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Appendix A

Cost of implemented unit

Type	Quantity	Price
Resistors		
2.2kΩ , ¼ W	1	20cts
4.7k Ω , ¼ W	3	60cts
10k Ω , ¼ W	3	60cts
470 Ω , ¼W	1	20cts
12 kΩ , ¼W	1	20cts
220 Ω , 2W	2	Rs.2.00
1kΩ , 5W	2	Rs.20.00
20kΩ , 2W	2	Rs.2.00
4.7kΩ , 1W	2	Rs.1.00
330Ω , 2W	2	Rs.2.00
Capacitors		
1µF , 25V	2	Rs.10.00
470µF , 50V	1	Rs.10.00
1000µF ,50V	1	Rs.20.00
22 µF , 50V	1	Rs.10.00
220µF ,400V	1	Rs.50.00
0.01µF, 600V	2	Rs.20.00
10µF , 25V	2	Rs.10.00
Diodes		
1A , 400V	4	Rs.4.00
8A , 1000V	4	Rs.12.00
Zener Diode		
12V , 2W	2	Rs.4.00
Variable resistor		
5 kΩ	1	Rs.10.00

10 kΩ	1	Rs.10.00
250 kΩ	1	Rs.10.00
Transistors		
2N2222	1	Rs.25.00
BD131	2	Rs.70.00
2N3055	2	Rs.100.00
BU808DFI	2	Rs.150.00
Bu806 (optional)	2	Rs.100.00
Total		**Rs.631.80**

Type	Quantity	Price
Transformer		
260/5V 100mA	1	Rs.100.00
230/12V 100mA	1	Rs.100.00
Driver 9 /12/12 2A	1	Rs.500.00
110V -250V/19V SMPS	1	Rs.1200.00
Others		
Circuit board	2	Rs.100.00
Bolt and nut ,lead etc.		Rs.100.00
Total		**Rs.2100.00**

Total cost excluding push pull transformer, casing, labour etc is **Rs.2731.80**

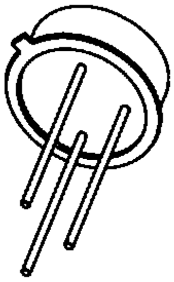
Additional cost involves in making Push-pull transformer and amount of power required. Normally BU808DFI can withstand for 8A at 400V with proper cooling and able to deliver approximately 1kW. The cost of the 1kW Regulator may be around Rs.15000 in the common market having their own weakness such as noise, frequency disturbance, time response for fluctuationetc.

For the information: To overcome the flux walk, transformer was designed for testing purpose of this project. Approximately Four square inch core was selected with primary winding of 2000 turns using enamel wire 36SWG with DC resistance of approximately 200Ω, for each transistor (Total 4000 turn, 400Ω) and secondary turns of 40000 turns with the same wire, to give out put voltage of 350V, when each collector voltage is at 200Vswing. This is done to reduce the maximum DC current flow in the primary winding about 1.5A (300V/200Ω). Since rectified voltage would be at peak level with capacitive filters. It is aware that due to the high resistance of the winding, output is less than expected. To increase the efficiency a large core has to be used with thick winding and heat sinks, cooling fan etc. The cost involved approximately Rs. 2500.

Appendix B

DISCRETE SEMICONDUCTORS

DATA SHEET



2N2222; 2N2222A
NPN switching transistors

Product specification
Supersedes data of September 1994
File under Discrete Semiconductors, SC04

1997 May 29

Philips Semiconductors

PHILIPS

NPN switching transistors 2N2222; 2N2222A

FEATURES

- High current (max. 800 mA)
- Low voltage (max. 40 V).

APPLICATIONS

- Linear amplification and switching.

DESCRIPTION

NPN switching transistor in a TO-18 metal package.
PNP complement: 2N2907A.

PINNING

PIN	DESCRIPTION
1	emitter
2	base
3	collector, connected to case

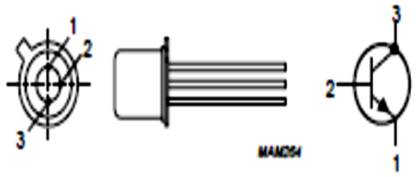


Fig.1 Simplified outline (TO-18) and symbol.

QUICK REFERENCE DATA

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
V_{CBO}	collector-base voltage	open emitter			
	2N2222		–	60	V
	2N2222A		–	75	V
V_{CEO}	collector-emitter voltage	open base			
	2N2222		–	30	V
	2N2222A		–	40	V
I_C	collector current (DC)		–	800	mA
P_{tot}	total power dissipation	$T_{amb} \leq 25$ °C	–	500	mW
h_{FE}	DC current gain	$I_C = 10$ mA; $V_{CE} = 10$ V	75	–	
f_T	transition frequency	$I_C = 20$ mA; $V_{CE} = 20$ V; f = 100 MHz			
	2N2222		250	–	MHz
	2N2222A		300	–	MHz
t_{off}	turn-off time	$I_{Con} = 150$ mA; $I_{Bon} = 15$ mA; $I_{Boff} = -15$ mA	–	250	ns

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			
	2N2222		–	60	V
	2N2222A		–	75	V
V_{CEO}	collector-emitter voltage	open base			
	2N2222		–	30	V
	2N2222A		–	40	V
V_{EBO}	emitter-base voltage	open collector			
	2N2222		–	5	V
	2N2222A		–	6	V
I_C	collector current (DC)		–	800	mA
I_{CM}	peak collector current		–	800	mA
I_{BM}	peak base current		–	200	mA
P_{tot}	total power dissipation	$T_{amb} \leq 25$ °C	–	500	mW
		$T_{case} \leq 25$ °C	–	1.2	W
T_{stg}	storage temperature		–65	+150	°C
T_j	junction temperature		–	200	°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	in free air	350	K/W
$R_{th\ j\text{-}c}$	thermal resistance from junction to case		146	K/W

CHARACTERISTICS

T_j = 25 °C unless otherwise specified.

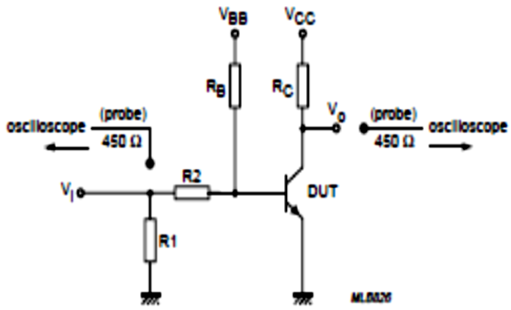
SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
I_{CBO}	collector cut-off current				
	2N2222	I_E = 0; V_{CB} = 50 V	–	10	nA
		I_E = 0; V_{CB} = 50 V; T_{amb} = 150 °C	–	10	µA
I_{CBO}	collector cut-off current				
	2N2222A	I_E = 0; V_{CB} = 60 V	–	10	nA
		I_E = 0; V_{CB} = 60 V; T_{amb} = 150 °C	–	10	µA
I_{EBO}	emitter cut-off current	I_C = 0; V_{EB} = 3 V	–	10	nA
h_{FE}	DC current gain	I_C = 0.1 mA; V_{CE} = 10 V	35	–	
		I_C = 1 mA; V_{CE} = 10 V	50	–	
		I_C = 10 mA; V_{CE} = 10 V	75	–	
		I_C = 150 mA; V_{CE} = 1 V; note 1	50	–	
		I_C = 150 mA; V_{CE} = 10 V; note 1	100	300	
h_{FE}	DC current gain	I_C = 10 mA; V_{CE} = 10 V; T_{amb} = −55 °C			
	2N2222A		35	–	
h_{FE}	DC current gain	I_C = 500 mA; V_{CE} = 10 V; note 1			
	2N2222		30	–	
	2N2222A		40	–	
V_{CEsat}	collector-emitter saturation voltage				
	2N2222	I_C = 150 mA; I_B = 15 mA; note 1	–	400	mV
		I_C = 500 mA; I_B = 50 mA; note 1	–	1.6	V
V_{CEsat}	collector-emitter saturation voltage				
	2N2222A	I_C = 150 mA; I_B = 15 mA; note 1	–	300	mV
		I_C = 500 mA; I_B = 50 mA; note 1	–	1	V
V_{BEsat}	base-emitter saturation voltage				
	2N2222	I_C = 150 mA; I_B = 15 mA; note 1	–	1.3	V
		I_C = 500 mA; I_B = 50 mA; note 1	–	2.6	V
V_{BEsat}	base-emitter saturation voltage				
	2N2222A	I_C = 150 mA; I_B = 15 mA; note 1	0.6	1.2	V
		I_C = 500 mA; I_B = 50 mA; note 1	–	2	V
C_c	collector capacitance	I_E = i_e = 0; V_{CB} = 10 V; f = 1 MHz	–	8	pF
C_e	emitter capacitance	I_C = i_c = 0; V_{EB} = 500 mV; f = 1 MHz			
	2N2222A		–	25	pF
f_T	transition frequency	I_C = 20 mA; V_{CE} = 20 V; f = 100 MHz			
	2N2222		250	–	MHz
	2N2222A		300	–	MHz
F	noise figure	I_C = 200 µA; V_{CE} = 5 V; R_S = 2 kΩ; f = 1 kHz; B = 200 Hz			
	2N2222A		–	4	dB

NPN switching transistors 2N2222; 2N2222A

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
Switching times (between 10% and 90% levels); see Fig.2					
t_{on}	turn-on time	I_{Con} = 150 mA; I_{Bon} = 15 mA; I_{Boff} = −15 mA	−	35	ns
t_d	delay time		−	10	ns
t_r	rise time		−	25	ns
t_{off}	turn-off time		−	250	ns
t_s	storage time		−	200	ns
t_f	fall time		−	60	ns

Note

1. Pulse test: $t_p \leq 300$ µs; $\delta \leq 0.02$.



V_i = 9.5 V; T = 500 µs; t_p = 10 µs; $t_r = t_f \leq 3$ ns.

R1 = 68 Ω; R2 = 325 Ω; R_B = 325 Ω; R_C = 160 Ω.

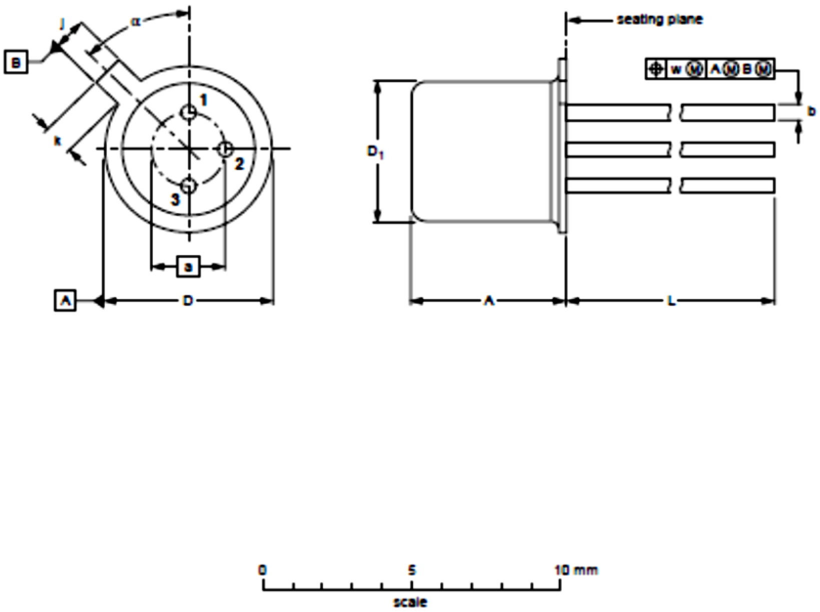
V_{BB} = −3.5 V; V_{CC} = 29.5 V.

Oscilloscope input impedance Z_i = 50 Ω.

Fig.2 Test circuit for switching times.

PACKAGE OUTLINE

Metal-can cylindrical single-ended package; 3 leads — **SOT18/13**



DIMENSIONS (millimetre dimensions are derived from the original inch dimensions)

UNIT	A	a	b	D	D_1	j	k	L	w	α
mm	5.31 4.74	2.54	0.47 0.41	5.45 5.30	4.70 4.55	1.03 0.94	1.1 0.9	15.0 12.7	0.40	45°

OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	EIAJ			
SOT18/13	B11/C7 type 3	TO-18				97-04-18

DEFINITIONS

Data sheet status	
Objective specification	This data sheet contains target or goal specifications for product development.
Preliminary specification	This data sheet contains preliminary data; supplementary data may be published later.
Product specification	This data sheet contains final product specifications.
Limiting values	
Limiting values given are in accordance with the Absolute Maximum Rating System (IEC 134). Stress above one or more of the limiting values may cause permanent damage to the device. These are stress ratings only and operation of the device at these or at any other conditions above those given in the Characteristics sections of the specification is not implied. Exposure to limiting values for extended periods may affect device reliability.	
Application information	
Where application information is given, it is advisory and does not form part of the specification.	

LIFE SUPPORT APPLICATIONS

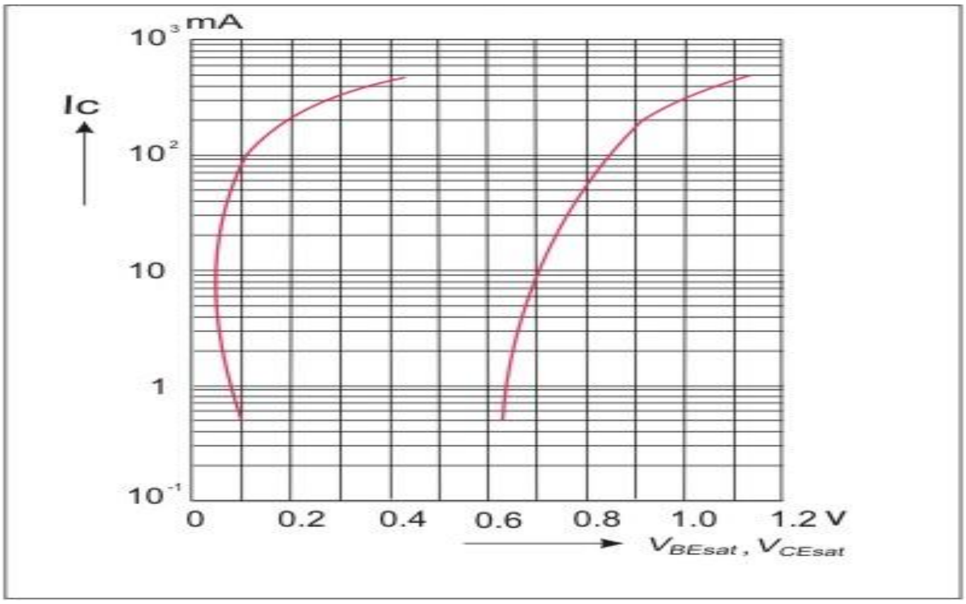
These products are not designed for use in life support appliances, devices, or systems where malfunction of these products can reasonably be expected to result in personal injury. Philips customers using or selling these products for use in such applications do so at their own risk and agree to fully indemnify Philips for any damages resulting from such improper use or sale.

Rating and characteristics curves

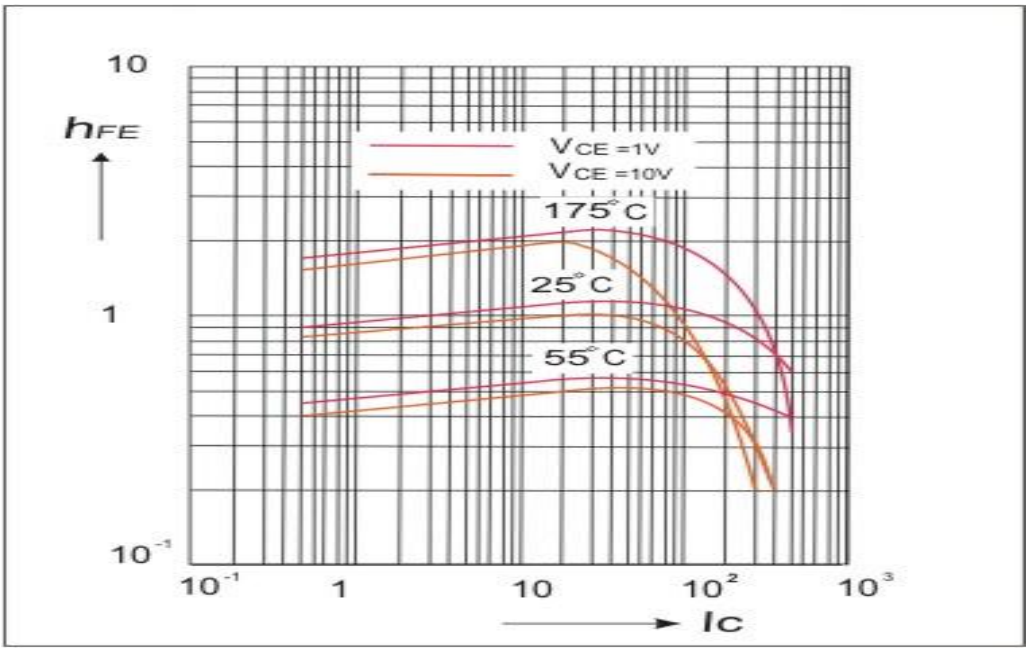
Turn off time= 300ns

Noise fig 4db

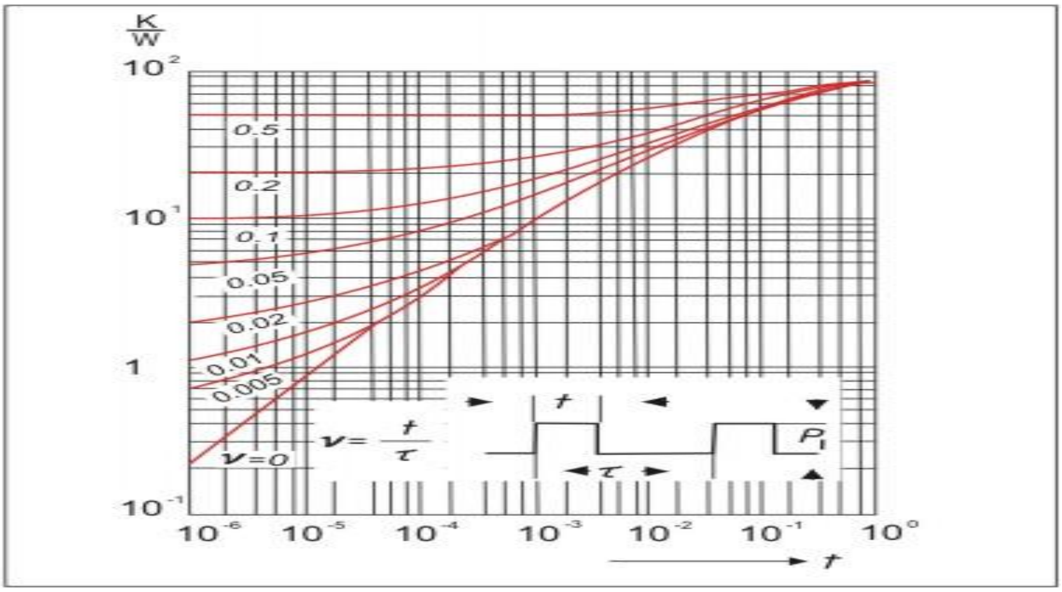
Tamp $=25^0$ C, h_{fe}=10



DC current gain

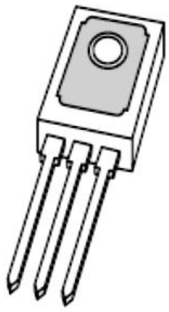


Permissible load



DISCRETE SEMICONDUCTORS

DATA SHEET



BD131
NPN power transistor

Product specification
Supersedes data of 1997 Mar 04

1999 Apr 12

Philips
Semiconductors

PHILIPS

NPN power transistor BD131

FEATURES

- High current (max. 3 A)
- Low voltage (max. 45 V).

APPLICATIONS

- General purpose power applications.

DESCRIPTION

NPN power transistor in a TO-126; SOT32 plastic package. PNP complement: BD132.

PINNING

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

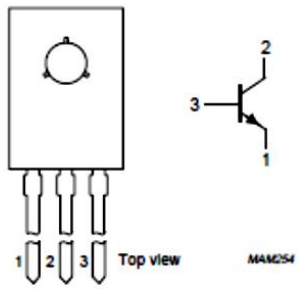


Fig.1 Simplified outline (TO-126; SOT32) and symbol.

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	–	70	V
V_{CEO}	collector-emitter voltage	open base	–	45	V
V_{EBO}	emitter-base voltage	open collector	–	6	V
I_C	collector current (DC)		–	3	A
I_{CM}	peak collector current		–	6	A
I_{BM}	peak base current		–	0.5	A
P_{tot}	total power dissipation	$T_{mb} \leq 60$ °C	–	15	W
T_{stg}	storage temperature		–65	+150	°C
T_j	junction temperature		–	150	°C
T_{amb}	operating ambient temperature		–65	+150	°C

NPN power transistor BD131

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		6	K/W

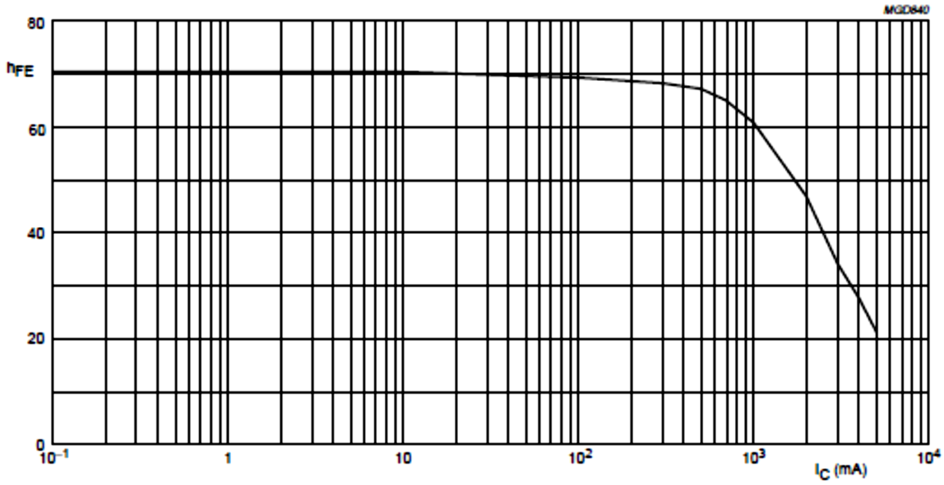
Note

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

CHARACTERISTICS

T_j = 25 °C unless otherwise specified.

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
I_{CBO}	collector cut-off current	$I_E = 0$; $V_{CB} = 50$ V	–	50	nA
		$I_E = 0$; $V_{CB} = 50$ V; $T_j = 150$ °C	–	10	μA
I_{EBO}	emitter cut-off current	$I_C = 0$; $V_{EB} = 5$ V	–	50	nA
h_{FE}	DC current gain	$I_C = 0.5$ A; $V_{CE} = 12$ V; (see Fig.2)	40	–	
		$I_C = 2$ A; $V_{CE} = 1$ V; (see Fig.2)	20	–	
V_{CEsat}	collector-emitter saturation voltage	$I_C = 0.5$ A; $I_B = 50$ mA	–	300	mV
		$I_C = 2$ A; $I_B = 200$ mA	–	700	mV
V_{BEsat}	base-emitter saturation voltage	$I_C = 0.5$ A; $I_B = 50$ mA	–	1.2	V
		$I_C = 2$ A; $I_B = 200$ mA	–	1.5	V
f_T	transition frequency	$I_C = 0.25$ A; $V_{CE} = 5$ V; f = 100 MHz; $T_{amb} = 25$ °C	60	–	MHz

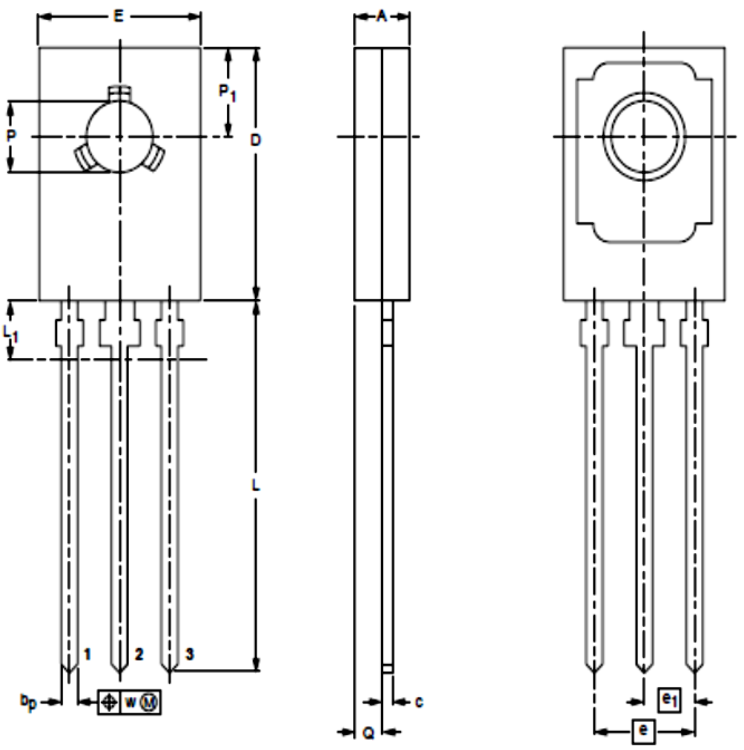


V_{CE} = 1 V.

Fig.2 DC current gain; typical values.

PACKAGE OUTLINE

Plastic single-ended leaded (through hole) package; mountable to heatsink, 1 mounting hole; 3 leads SOT32



DIMENSIONS (mm are the original dimensions)

UNIT	A	b_p	c	D	E	e	e_1	L	$L_1^{(1)}$ max	Q	P	P_1	w
mm	2.7 2.3	0.88 0.65	0.60 0.45	11.1 10.5	7.8 7.2	4.58	2.29	16.5 15.3	2.54	1.5 0.9	3.2 3.0	3.9 3.6	0.254

Note

1. Terminal dimensions within this zone are uncontrolled to allow for flow of plastic and terminal irregularities.

OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	EIAJ			
SOT32		TO-126				97-03-04

DEFINITIONS

Data Sheet Status	
Objective specification	This data sheet contains target or goal specifications for product development.
Preliminary specification	This data sheet contains preliminary data; supplementary data may be published later.
Product specification	This data sheet contains final product specifications.
Limiting values	
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Application information	
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LIFE SUPPORT APPLICATIONS

These products are not designed for use in life support appliances, devices, or systems where malfunction of these products can reasonably be expected to result in personal injury. Philips customers using or selling these products for use in such applications do so at their own risk and agree to fully indemnify Philips for any damages resulting from such improper use or sale.

BU806
BU807

MEDIUM VOLTAGE NPN FAST SWITCHING DARLINGTON TRANSISTORS

- STMicroelectronics PREFERRED SALESTYPES
- NPN DARLINGTONS
- LOW BASE-DRIVE REQUIREMENTS
- INTEGRATED ANTIPARALLEL COLLECTOR-EMITTER DIODE

APPLICATION

- HORIZONTAL DEFLECTION FOR MONOCHROME TVs

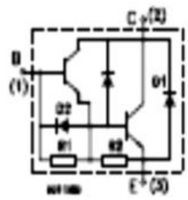
DESCRIPTION

The devices are silicon Epitaxial Planar NPN power transistors in Darlington configuration with integrated base-emitter speed-up diode, mounted in TO-220 plastic package.

They can be used in horizontal output stages of 110 °CRT video displays.

TO-220

INTERNAL SCHEMATIC DIAGRAM



ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value		Unit
		BU806	BU807	
V_{CBO}	Collector-base Voltage (I_E = 0)	400	330	V
V_{CEV}	Collector-emitter Voltage (V_{BE} = -6V)	400	330	V
V_{CEO}	Collector-emitter Voltage (I_B = 0)	200	150	V
V_{EBO}	Emitter-Base Voltage (I_C = 0)	6		V
I_C	Collector Current	8		A
I_{CM}	Collector Peak Current	15		A
I_{DM}	Damper Diode Peak Forward Current	10		A
I_B	Base Current	2		A
P_{tot}	Total Power Dissipation at T_{case} < 25 °C	60		W
T_{stg}	Storage Temperature	-65 to 150		°C
T_j	Max Operating Junction Temperature	150		°C

THERMAL DATA

$R_{thj-case}$	Thermal Resistance Junction-case	Max	2.08	°C/W
$R_{thj-amb}$	Thermal Resistance Junction-ambient	Max	70	°C/W

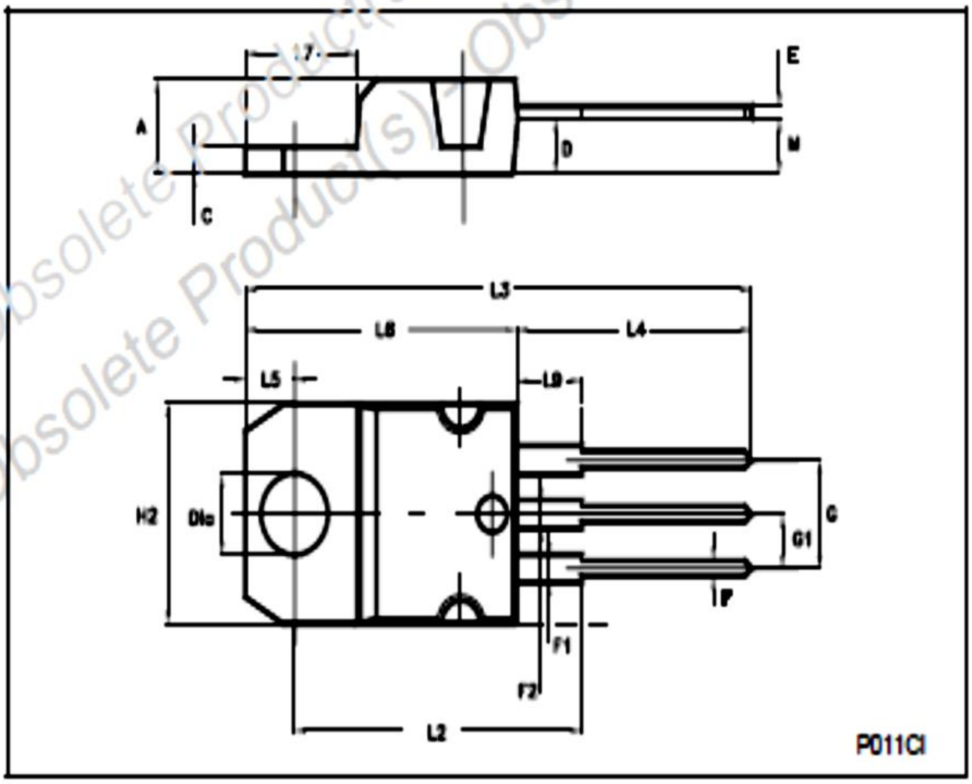
ELECTRICAL CHARACTERISTICS (T_{case} = 25 °C unless otherwise specified)

Symbol	Parameter	Test Conditions		Min.	Typ.	Max.	Unit
I_{CES}	Collector Cut-off Current (V_{BE} = 0)	for BU807 for BU806	V_{CE} = 330 V V_{CE} = 400 V			100 100	µA µA
I_{CEV}	Collector Cut-off Current (V_{BE} = -6V)	for BU807 for BU806	V_{CE} = 330 V V_{CE} = 400 V			100 100	µA µA
I_{EBO}	Emitter Cut-off Current (I_C = 0)	V_{EB} = 6 V				3.5	mA
$V_{CEO(sus)}$*	Collector-Emitter Sustaining Voltage (I_B = 0)	I_C = 100 mA	for BU807 for BU806	150 200			V V
$V_{CE(sat)}$*	Collector-Emitter Saturation Voltage	I_C = 5A	I_B = 50mA			1.5	V
$V_{BE(sat)}$*	Base-Emitter Saturation Voltage	I_C = 5A	I_B = 50mA			2.4	V
V_F*	Damper Diode Forward Voltage	I_F = 4A				2	V
 t_{on} t_{off} t_s t_f	RESISTIVE LOAD Turn-on Time Turn-off Time Storage Time Fall Time	 I_C = 5 A I_{B1} = 50 mA	 V_{CC} = 100 V I_{B2} = -500 mA		 0.35 0.4 0.55 0.2	 1	 µs µs µs µs

* Pulsed: Pulse duration = 300 µs, duty cycle < 1.5 %

TO-220 MECHANICAL DATA

DIM.	mm			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A	4.40		4.60	0.173		0.181
C	1.23		1.32	0.048		0.052
D	2.40		2.72	0.094		0.107
E	0.49		0.70	0.019		0.027
F	0.61		0.88	0.024		0.034
F1	1.14		1.70	0.044		0.067
F2	1.14		1.70	0.044		0.067
G	4.95		5.15	0.194		0.202
G1	2.40		2.70	0.094		0.106
H2	10.00		10.40	0.394		0.409
L2		16.40			0.645	
L4	13.00		14.00	0.511		0.551
L5	2.65		2.95	0.104		0.116
L6	15.25		15.75	0.600		0.620
L7	6.20		6.60	0.244		0.260
L9	3.50		3.93	0.137		0.154
M		2.60			0.102	
DIA.	3.75		3.85	0.147		0.151



BU808DFI

HIGH VOLTAGE FAST-SWITCHING NPN POWER DARLINGTON TRANSISTOR

- STMicroelectronics PREFERRED SALESTYPE
- NPN MONOLITHIC DARLINGTON WITH INTEGRATED FREE-WHEELING DIODE
- HIGH VOLTAGE CAPABILITY (> 1400 V)
- HIGH DC CURRENT GAIN (TYP. 150)
- FULLY INSULATED PACKAGE (U.L. COMPLIANT) FOR EASY MOUNTING
- LOW BASE-DRIVE REQUIREMENTS
- DEDICATED APPLICATION NOTE AN1184

ISOWATT218

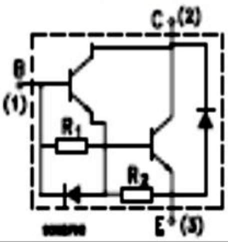
APPLICATIONS

- COST EFFECTIVE SOLUTION FOR HORIZONTAL DEFLECTION IN LOW END TV UP TO 21 INCHES.

DESCRIPTION

The BU808DFI is a NPN transistor in monolithic Darlington configuration. It is manufactured using Multiepitaxial Mesa technology for cost-effective high performance.

INTERNAL SCHEMATIC DIAGRAM



ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
V_{CBO}	Collector-Base Voltage ($I_E = 0$)	1400	V
V_{CEO}	Collector-Emitter Voltage ($I_B = 0$)	700	V
V_{EBO}	Emitter-Base Voltage ($I_C = 0$)	5	V
I_C	Collector Current	8	A
I_{CM}	Collector Peak Current ($t_p < 5$ ms)	10	A
I_B	Base Current	3	A
I_{BM}	Base Peak Current ($t_p < 5$ ms)	6	A
P_{tot}	Total Dissipation at $T_c = 25$ °C	52	W
V_{isol}	Insulation Withstand Voltage (RMS) from All Three Leads to Exernal Heatsink	2500	V
T_{stg}	Storage Temperature	-65 to 150	°C
T_j	Max. Operating Junction Temperature	150	°C

THERMAL DATA

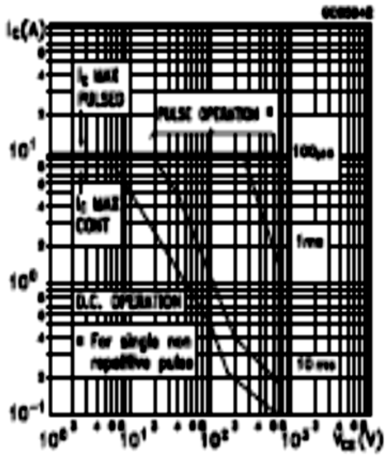
$R_{thj-case}$	Thermal Resistance Junction-case	Max	2.4	°C/W

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

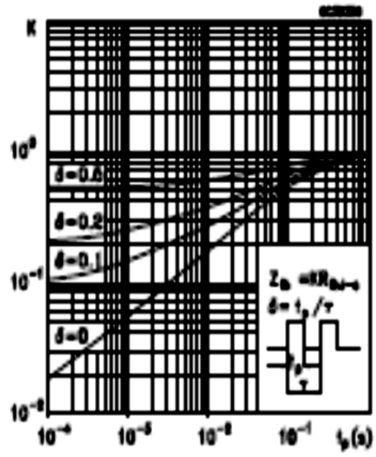
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
I_{CES}	Collector Cut-off Current (V_{BE} = 0)	V_{CE} = 1400 V			400	µA
I_{EBO}	Emitter Cut-off Current (I_C = 0)	V_{EB} = 5 V			100	mA
$V_{CE(sat)}$*	Collector-Emitter Saturation Voltage	I_C = 5 A I_B = 0.5 A			1.6	V
$V_{BE(sat)}$*	Base-Emitter Saturation Voltage	I_C = 5 A I_B = 0.5 A			2.1	V
h_{FE}*	DC Current Gain	I_C = 5 A V_{CE} = 5 V I_C = 5 A V_{CE} = 5 V T_j = 100 °C	60 20		230	
t_s t_f	INDUCTIVE LOAD Storage Time Fall Time	V_{CC} = 150 V I_C = 5 A I_{B1} = 0.5 A $V_{BE(off)}$ = -5 V			3 0.8	µs µs
t_s t_f	INDUCTIVE LOAD Storage Time Fall Time	V_{CC} = 150 V I_C = 5 A I_{B1} = 0.5 A $V_{BE(off)}$ = -5 V T_j = 100 °C		2 0.8		µs µs
V_F	Diode Forward Voltage	I_F = 5 A			3	V

* Pulsed: Pulse duration = 300 µs, duty cycle 1.5 %

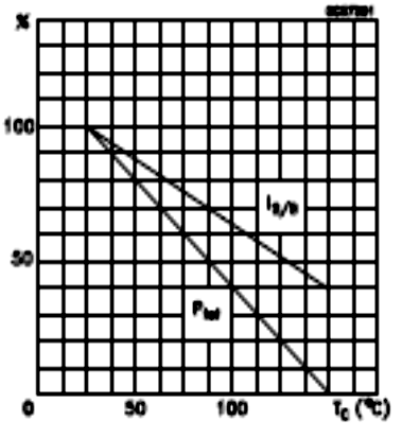
Safe Operating Area



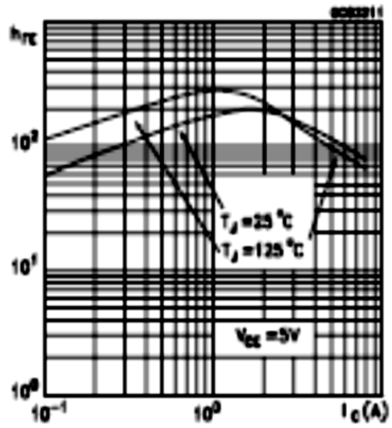
Thermal Impedance



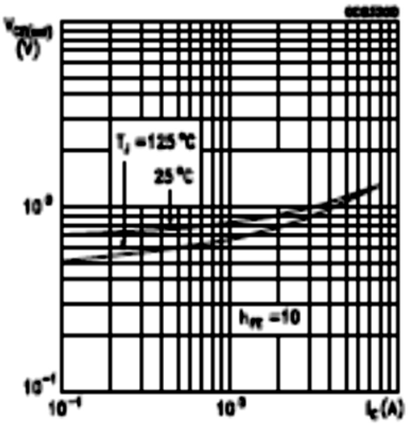
Derating Curve



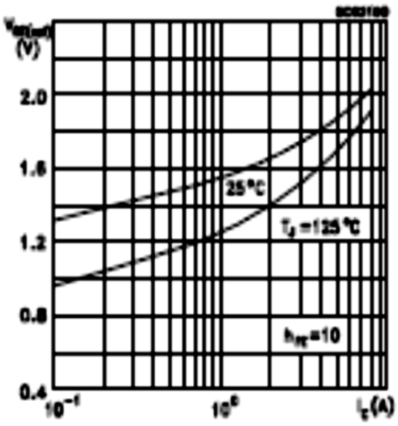
DC Current Gain



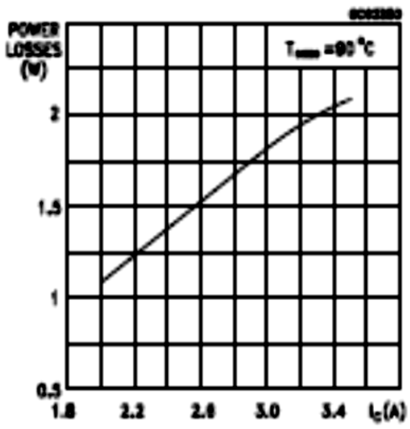
Collector Emitter Saturation Voltage



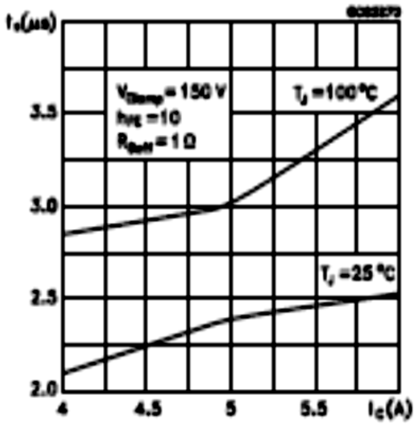
Base Emitter Saturation Voltage



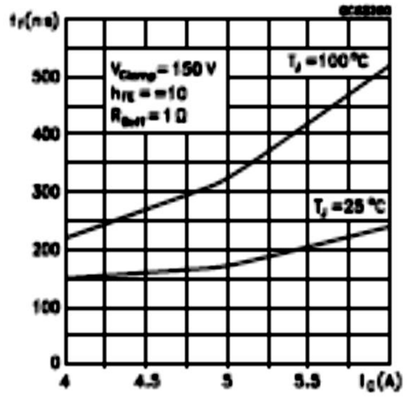
Power Losses at 16 KHz



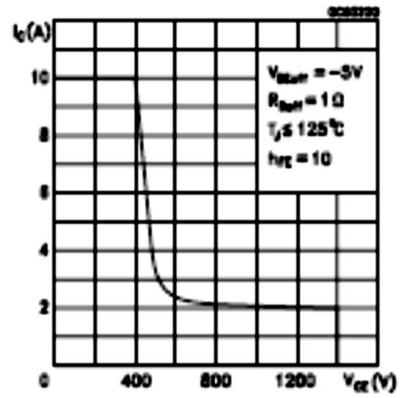
Switching Time Inductive Load at 16KHz



Switching Time Inductive Load at 16KHZ



Reverse Biased SOA



BASE DRIVE INFORMATION

In order to saturate the power switch and reduce conduction losses, adequate direct base current I_{B1} has to be provided for the lowest gain h_{FE} at 100 °C (line scan phase). On the other hand, negative base current I_{B2} must be provided to turn off the power transistor (retrace phase).

Most of the dissipation, in the deflection application, occurs at switch-off. Therefore it is essential to determine the value of I_{B2} which minimizes power losses, fall time t_f and, consequently, T_j. A new set of curves have been defined to give total power losses, t_s and t_f as a function of I_{B2} at both 16 KHz scanning frequencies for choosing the optimum negative drive. The test circuit is illustrated in figure 1.

Inductance L_1 serves to control the slope of the negative base current I_{B2} to recombine the excess carrier in the collector when base current is still present, this would avoid any tailing phenomenon in the collector current.

The values of L and C are calculated from the following equations:

$$\frac{1}{2} L (I_C)^2 = \frac{1}{2} C (V_{CEfly})^2 \qquad \omega = 2\pi f = \frac{1}{\sqrt{LC}}$$

Where I_C = operating collector current, V_{CEfly} = flyback voltage, f = frequency of oscillation during retrace.

Figure 1: Inductive Load Switching Test Circuits.

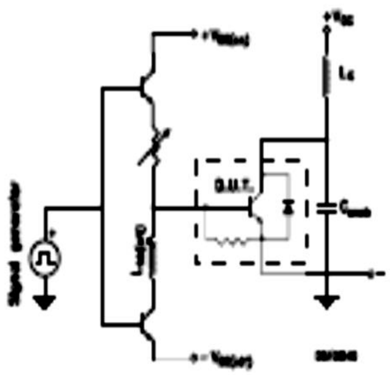
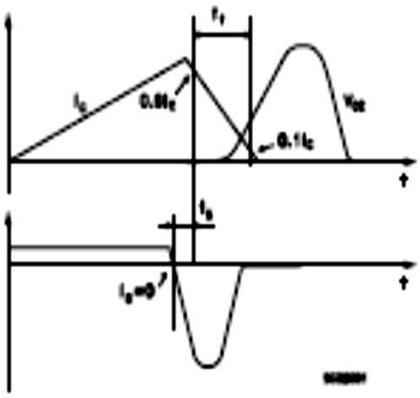
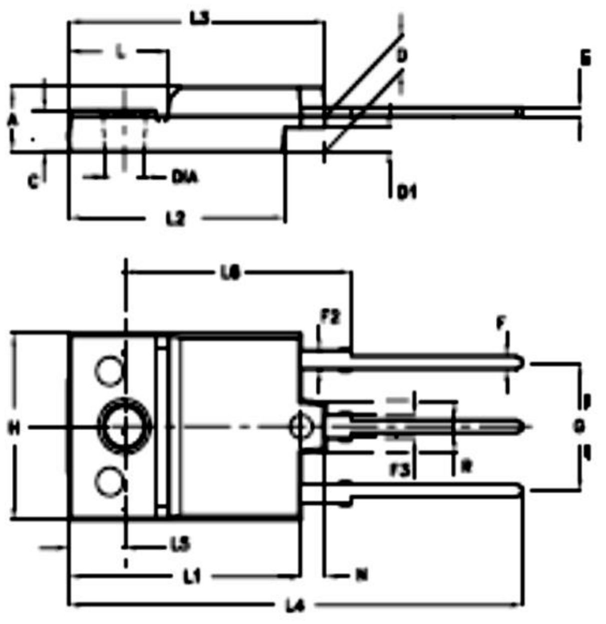


Figure 2: Switching Waveforms in a Deflection Circuit



ISOWATT218 MECHANICAL DATA

DIM.	mm			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A	5.35		5.65	0.211		0.222
C	3.30		3.80	0.130		0.150
D	2.90		3.10	0.114		0.122
D1	1.88		2.08	0.074		0.082
E	0.75		0.95	0.030		0.037
F	1.05		1.25	0.041		0.049
F2	1.50		1.70	0.059		0.067
F3	1.90		2.10	0.075		0.083
G	10.80		11.20	0.425		0.441
H	15.80		16.20	0.622		0.638
L		9			0.354	
L1	20.80		21.20	0.819		0.835
L2	19.10		19.90	0.752		0.783
L3	22.80		23.60	0.898		0.929
L4	40.50		42.50	1.594		1.673
L5	4.85		5.25	0.191		0.207
L6	20.25		20.75	0.797		0.817
N	2.1		2.3	0.083		0.091
R		4.6			0.181	
DIA	3.5		3.7	0.138		0.146



- Weight : 4.9 g (typ.)
- Maximum Torque (applied to mounting flange) Recommended: 0.8 Nm; Maximum: 1 Nm
- The side of the dissipator must be flat within 80 μm

P025C/A

2N3055, MJ2955

Complementary power transistors

Datasheet - production data

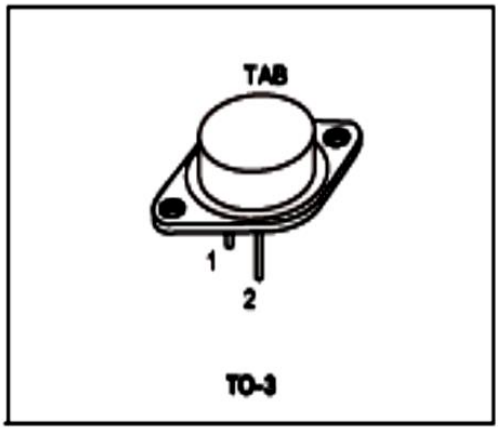
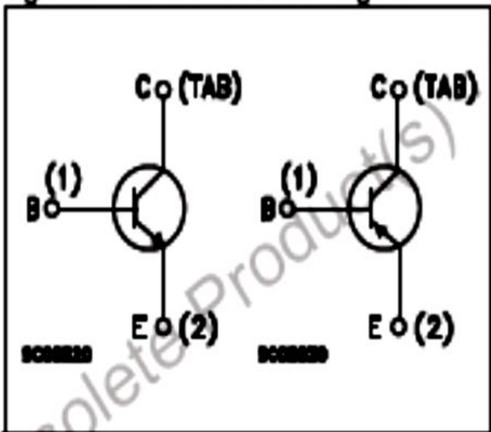


Figure 1. Internal schematic diagram



Features

- Low collector-emitter saturation voltage
- Complementary NPN - PNP transistors

Applications

- General purpose
- Audio amplifier

Description

The devices are manufactured in planar technology with 'base island' layout and are suitable for audio, power linear and switching applications.

Table 1. Device summary

Order code	Marking	Package	Packaging
2N3055	2N3055	TO-3	Tray
MJ2955	MJ2955		

1 Absolute maximum rating

Table 2. Absolute maximum rating

Symbol	Parameter	Value		Unit
		NPN	2N3055	
		PNP	MJ2955	
V_{CBO}	Collector-base voltage (I_E = 0)		100	V
V_{CER}	Collector-emitter voltage (R_{BE} = 100 Ω)		70	V
V_{CEO}	Collector-emitter voltage (I_B = 0)		60	V
V_{EBO}	Emitter-base voltage (I_C = 0)		7	V
I_C	Collector current		15	A
I_B	Base current		7	A
P_{TOT}	Total dissipation at $T_c \le 25$ °C		115	W
T_{stg}	Storage temperature		-65 to 200	°C
T_J	Max. operating junction temperature		200	°C

Table 3. Thermal data

Symbol	Parameter	Value	Unit
$R_{thj-case}$	Thermal resistance junction-case max	1.5	°C/W

Note: For PNP type voltage and current values are negative

2 Electrical characteristics

(T_{case} = 25°C; unless otherwise specified)

Table 4. Electrical characteristics

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
I_{CEX}	Collector cut-off current (V_{BE} = -1.5 V)	V_{CE} = 100 V V_{CE} = 100 V T_C = 150 °C			1 5	mA mA
I_{CEO}	Collector cut-off current (I_B = 0)	V_{CE} = 30 V			0.7	mA
I_{EBO}	Emitter cut-off current (I_C = 0)	V_{EB} = 7 V			5	mA
$V_{CEO(sus)}$[1]	Collector-emitter sustaining voltage (I_B = 0)	I_C = 200 mA	60			V
$V_{CER(sus)}$[1]	Collector-emitter sustaining voltage (R_{BE} = 100 Ω)	I_C = 200 mA	70			V
$V_{CE(sat)}$[1]	Collector-emitter saturation voltage	I_C = 4 A I_B = 400 mA I_C = 10 A I_B = 3.3 A			1 3	V V
V_{BE}[1]	Base-emitter voltage	I_C = 4 A V_{CE} = 4 V			1.8	V
h_{FE}[1]	DC current gain	I_C = 4 A V_{CE} = 4 V I_C = 10 A V_{CE} = 4 V	20 5		70	

1. *Pulsed: Pulse duration = 300 µs, duty cycle ≤ 1.5%*

Note: *For PNP type voltage and current values are negative*

2.1 Electrical characteristics (curve)

Figure 2. Safe operating area

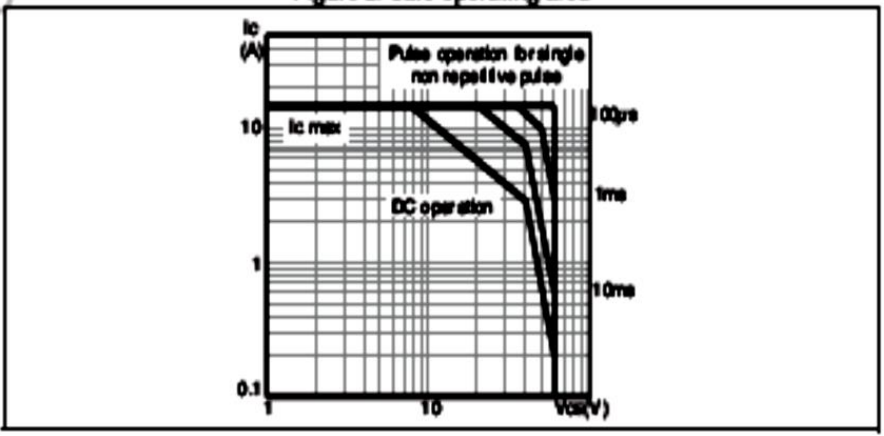
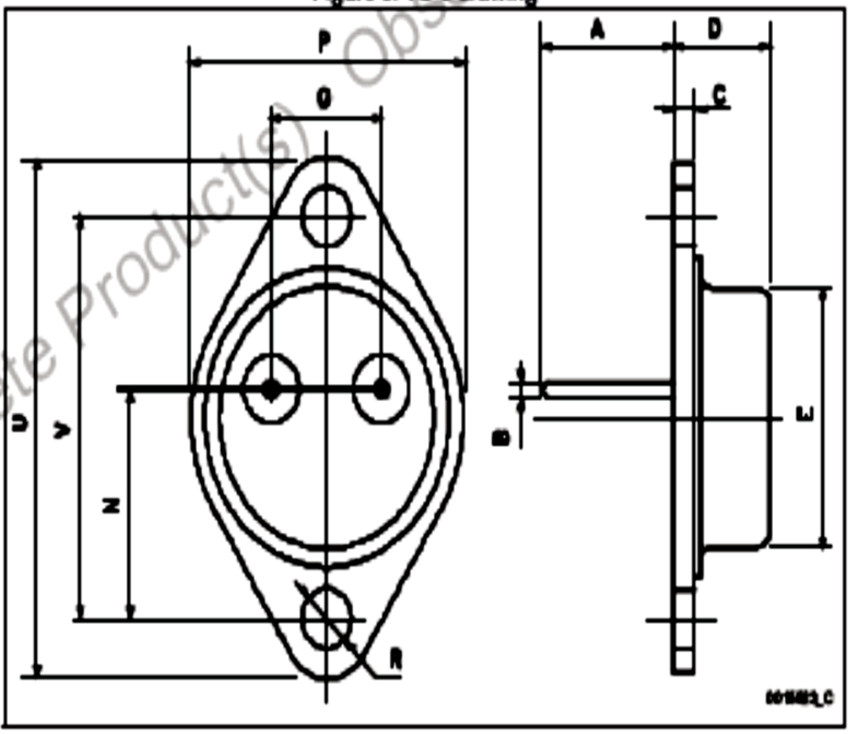


Table 5. TO-3 mechanical data

Dim.	mm		
	Min.	Typ.	Max.
A	11.00		13.10
B	0.97		1.15
C	1.50		1.65
D	8.32		8.92
E	19.00		20.00
G	10.70		11.10
N	16.50		17.20
P	25.00		26.00
R	4.00		4.09
U	38.50		39.30
V	30.00		30.30

Figure 3. TO-3 drawing



4 Revision history

Table 6. Document revision history

Date	Revision	Changes
11-Oct-1999	6	
29-Jan-2007	7	Content reworked to improve readability, no technical changes
11-Nov-2013	8	Inserted *Table 3: Thermal data* and *Figure 2: Safe operating area*. Minor text changes.