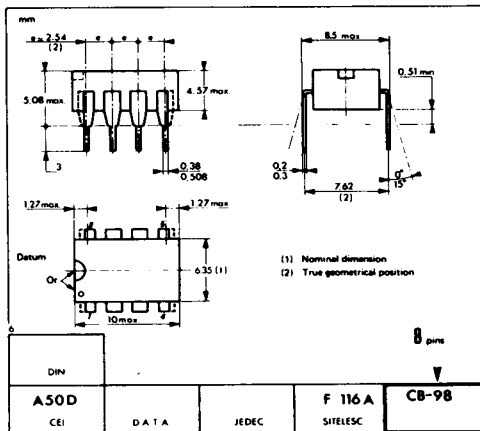


The device in the above application operates at :
 $V_{CC} = +45$ V, $I_O = 300$ mA with a heatsink such that
 $R_{th(j-a)} \leq 90^\circ\text{C/W}$. The device supports an output voltage
of $V_{CC} + V_Z$ during the current cut off time, which is
decreased by the zener diode.
This voltage must be \leq to the maximum supply voltage.

WAVEFORMS OF FIGURE 1



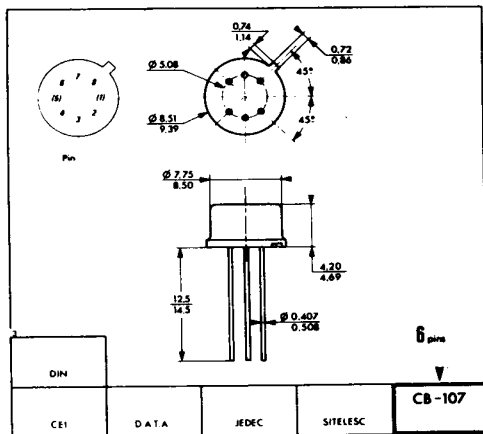
Note 1 : In the case of the figure 1a, the TDE1647,A-CM can withstand $+60\text{ V}$ @ 400 mA for $t \leq 5\ \mu\text{s}$.



CB-98



DP SUFFIX
PLASTIC PACKAGE



CB-107

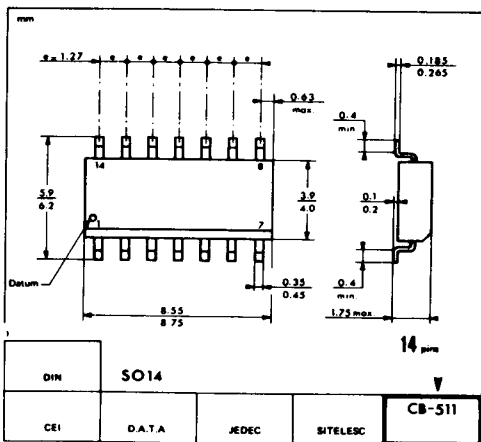


CM SUFFIX
METAL CAN

CB-511



FP SUFFIX
PLASTIC MICROPACKAGE



These specifications are subject to change without notice.
Please inquire with our sales offices about the availability of the different packages.