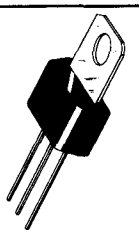
MPS-U10 (SILICON)

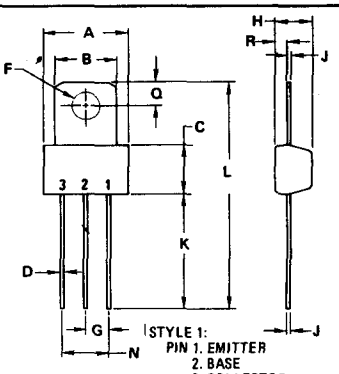
NPN SILICON ANNULAR TRANSISTOR

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

- High Collector-Emitter Breakdown Voltage —
  BV_{CEO} = 300 Vdc (Min) @ I_C = 1.0 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} = 20 Vdc

NPN SILICON HIGH VOLTAGE AMPLIFIER TRANSISTOR





DIM	MILLIMETERS MIN	MILLIMETERS MAX	INCHES MIN	INCHES MAX
A	9.14	9.53	0.360	0.375
B	6.60	7.24	0.260	0.285
C	5.41	5.66	0.213	0.223
D	0.38	0.53	0.015	0.021
F	3.18	3.33	0.125	0.131
G	2.54 BSC		0.100 BSC	
H	3.94	4.19	0.155	0.165
J	0.36	0.41	0.014	0.016
K	12.07	12.70	0.475	0.500
L	25.02	25.53	0.985	1.005
N	5.08 BSC		0.200 BSC	
Q	2.39	2.69	0.094	0.106
R	1.14	1.40	0.045	0.055

CASE 152-02

MAXIMUM RATINGS

Rating	Symbol	Value	Unit
Collector-Emitter Voltage	V_{CEO}	300	Vdc
Collector-Base Voltage	V_{CB}	300	Vdc
Emitter-Base Voltage	V_{EB}	6.0	Vdc
Collector Current — Continuous	I_C	500	mAdc
Total Power Dissipation @ T_A = 25°C Derate above 25°C	P_D	1.0 8.0	Watt mW/°C
Total Power 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	$R_{\theta JC}$	12.5	°C/W
Thermal Resistance, Junction to Ambient	$R_{\theta JA}$(1)	125	°C/W

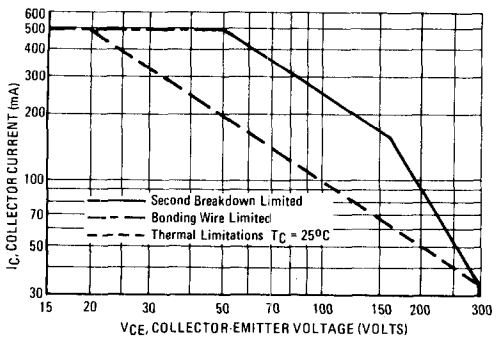
(1) $R_{\theta JA}$ is measured with the device soldered into a typical printed circuit board.

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

Characteristics	Symbol	Min	Max	Unit
OFF CHARACTERISTICS				
Collector-Emitter Breakdown Voltage (1) (I_C = 1.0 mAdc, I_B = 0)	BV_{CEO}	300	–	Vdc
Collector-Base Breakdown Voltage (I_C = 100 μAdc, I_E = 0)	BV_{CBO}	300	–	Vdc
Emitter-Base Breakdown Voltage (I_E = 100 μAdc, I_C = 0)	BV_{EBO}	6.0	–	Vdc
Collector Cutoff Current (V_{CB} = 200 Vdc, I_E = 0)	I_{CBO}	–	0.2	μAdc
Emitter Cutoff Current (V_{BE} = 6.0 Vdc, I_C = 0)	I_{EBO}	–	0.1	μAdc
ON CHARACTERISTICS				
DC Current Gain	h_{FE}			–
(I_C = 1.0 mAdc, V_{CE} = 10 Vdc)		25	–	
(I_C = 10 mAdc, V_{CE} = 10 Vdc)		40	–	
(I_C = 30 mAdc, V_{CE} = 10 Vdc)		40	–	
Collector-Emitter Saturation Voltage (I_C = 30 mAdc, I_B = 3.0 mAdc)	$V_{CE(sat)}$	–	0.75	Vdc
Base-Emitter On Voltage (I_C = 30 mAdc, V_{CE} = 10 Vdc)	$V_{BE(on)}$	–	0.85	Vdc
DYNAMIC CHARACTERISTICS				
Current-Gain–Bandwidth Product (1) (I_C = 10 mAdc, V_{CE} = 20 Vdc, f = 100 MHz)	f_T	60	–	MHz
Collector-Base Capacitance (V_{CB} = 20 Vdc, I_E = 0, f = 1.0 MHz)	C_{cb}	–	3.0	pF

(1)Pulse Test: Pulse Width ≤300 μs, Duty Cycle≤ 2%.

FIGURE 1 – DC SAFE OPERATING AREA



The Safe Operating Area Curves indicate I_C–V_{CE} limits below which the device will not enter second 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

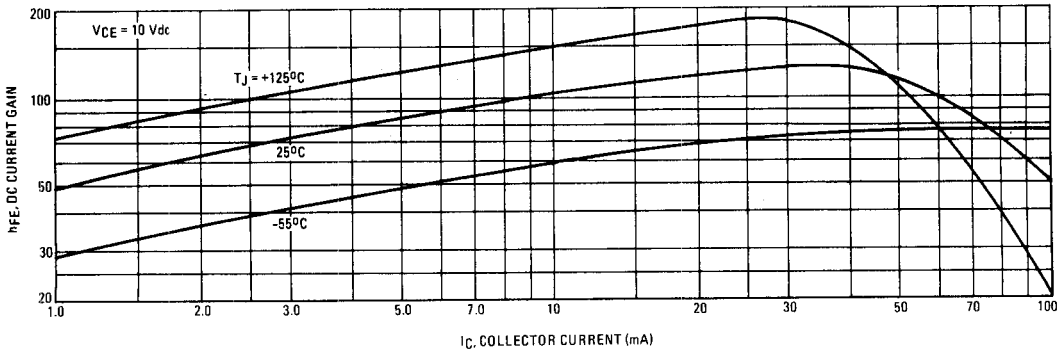


FIGURE 3 – CAPACITANCES

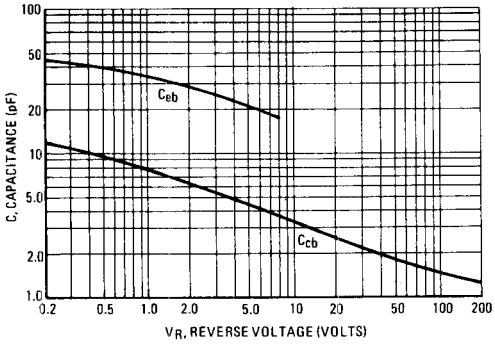


FIGURE 4 – CURRENT-GAIN–BANDWIDTH PRODUCT

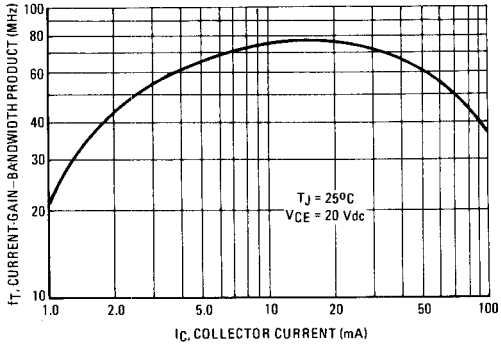
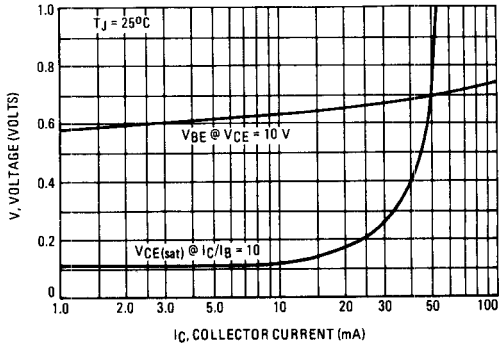


FIGURE 5 – "ON" VOLTAGES



APPLICATIONS INFORMATION

The MPS-U10 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 MPS-U10 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 $R_{\theta JA}$ = 150-65/1.6 = 53°C/W will be required. The junction-to-case thermal resistance, $R_{\theta JC}$, 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" x 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 MPS-U10 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 MPS-U10 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 $R_{\theta JA}$ of 150-65/3 = 28.4°C/W. This 28.4°C/W means a heat dissipator of 15.9°C/W, (approximately 2" x 3" aluminum plate) will be required.

FIGURE 6 – MPS-U10 AS RGB OUTPUT WITH RGB INPUT

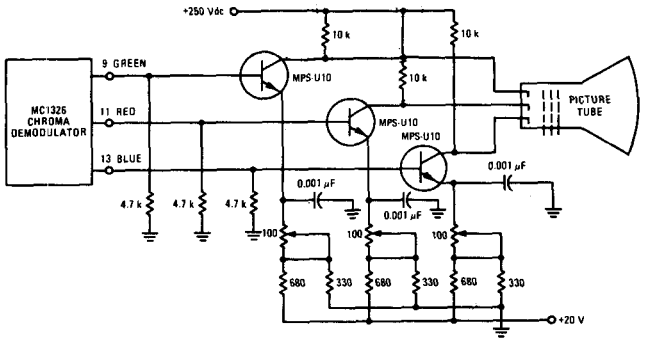


FIGURE 7 – MPS-U10 AS RGB OUTPUT, MATRIXING COLOR DIFFERENCE AND LUMINANCE INPUTS