

Type 1 Vs. 2

T10/07-045r0



Never stop thinking

T10/1601-D Revision 10

- 5.3.5.2 Transmitter device eye mask
- Figure 105 describes the eye mask used for testing the signal output of the transmitter device at IT, CT, IR, and CR. This eye mask applies to jitter after the application of a single pole high-pass frequency-weighting function that progressively attenuates jitter at 20 dB/decade below a frequency of $((\text{bit rate}) / 1\ 667)$.

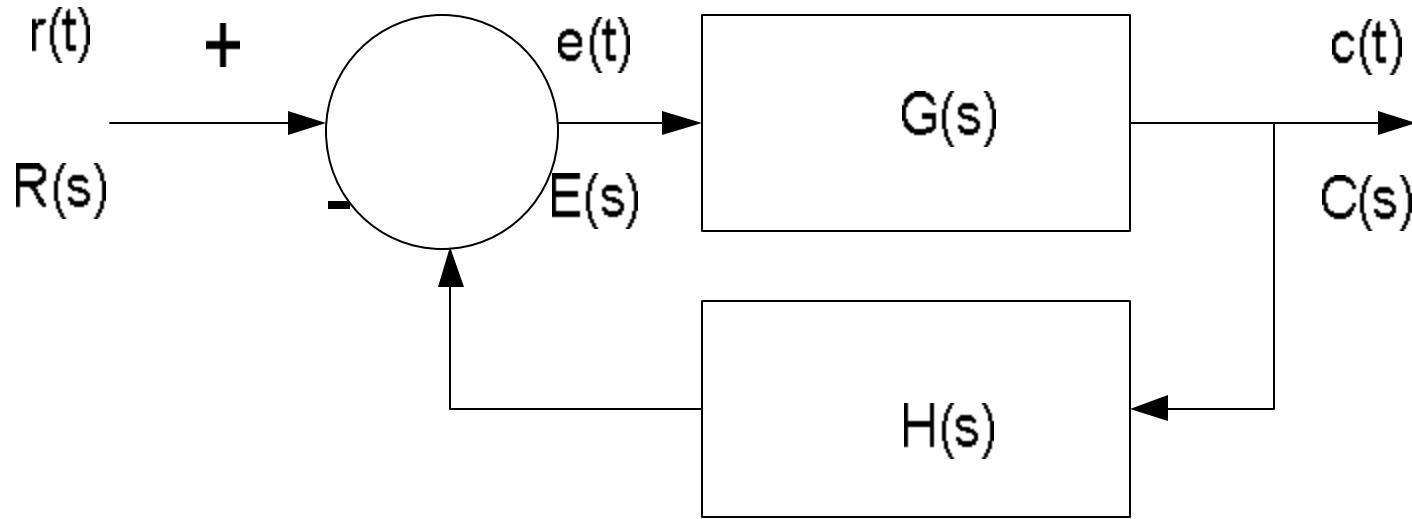
- 5.3.5.3 Receiver device eye mask
- Figure 106 describes the eye mask used for testing the signal delivered to the receiver device at IR and CR. The signal shall be measured using a jitter timing reference (e.g., a golden PLL) that approximates a single pole (i.e., 20 dB per decade) low-pass filter with corner frequency of $((\text{bit rate}) / 1\ 667)$. This requirement accounts for the low frequency tracking properties and response time of the CDRs in receiver devices.
- Footnote A in table 47.
- All DJ and TJ values are level 1 (see MJSQ).

SATA rev 2.5

- 7.3.2 Reference Clock Definition
- ... type 2 PLL with a -3 dB corner frequency $f_{c3dB} = f_{BAUD}/N$...

What is type 1 or 2?

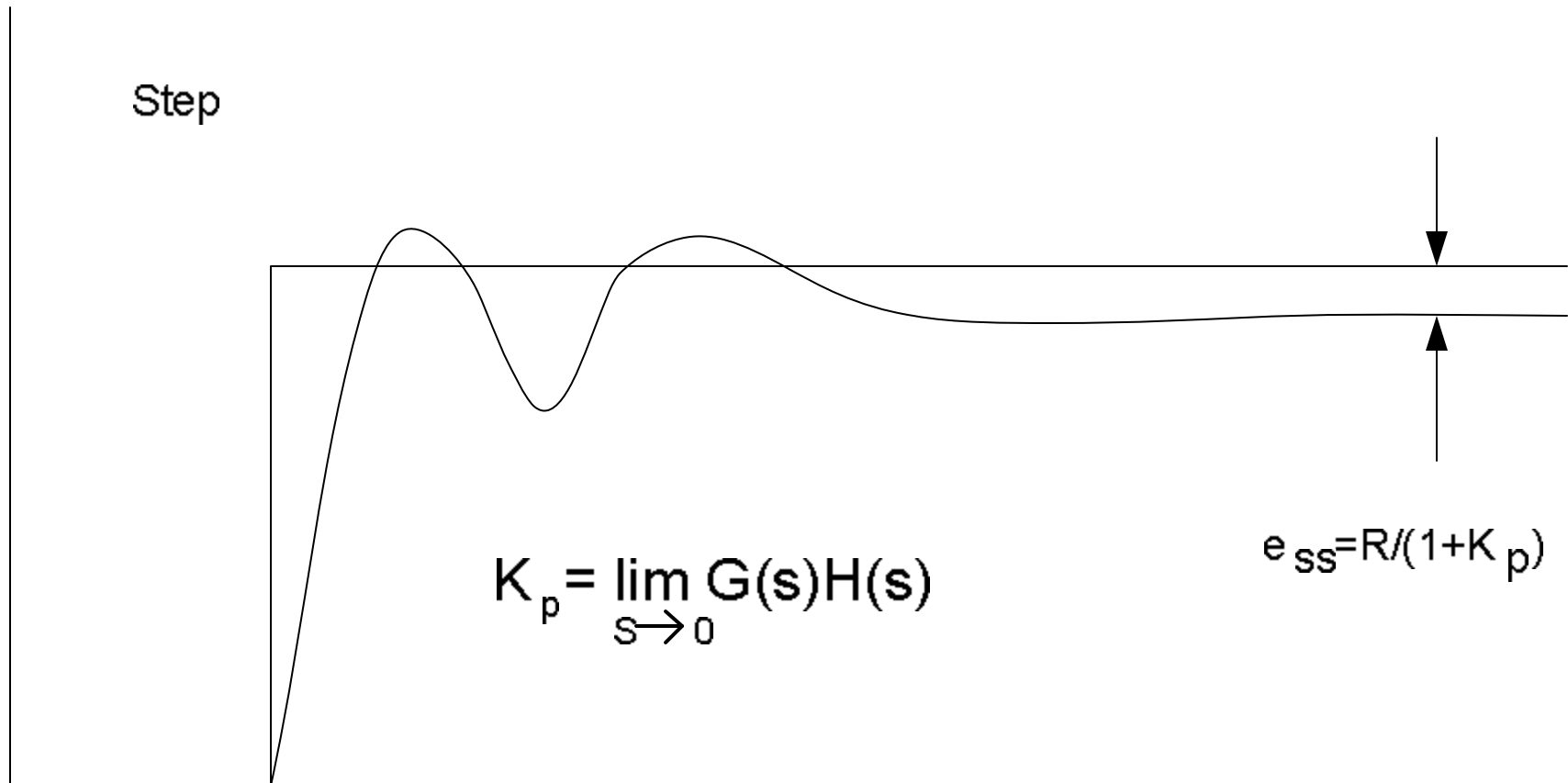
- The type of the closed-loop system refers to the order of the pole of $G(s)H(s)$ at $s=0$.
- Type $J=0, 1, 2, \dots$



$$G(s)H(s) = \frac{K(1-T_1s)(1-T_2s)\dots}{s^J K(1-T_as)(1-T_bs)\dots} e^{-T_d s}$$

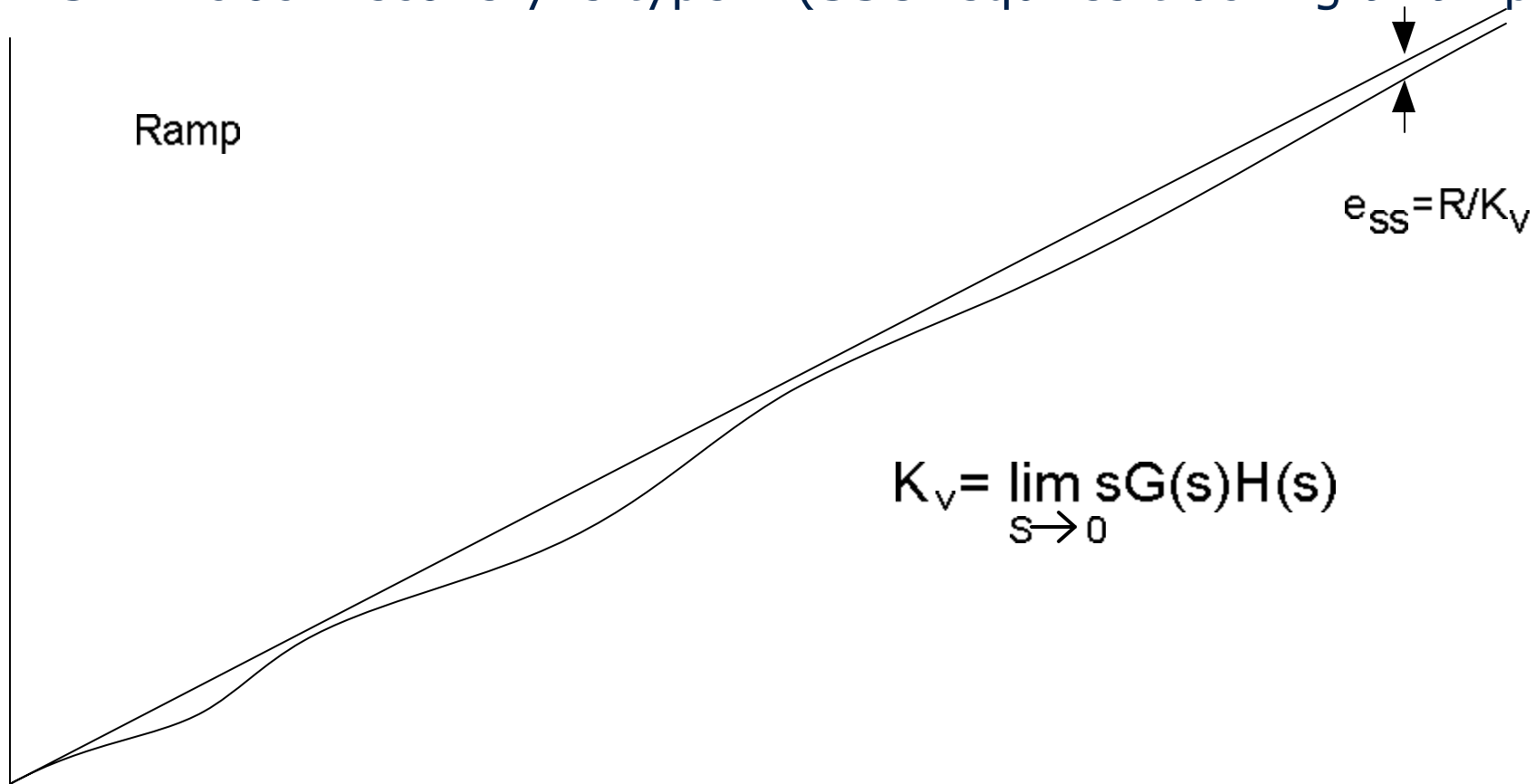
Step function

- Type 0 steady state error shown in graph.
- Type 1 or higher steady state error is zero.
- SAS1-1 clock recovery is Level 1 (fixed target after power up).



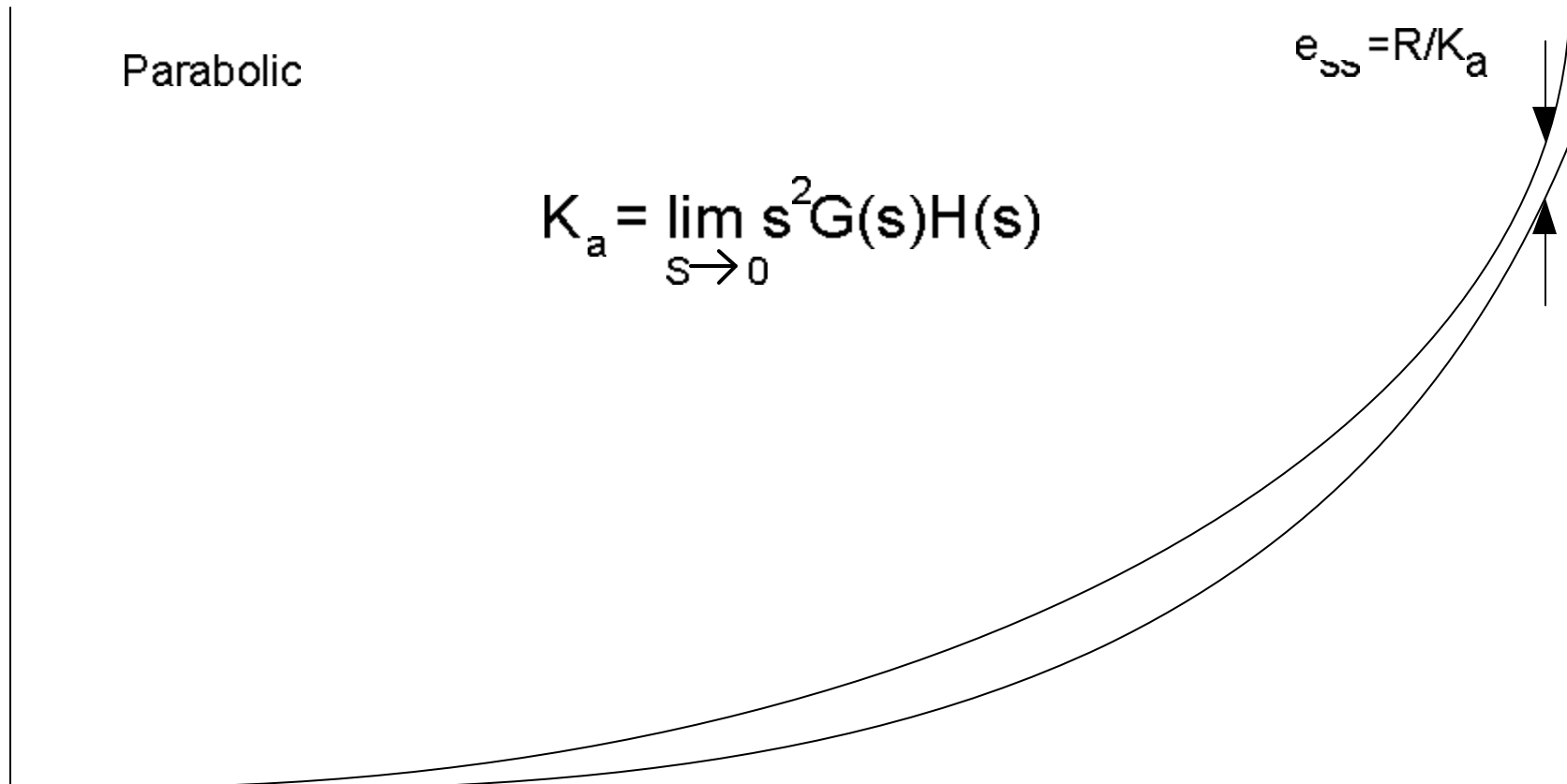
Ramp function

- Type 0 steady state error is infinite.
- Type 1 steady state error shown in graph.
- Type 2 or higher steady state error is zero.
- SATA clock recovery is type 2 (SSC requires tracking a ramp).



Parabolic function.

- Type 0 steady state error is infinite.
- Type 1 steady state error is infinite.
- Type 2 steady state error shown in graph.
- Type 3 or higher steady state error is zero.



Conclusion

- Type 2 PLL is required to have zero error for tracking the SSC profile.