

MEMO: ML-G PREAMP MC STAGE COST IMPROVEMENT

Subject: Measurement of HITACHI 2SC2546-E Base Spreading Resistance (Rbb)

With the recent price and MOQ increases imposed by ROHM Japan for the 2SD786-S, the HITACHI 2SC2547-E is being investigated as a possible direct replacement. HITACHI has quoted USD0.03 per unit for MOQ 5,000 pieces, lead-time: ex-works (Compared with ROHM USD0.13 per unit for MOQ 20000 pieces and lead-time 16+ weeks)

HITACHI Applications Engineering Japan have indicated that the Rbb should range from 10 - 14 ohms @ $I_c = 2$ mA. The 2SD786-S is achieving an Rbb of 3.8 ± 0.7 Ohms at $I_c = 2$ mA (Range measured from 100 piece sample across three production batches).

To meet noise requirements for the MC Gain Stage of the ML-G preamp, 3-4 units of 2SC2546-E devices will need to be paralleled to replace a single 2SD786-S: PCB Modifications will need to be made to accommodate the additional 4/6 devices for the input stage – Exact number of 2SC2546-E devices to be confirmed by Mark Harris (Design Responsible). (Device capacitances already supplied by HITACHI)

New production samples of the modified phono preamp boards will need to be made available to SS Japan no later than Oct/Nov in order to meet the next production run tool-up cutoff. (Fax from Nakamura-san, Feb14th): ORCAD files to be supplied on disk and couriered to Nakamura-san by June/July end.

SS Japan are already using the 2SC2546-E as an alternative to 2SD786-S for another customer with good results – with 3 devices for a single 2SD786-S

Test Method:

1. 100 samples of HITACHI 2SC2546-E Low Noise NPN BJT were measured for base spreading resistance with HP-Yokogawa 4156 Semiconductor Analyzer
2. 10 samples from 10 different HITACHI production dates were used: Production dates ranged from July 1989 to November 1997; 10 pieces were taken at random from each production date sample to make 100 test piece sample
3. Samples supplied by SS Japan for 1989-1997 HITACHI production

Test Environment:

1. HP Test Circuit No 12 used – Vce controlled to 9.8V to reflect production design values for low-noise preamp circuit used in ML-G Preamp
2. $T_{ambient}$ controlled between 22-24 deg C
3. Belling-Lee Screened Room used for all measurements
4. HP 4156C Calibration checked and confirmed with QA

Test Results:

The following graphs:

1. Figure 1 shows the average and production spread of Rbb for HITACHI 2SC2546-E – results support advice from HITACHI Applications Engineering Japan for expected Rbb values
2. Figure 2 shows the Rbb spread across all samples for each I_c measurement – Rbb variation spread is as good or better than the 2SD786-S. Note that sample measurement range is -6% and +15% (The devices from the two 1997 batches measured higher than average values for Rbb compared with the other test samples) – See Comments

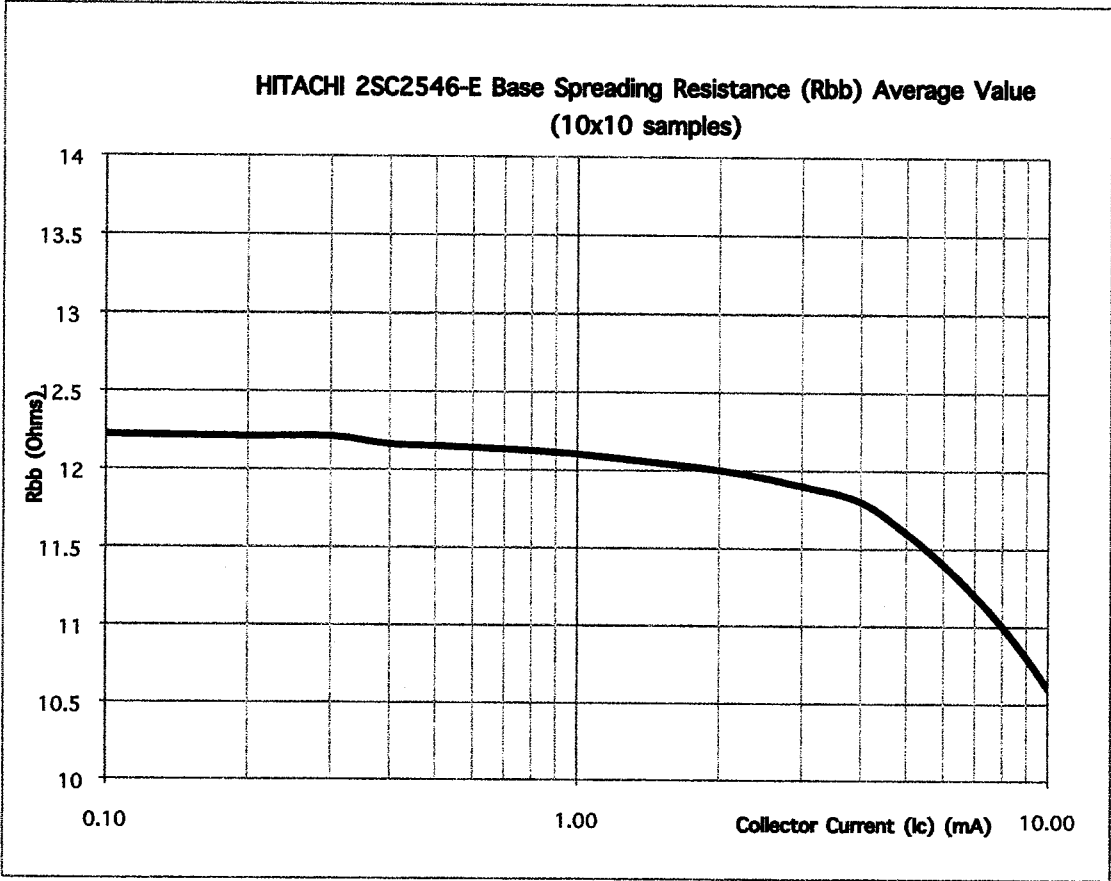


Figure 1: Average value of 2SC2546-E Base Spreading Resistance