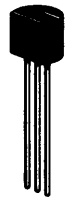
MPS-A10 (SILICON)
MPS-K10, MPS-K11
MPS-K12

NPN SILICON ANNULAR TRANSISTORS

. . . designed for general-purpose use in audio, radio, and television applications.

- MPS-K10, MPS-K11, MPS-K12 are 3, 5 and 9 Transistor Kits Available in Varied h_{FE} Ranges — See Table 1
- High Breakdown Voltage — BV_{CEO} = 40 Vdc (Min) @ I_C = 1.0 mAdc
- Low Output Capacitance — C_{ob} = 4.0 pF (Max) @ V_{CB} = 10 Vdc
- One-Piece, Injection-Molded Unibloc Package

NPN SILICON AMPLIFIER TRANSISTORS

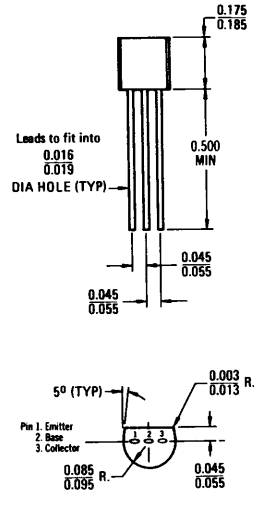


MAXIMUM RATINGS

Rating	Symbol	Value	Unit
Collector-Emitter Voltage	V_{CEO}	40	Vdc
Emitter-Base Voltage	V_{EB}	4.0	Vdc
Collector Current – Continuous	I_C	100	mAdc
Total Device Dissipation @ T_A = 25°C Derate above 25°C	P_D	300 2.73	mW mW/°C
Operating and Storage Junction Temperature Range	T_J, T_{stg}	-55 to +135	°C

THERMAL CHARACTERISTICS

Characteristic	Symbol	Max	Unit
Thermal Resistance, Junction to Ambient	θ_{JA}	0.367	°C/mW



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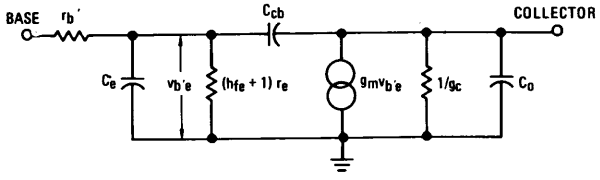
ELECTRICAL CHARACTERISTICS (T_A = 25°C unless otherwise noted)

Characteristic	Symbol	Min	Max	Unit
OFF CHARACTERISTICS				
Collector-Emitter Breakdown Voltage (I_C = 1.0 mAdc, I_B = 0)	BV_{CEO}	40	-	Vdc
Emitter-Base Breakdown Voltage (I_E = 100 μAdc, I_C = 0)	BV_{EBO}	4.0	-	Vdc
Collector Cutoff Current (V_{CB} = 30 Vdc, I_E = 0)	I_{CBO}	-	100	nAdc
ON CHARACTERISTICS				
DC Current Gain (I_C = 5.0 mAdc, V_{CE} = 10 Vdc)	h_{FE}	40	400	-
DYNAMIC CHARACTERISTICS				
Current-Gain–Bandwidth Product (I_C = 5.0 mAdc, V_{CE} = 10 Vdc, f = 20 MHz)	f_T	50	-	MHz
Output Capacitance (V_{CB} = 10 Vdc, I_E = 0, f = 100 kHz)	C_{ob}	-	4.0	pF

FIGURE 1 – SIMPLIFIED AC EQUIVALENT CIRCUIT (Common Emitter)



Note:

Data for MPS-A10 is presented in terms of the equivalent circuit shown in Figure 1. Values for its components may be found or calculated as follows:

r_b' – See Figure 8

$r_e = 26\ mV/I_E$

$C_e = \dfrac{1}{2\pi f_t r_e}$

$C_{cb} = C_{ob} - 0.2$ pF (See Figure 6)

$g_m = 1/r_e$

$g_c = (h_{fe} + 1)\, h_{ob}$ (See Figures 2 & 7)

$C_o = 0.2$ pF

Low frequency h parameters may be found from:

$h_{ie} = r_b' + (h_{fe} + 1)\, r_e$

h_{fe} = See Figure 2

h_{re} = Negligible

$h_{oe} = (h_{fe} + 1)\, h_{ob}$

FIGURE 2 – SMALL SIGNAL CURRENT GAIN

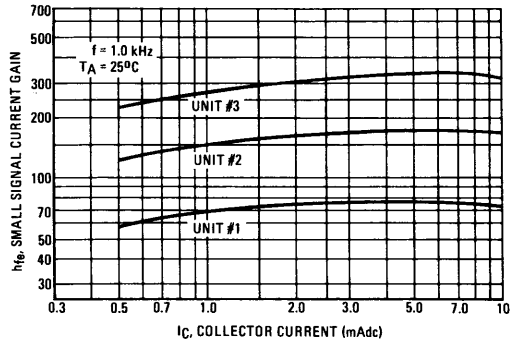


FIGURE 3 – NORMALIZED DC CURRENT GAIN

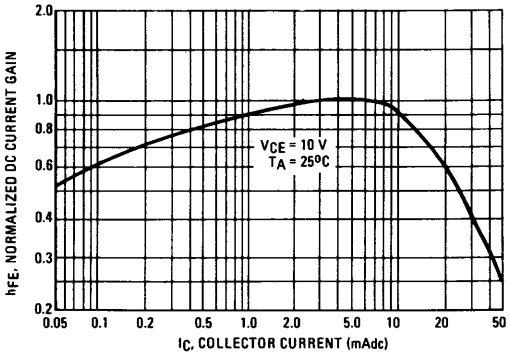


FIGURE 4 – "SATURATION" AND "ON" VOLTAGES

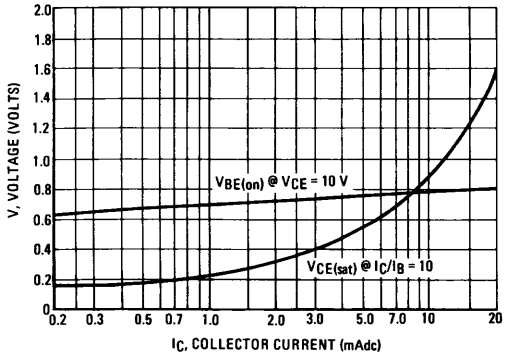


FIGURE 5 – CURRENT-GAIN–BANDWIDTH PRODUCT

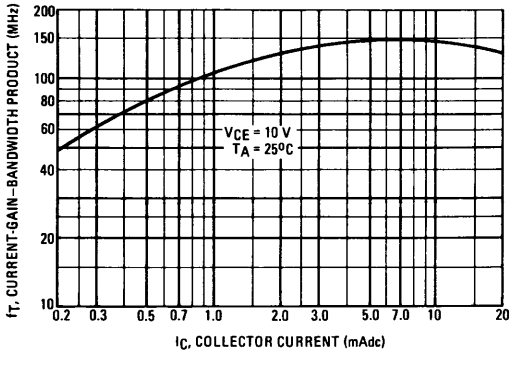


FIGURE 6 – CAPACITANCES

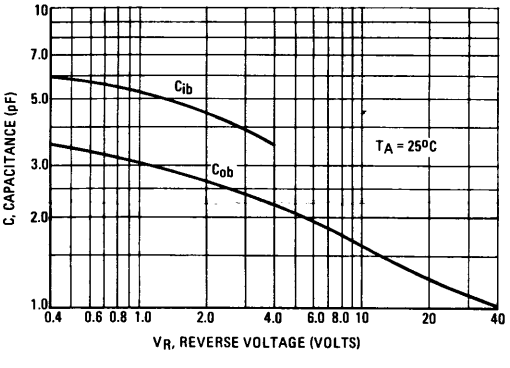


FIGURE 7 – OUTPUT ADMITTANCE

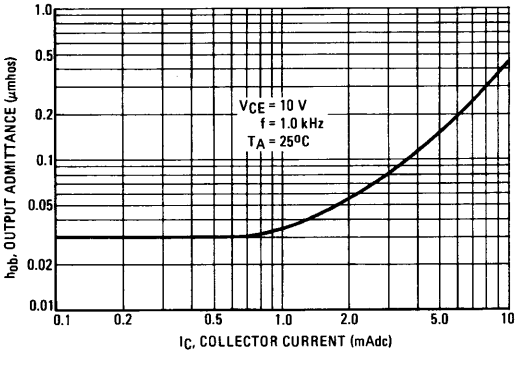
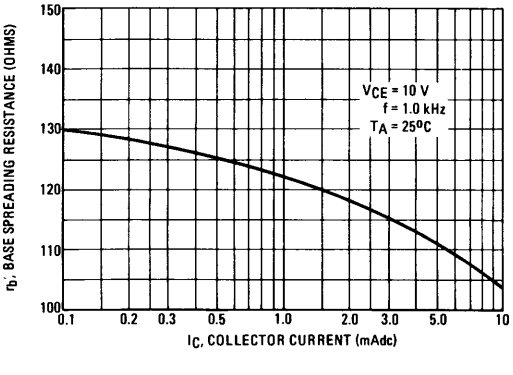


FIGURE 8 – BASE SPREADING RESISTANCE



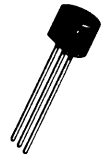
MPS-L07 (SILICON)
MPS-L08

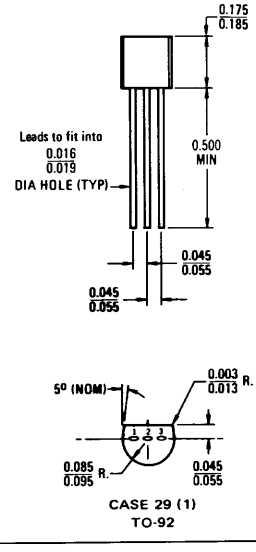
PNP SILICON ANNULAR TRANSISTORS

. . . designed for high-speed saturated switching applications.

- Fast Switching Time –
  $t_{on} + t_{off}$ = 50 ns (Typ) @ I_C = 10 mAdc
- Low Storage Time –
  τ_s = 15 ns (Max) @ I_C = 10 mAdc (MPS-L07)
  = 20 ns (Max) @ I_C = 10 mAdc (MPS-L08)
- Low Collector-Emitter Saturation Voltage –
  $V_{CE(sat)}$ = 0.07 Vdc (Typ) @ I_C = 10 mAdc
- High Current-Gain–Bandwidth Product –
  f_T = 500 MHz (Min) @ 10 mA (MPS-L07)
  = 700 MHz (Min) @ 10 mA (MPS-L08)

PNP SILICON SWITCHING TRANSISTORS





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MAXIMUM RATINGS

Rating	Symbol	MPS-L07	MPS-L08	Unit
Collector-Emitter Voltage	V_{CEO}	6.0	12	Vdc
Collector-Base Voltage	V_{CB}	6.0	12	Vdc
Emitter-Base Voltage	V_{EB}	4.5		Vdc
Collector Current – Continuous	I_C	80		mAdc
Total Device Dissipation @ T_A = 25°C Derate above 25°C	P_D	310 2.81		mW mW/°C
Operating and Storage Junction Temperature Range	T_J, T_{stg}	−55 to +135		°C

THERMAL CHARACTERISTICS

Characteristic	Symbol	Max	Unit
Thermal Resistance, Junction to Ambient	θ_{JA}	0.357	°C/mW

FIGURE 1 – TURN-ON AND TURN-OFF TEST CIRCUIT

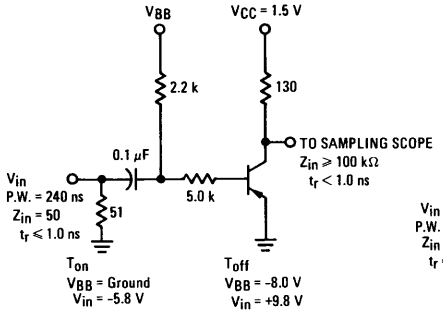
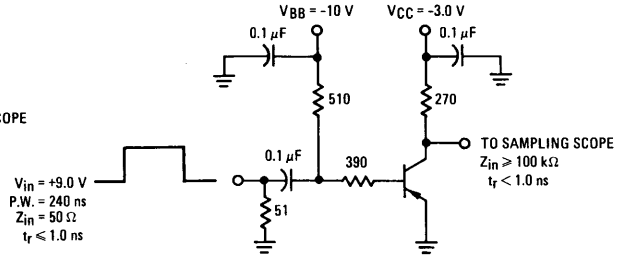


FIGURE 2 – CHARGE STORAGE TIME TEST CIRCUIT



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

Characteristic		Symbol	Min	Typ	Max	Unit
OFF CHARACTERISTICS						
Collector-Emitter Sustaining Voltage (I_C = 3.0 mAdc, I_B = 0)	MPS-L07	$V_{CEO(sus)}$	6.0	–	–	Vdc
	MPS-L08		12	–	–	
Collector-Emitter Breakdown Voltage (I_C = 100 μAdc, V_{BE} = 0)	MPS-L07	BV_{CES}	6.0	–	–	Vdc
	MPS-L08		12	–	–	
Collector-Base Breakdown Voltage (I_C = 100 μAdc, I_E = 0)	MPS-L07	BV_{CBO}	6.0	–	–	Vdc
	MPS-L08		12	–	–	
Emitter-Base Breakdown Voltage (I_E = 100 μAdc, I_C = 0)		BV_{EBO}	4.5	–	–	Vdc
Collector Cutoff Current		I_{CES}				nAdc
(V_{CE} = 3.0 Vdc, V_{BE} = 0)	MPS-L07		–	1.0	10	
(V_{CE} = 6.0 Vdc, V_{BE} = 0)	MPS-L08		–	1.0	10	
(V_{CE} = 3.0 Vdc, V_{BE} = 0, T_A = 65°C)	MPS-L07		–	–	5.0	μAdc
(V_{CE} = 6.0 Vdc, V_{BE} = 0, T_A = 65°C)	MPS-L08		–	–	5.0	
Base Current		I_B				nAdc
(V_{CE} = 3.0 Vdc, V_{BE} = 0)	MPS-L07		–	–	10	
(V_{CE} = 6.0 Vdc, V_{BE} = 0)	MPS-L08		–	–	10	
ON CHARACTERISTICS						
DC Current Gain		h_{FE}				–
(I_C = 1.0 mAdc, V_{CE} = 0.5 Vdc)			15	40	–	
(I_C = 10 mAdc, V_{CE} = 3.0 Vdc)			30	50	120	
(I_C = 50 mAdc, V_{CE} = 1.0 Vdc)			30	35	–	
Collector-Emitter Saturation Voltage		$V_{CE(sat)}$				Vdc
(I_C = 10 mAdc, I_B = 1.0 mAdc)			–	0.07	0.15	
(I_C = 50 mAdc, I_B = 5.0 mAdc)			–	0.2	0.5	
Base-Emitter Saturation Voltage		$V_{BE(sat)}$				Vdc
(I_C = 10 mAdc, I_B = 1.0 mAdc)			0.73	0.79	0.88	
(I_C = 50 mAdc, I_B = 5.0 mAdc)			–	0.89	1.5	
DYNAMIC CHARACTERISTICS						
Current-Gain–Bandwidth Product		f_T				MHz
(I_C = 10 mAdc, V_{CE} = 5.0 Vdc, f = 100 MHz)	MPS-L07		500	1000	–	
(I_C = 10 mAdc, V_{CE} = 10 Vdc, f = 100 MHz)	MPS-L08		700	1200	–	
Output Capacitance (V_{CB} = 5.0 Vdc, I_E = 0, f = 140 kHz)		C_{ob}	–	1.9	3.0	pF
Input Capacitance (V_{BE} = 0.5 Vdc, I_C = 0, f = 140 kHz)		C_{ib}	–	3.6	5.0	pF
SWITCHING CHARACTERISTICS						
Turn-On Time	(I_C = 10 mAdc, I_{B1} = I_{B2} = 1.0 mAdc) (Figure 1)	t_{on}	–	15	20	ns
Turn-Off Time		t_{off}	–	35	40	ns
Charge Storage Time (Figure 2)		t_s				ns
(I_C = 10 mAdc, I_{B1} = I_{B2} = 10 mAdc)	MPS-L07		–	–	15	
	MPS-L08		–	–	20	