NEC
ELECTRON DEVICE

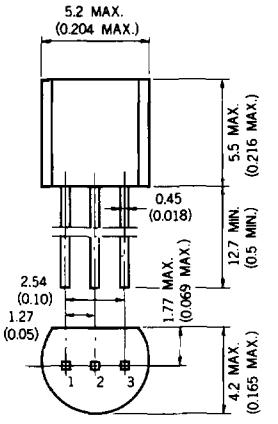
PNP SILICON TRANSISTOR
2SA640

DESCRIPTION The 2SA640 is designed for use in AF low noise amplifier of STEREOSET, RADIO and TAPE RECORDER.

FEATURES

- High h_{FE} : 450 TYP.
  h_{FE} (I_C = −0.5 mA, V_{CE} = −3.0 V)
- Low Noise Voltage : 25 mV TYP.
  NV (G_V = 80 dB, RIAA AMP.)

PACKAGE DIMENSIONS
in millimeters (inches)



1. EMITTER
2. COLLECTOR
3. BASE

EIAJ : SC-43
JEDEC : TO-92
IEC : PA33

ABSOLUTE MAXIMUM RATINGS

Maximum Temperatures

- Storage Temperature . . . . . −55 to +125 °C
- Junction Temperature . . . . . +125 °C Maximum

Maximum Power Dissipation (Ta = 25 °C)

- Total Power Dissipation . . . . . 250 mW

Maximum Voltages and Currents (Ta = 25 °C)

- V_{CBO} Collector to Base Voltage . . . . . −50 V
- V_{CEO} Collector to Emitter Voltage . . . . . −50 V
- V_{EBO} Emitter to Base Voltage . . . . . −5.0 V
- I_C Collector Current . . . . . −50 mA
- I_B Base Current . . . . . −10 mA

ELECTRICAL CHARACTERISTICS (Ta = 25 °C)

SYMBOL	CHARACTERISTIC	MIN.	TYP.	MAX.	UNIT	TEST CONDITIONS
h_{FE1}	DC Current Gain	190	430		−	V_{CE}=−3.0 V, I_C=−0.1 mA
h_{FE2}	DC Current Gain	225	450	1000	−	V_{CE}=−3.0 V, I_C=−0.5 mA
NF_1	Noise Figure		5.0	15	dB	V_{CE}=−6.0 V, I_C=−0.3 mA, R_G=10 kΩ, f=10 Hz
NF_2	Noise Figure		1.5	4.0	dB	V_{CE}=−6.0 V, I_C=−0.3 mA, R_G=10 kΩ, f=100 Hz
NV	Noise Voltage		25	30	mV	See test circuit
I_{CBO}	Collector Cutoff Current			−50	nA	V_{CB}=−50 V, I_E=0
I_{CEO}	Collector Cutoff Current			−1.0	μA	V_{CE}=−40 V, I_B=0
I_{EBO}	Emitter Cutoff Current			−50	nA	V_{EB}=−5.0 V, I_C=0
V_{BE}	Base to Emitter Voltage	−0.55	−0.58	−0.65	V	V_{CE}=−3.0 V, I_C=−0.5 mA
$V_{CE(sat)}$	Collector Saturation Voltage		−0.3	−0.5	V	I_C=−30 mA, I_B=−3.0 mA
$V_{BE(sat)}$	Base Saturation Voltage		−0.82	−1.0	V	I_C=−30 mA, I_B=−3.0 mA
f_T	Gain Bandwidth Product	50	100		MHz	V_{CE}=−6.0 V, I_E=1.0 mA
C_{ob}	Output Capacitance		6.5	10	pF	V_{CB}=−10 V, I_E=0, f=1.0 MHz

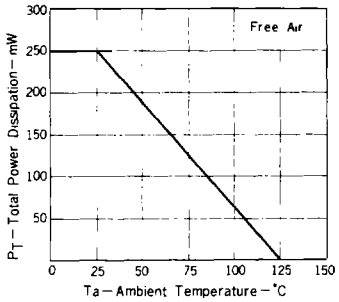
Classification of h_{FE2}

Rank	F	E	U
Range	225 − 450	350 − 700	500 − 1000

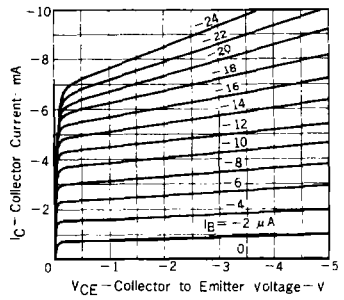
h_{FE} Test Conditions : V_{CE} = −3.0 V, I_C = −0.5 mA

TYPICAL CHARACTERISTICS (Ta = 25 °C unless otherwise noted)

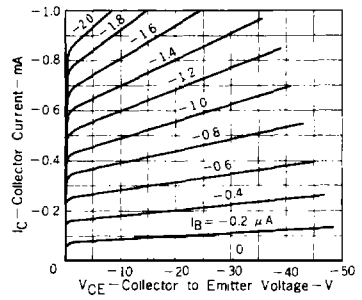
TOTAL POWER DISSIPATION vs. AMBIENT TEMPERATURE



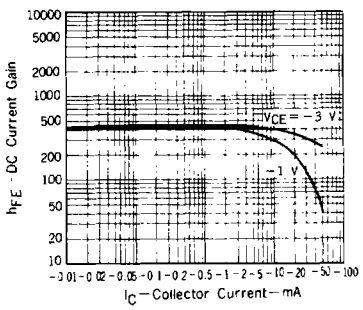
COLLECTOR CURRENT vs. COLLECTOR TO EMITTER VOLTAGE



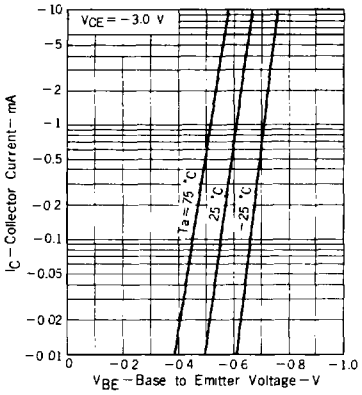
COLLECTOR CURRENT vs. COLLECTOR TO EMITTER VOLTAGE



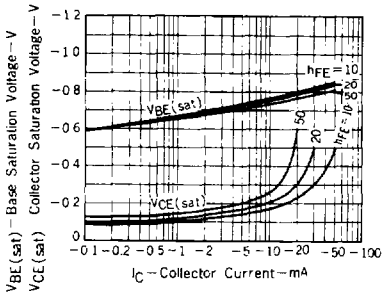
DC CURRENT GAIN vs. COLLECTOR CURRENT



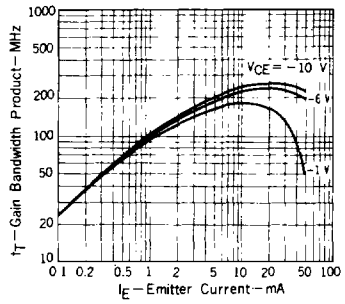
COLLECTOR CURRENT vs. BASE TO EMITTER VOLTAGE



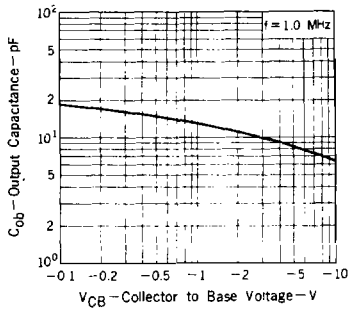
COLLECTOR AND BASE SATURATION VOLTAGE vs. COLLECTOR CURRENT



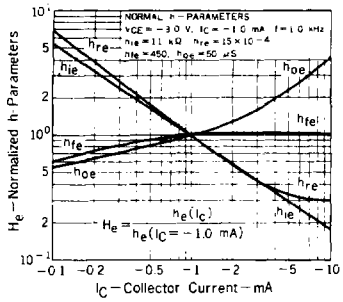
GAIN BANDWIDTH PRODUCT vs. EMITTER CURRENT



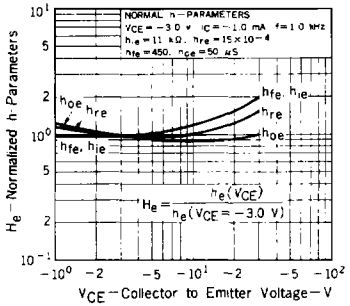
OUTPUT CAPACITANCE vs. COLLECTOR TO BASE VOLTAGE



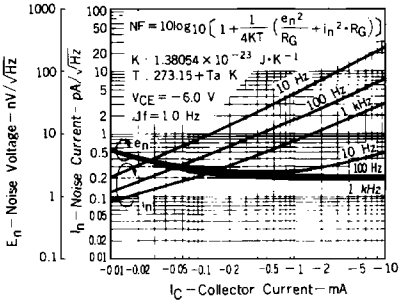
NORMALIZED h-PARAMETERS vs. COLLECTOR CURRENT



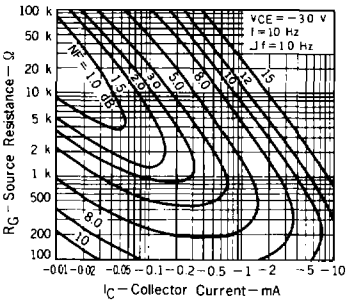
NORMALIZED h-PARAMETERS vs. COLLECTOR TO EMITTER VOLTAGE



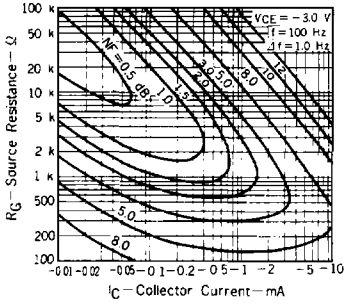
E_n AND I_n vs. COLLECTOR CURRENT



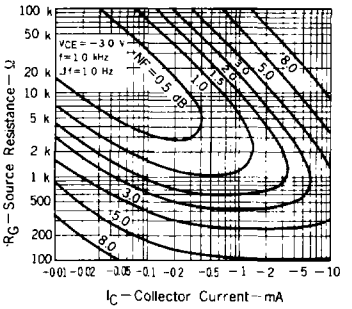
NOISE FIGURE MAP 1



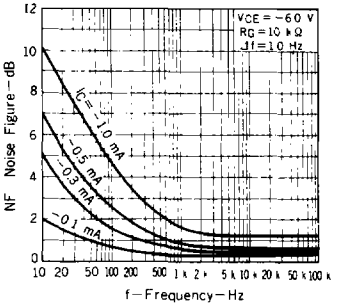
NOISE FIGURE MAP 2



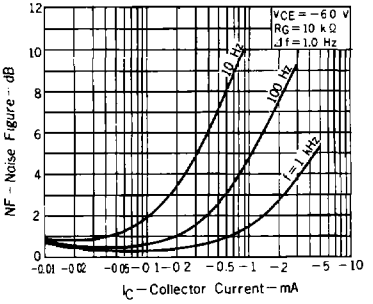
NOISE FIGURE MAP 3



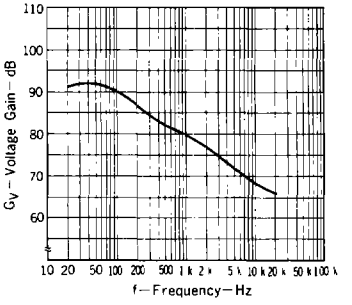
NOISE FIGURE vs. FREQUENCY



NOISE FIGURE vs. COLLECTOR CURRENT



VOLTAGE GAIN vs. FREQUENCY



NOISE VOLTAGE TEST CIRCUIT