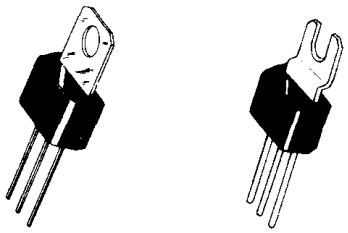
BF380
BF381
BF382

NPN SILICON ANNULAR TRANSISTORS

. . . designed for high-voltage video and luminance output stages in TV receivers.

- High Collector-Emitter Breakdown Voltage —
  BV_{CEO} = 300, 250, and 180 Vdc @ I_C = 10 mAdc
- Low Collector-Emitter Saturation Voltage —
  $V_{CE(sat)}$ = 0.75 Vdc (Max) @ I_C = 30 mAdc
- Low Collector-Base Capacitance —
  C_{cb} = 3.0 pF (Max) @ V_{CB} = 30 Vdc

NPN SILICON HIGH VOLTAGE AMPLIFIER TRANSISTORS



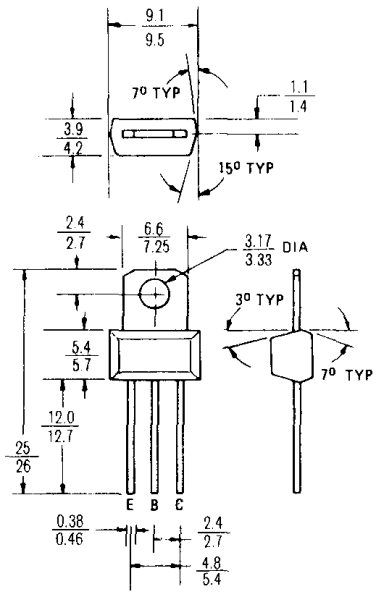
(1) Standard package: BF380/381/382.
(2) Tab formed for flat mounting:
BF380-1/BF381-1/BF382-1
Leads formed to TO-5 configuration:
BF380-5/BF381-5/BF382-5

MAXIMUM RATINGS

Rating	Symbol	BF 380	BF 381	BF 382	Unit
Collector-Emitter Voltage	V_{CEO}	180	250	300	Vdc
Collector-Base Voltage	V_{CB}	180	250	300	Vdc
Emitter-Base Voltage	V_{EB}	—	5	—	Vdc
Collector Current—Continuous	I_C	—	500	—	mAdc
Total Device Dissipation @ T_A = 25°C Derate above 25°C	P_D		1.0 8.0		Watt mW/°C
Total Device Dissipation @ T_C = 25°C Derate above 25°C	P_D		10 80		Watts mW/°C
Operating and Storage Junction Temperature Range	T_J, T_{stg}		−55 to +150		°C

THERMAL CHARACTERISTICS

Characteristic	Symbol	Max	Unit
Thermal Resistance, Junction to Case	θ_{JC}	12.5	°C/W
Thermal Resistance, Junction to Ambient	θ_{JA}	125	°C/W



All dimensions in millimeters
Collector connected to tab

CASE 152

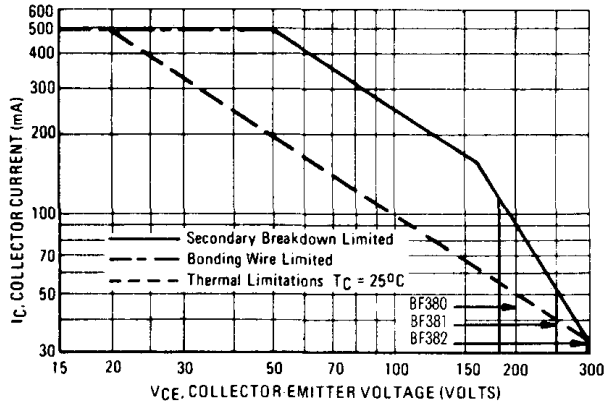
BF380
BF381
BF382

ELECTRICAL CHARACTERISTICS (T_C = 25 °C unless otherwise noted)

Characteristic		Symbol	Min	Typ	Max	Unit
OFF CHARACTERISTICS						
Collector-Emitter Breakdown Voltage (1)		BV_{CEO}				Vdc
(I_C = 10 mAdc, I_B = 0)	BF 380		180	—	—	
	BF 381		250	—	—	
	BF 382		300	—	—	
Collector-Base Breakdown Voltage		BV_{CBO}				Vdc
(I_C = 100 μAdc, I_E = 0)	BF 380		180	—	—	
	BF 381		250	—	—	
	BF 382		300	—	—	
Emitter-Base Breakdown Voltage		BV_{EBO}		—	—	Vdc
(I_E = 10 μAdc, I_C = 0)			5.0			
Collector Cutoff Current		I_{CBO}				nAdc
(V_{CB} = 100 Vdc, I_E = 0)	BF 380		—	—	50	
(V_{CB} = 200 Vdc, I_E = 0)	BF 381		—	—	50	
(V_{CB} = 250 Vdc, I_E = 0)	BF 382		—	—	50	
ON CHARACTERISTICS						
DC Current Gain		h_{FE}		—	—	—
(I_C = 30 mAdc, V_{CE} = 10 Vdc)			25			
Collector-Emitter Saturation Voltage		$V_{CE(sat)}$				Vdc
(I_C = 30 mAdc, I_B = 6.0 mAdc)			—	0.3	0.75	
Collector-Emitter Knee Voltage (T_J = 150 °C)		V_{CEK}				Vdc
(I_C = 30 mAdc) (2)			—	11	—	
DYNAMIC CHARACTERISTICS						
Current-Gain—Bandwidth Product		f_T				MHz
(I_C = 15 mAdc, V_{CE} = 10 Vdc, f = 100 MHz)			—	90	—	
Collector-Base Capacitance		C_{CB}				Pf
(V_{CB} = 30 Vdc, I_E = 0, f = 1.0 MHz)			—	2.2	3.0	

(1) Pulse Test: Pulse Width ≤ 300 μs, Duty Cycle ≤ 2%.
(2) Value of V_{CE} at which h_{FE} is 80% of its value at V_{CE} = 50 Vdc, I_C = 30 mAdc.

FIGURE 1—DC SAFE OPERATING AREA



The Safe Operating Area Curves indicate I_C—V_{CE} limits below which the device will not enter secondary breakdown. Collector load lines for specific circuits must fall within the applicable Safe Area to avoid causing a catastrophic failure. To insure operation below the maximum T_J, power-temperature derating must be observed for both steady state and pulse power conditions.

FIGURE 2—DC CURRENT GAIN

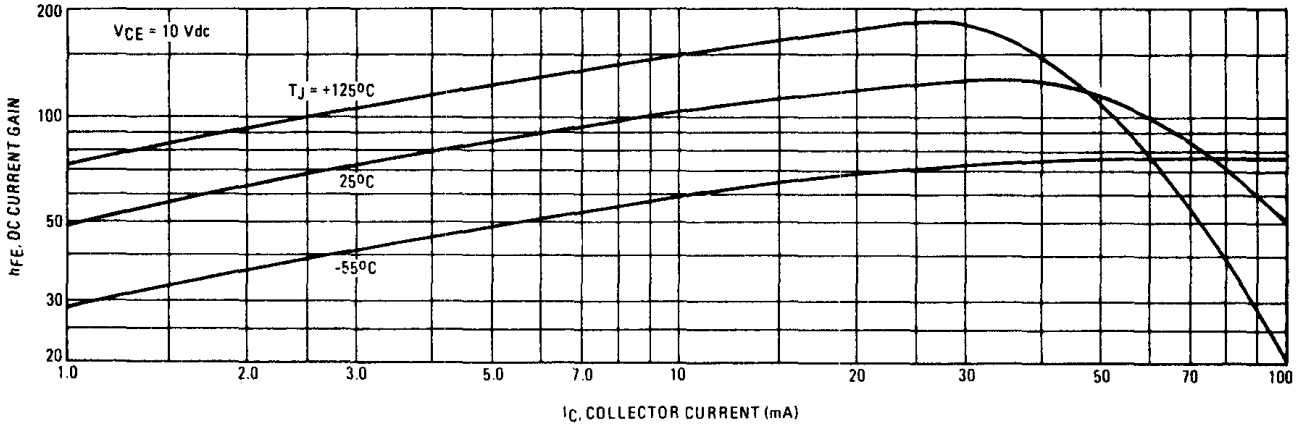


FIGURE 3—CAPACITANCES

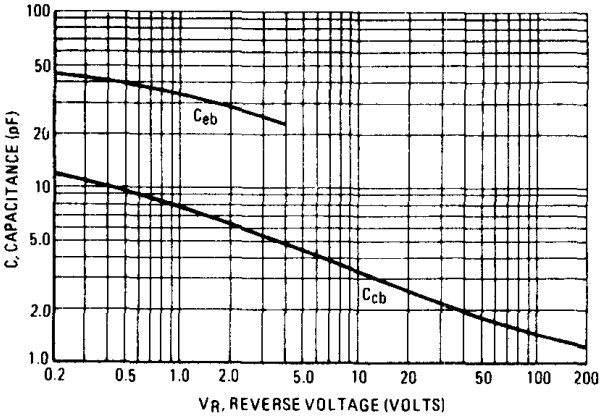


FIGURE 4—CURRENT-GAIN—BANDWIDTH PRODUCT

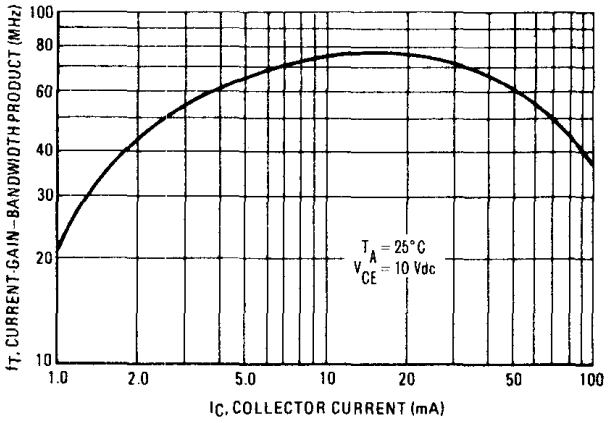
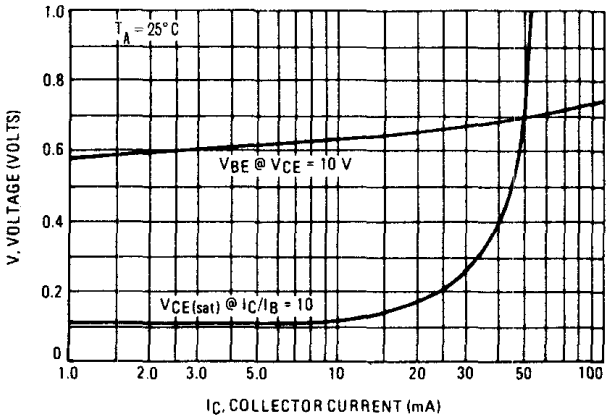


FIGURE 5—"ON" VOLTAGES



APPLICATIONS INFORMATION

The BF 382 is primarily designed for use in the R, G, and B output stages of color television receivers and with a high BV_{CEO}, it can supply the video amplitude requirements of any known system. The low feedback capacitance provides good video bandwidth with modest drive current requirements. Typical drive is from an emitter-follower with a 4.7 k emitter-resistor operated from a 20-Volt supply. It will, therefore, be operable directly from a number of available chroma demodulators. The low output capacitance of this device adds little to the total load capacitance, allowing improved bandwidth for a given collector load resistor. Two typical applications for the BF 382 are shown in Figures 6 and 7.

Device dissipation will reach approximately 1.6 Watts under worst-case signal conditions and some heat sinking is required. At an operating ambient temperature of 65 °C, a thermal resistance $\theta_{JA} = 150\text{-}65/1.6 = 53\,°C/W$ will be required. The junction-to-case thermal resistance, θ_{JC}, of the device is 12.5 °C/W, thus a heat dissipator of 40.5 °C/W, or lower, will be required. A black anodized 0.020" thick aluminum plate measuring 1" × 2" can be folded into a channel shape and formed with «feet» to snap into a printed circuit panel for support. This will provide the safety factor.

Used as a color difference output, where drive and bandwidth requirements are less severe, the BF 382 can be operated with 27 k ohm load resistors (worst-case dissipation would then be only 0.6 Watts). The device can, therefore, be operated as a color-difference output without any heat radiator in ambient temperatures to 150-0.6 (125) = 75 °C.

In addition the safe operating area of the BF 382 will fill the requirements of the luminance output function with a total equivalent load of 5.0 kilohms. Worst-case dissipation can reach 3 Watts, this requires a total θ_{JA} of 150-65/3 = 28.4 °C/W. This 28.4 °C/W means a heat dissipator of 15.9 °C/W, (approximately 2" × 3" aluminum plate) will be required.

FIGURE 6—BF 382 AS RGB OUTPUT, MATRIXING COLOR DIFFERENCE AND LUMINANCE INPUTS

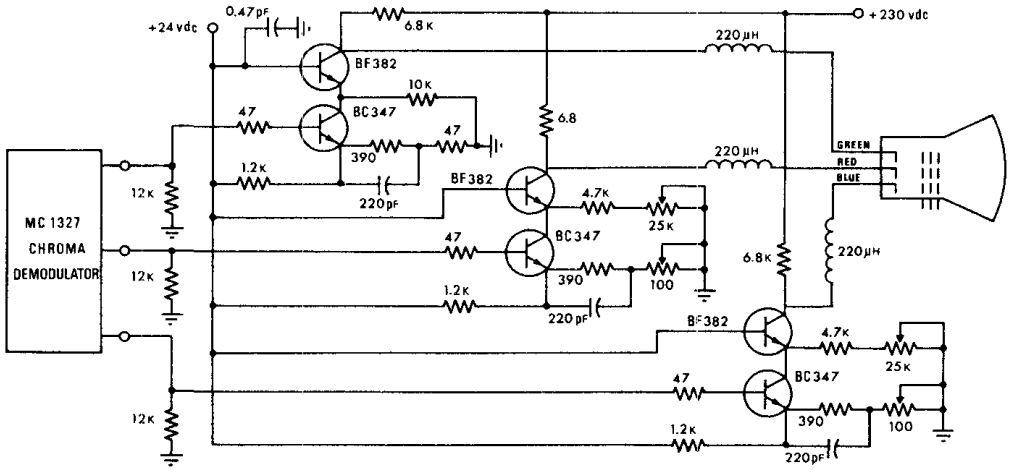


FIGURE 7—HEAT SINK VERSUS SURFACE AREA

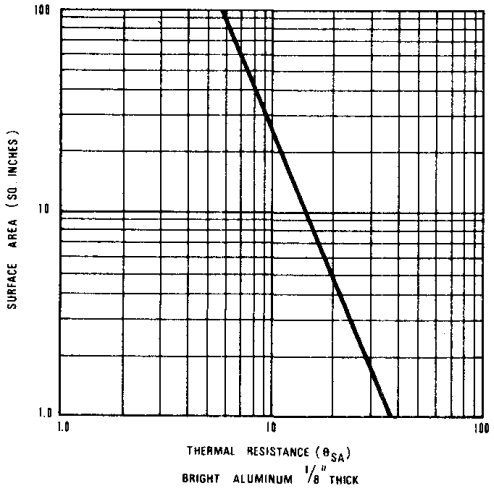


FIGURE 8—TYPICAL THERMAL RESISTANCE DATA—TAB TO SINK

CONDITION	θ_{CS} in °C/W	MOUNTING SCREW TORQUE (in./lbs)
NO GREASE	4.25	5
WITH DOW-340	2.1	2
THERMAL COMPOUND	1.7	5
WITH DOW-340 AND 2 MIL	4.7	2
MICA WASHER	4.3	5

FIGURE 9—TYPICAL MOUNTING METHODS