Samsung Log

White Paper
2025

Contents

Introduction to Samsung Log

This document provides a summary of Samsung Log, a scene-referred encoding that uses a logarithmic curve for the transfer function and a wide color gamut. Both of those features are described in this document. The appendix demonstrates the practical usage of Samsung Log for best image quality.

The purpose of Samsung Log is to maximize the dynamic range and allow flexibility in editing colors and contrast in post-production workflows. By using the Samsung Log profile on Galaxy devices, the captured video data can be preserved better, and the data can be used as a source in post-production for rendering.

Samsung Log curve characteristics

Figures 1. and 2. represent the characteristics of the Samsung Log curve. As shown in Figure 1, the pixel value shown as 10-bit code value increases proportionally with scene reflection.

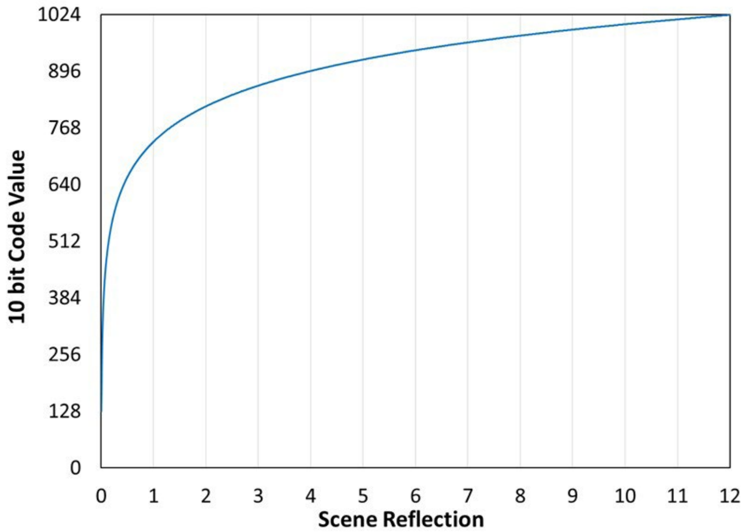

Figure 1. Samsung Log curve showing when 10-bit code value approaches the maximum

Figure 2. shows the specific characteristic of Samsung Log. The curve has an S-shape, and more tonal gradation in dark areas can be preserved.

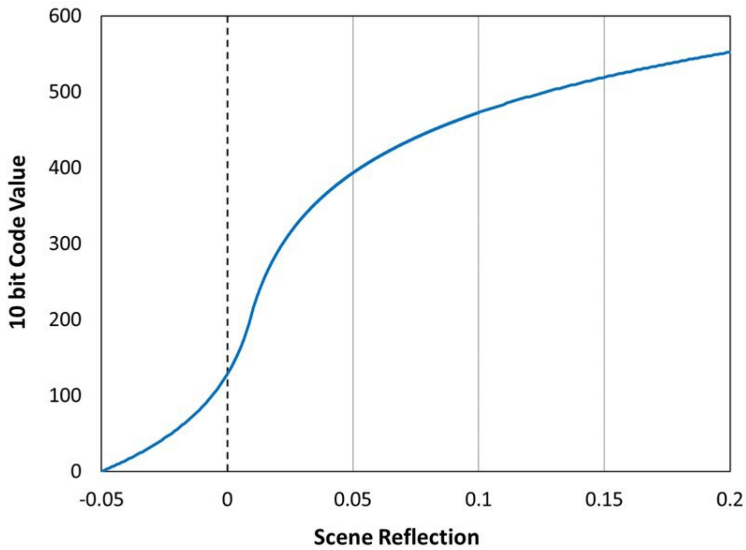

Figure 2. Enhanced shadow detail of the Samsung Log curve

Samsung Log transfer function

The Samsung Log can be expressed by the transfer function which is used for the forward and inverse process. The transfer function converts between scene reflectance and pixel value (floating data) stored in a video file. This transfer function uses two logarithmic functions that have different parameters.

Forward Samsung Log function

The forward function in the camera receives optical information from the scene and converts it into digital signals with pixel values to store the information. The conversion is done through a logarithmic equation as follows:

$$y = \begin{cases} \alpha_1 \, log(x + \beta_1) + \gamma_1, & if \ x \geq x_t \\ \alpha_2 \, log(-x + \beta_2) + \gamma_2, & if \ x_0 \leq x < x_t \\ 0, & if \ x < x_0 \end{cases}$$

with

$x_0 = -0.05, \ x_t = 0.01$

$\alpha_1 = 0.258984868, \ \beta_1 = 0.0003645, \ \gamma_1 = 0.720504856$

$\alpha_2 = -0.20942, \ \beta_2 = 0.016904, \ \gamma_2 = -0.24597$

The scene reflection value “x” is represented using floating point encoding. The “y” value is the captured pixel value. The formula varies depending on the parameter based on x_0 and x_t.

Inverse Samsung Log function

$$x = \begin{cases} 10^{\frac{y-\gamma_1}{\alpha_1}} - \beta_1, & if \ y \geq y_t \\ -\left(10^{\frac{y-\gamma_2}{\alpha_2}}\right) + \beta_2, & if \ 0 \leq y < y_t \\ x_0, & if \ y < 0 \end{cases}$$

with

$y_t = 0.206561909$

$\alpha_1 = 0.258984868, \ \beta_1 = 0.0003645, \ \gamma_1 = 0.720504856$

$\alpha_2 = -0.20942, \ \beta_2 = 0.016904, \ \gamma_2 = -0.24597$

$x_0 = -0.05$

The inverse function can reproduce the pixel value stored in the camera as a scene reflection signal. The captured pixel values use normalized values ranging from [0,1] as floating points. Since it is a decoding function of a logarithmic function, it takes the form of an exponential function.

Mapping a scene reflection to stops

The relative exposure value of zero (relative stops) corresponds to 18% gray. Figure 3 illustrates the mapping of relative exposure (in stops from 18% gray) to 10-bit code values. The graph shows how different levels of scene brightness are encoded into the 10-bit scale.

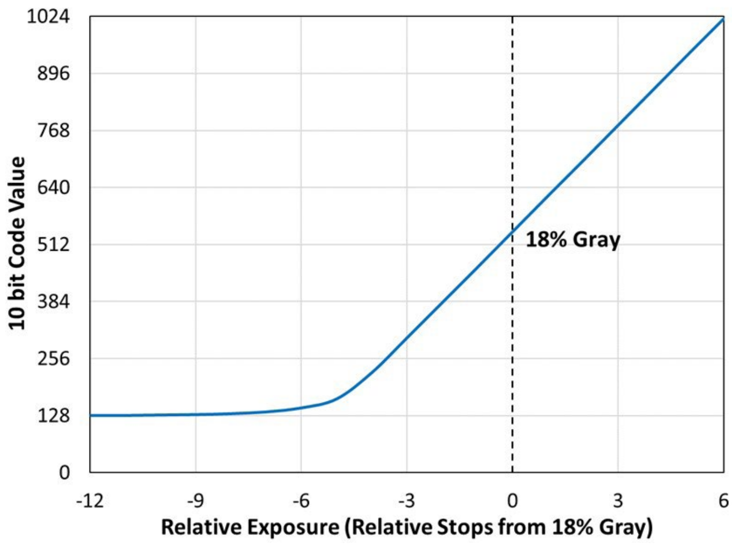

Figure 3. The relationship between the relative exposure value and the corresponding 10-bit code value of Samsung Log.

Table 1. represents the scene reflection, captured pixel values such as encoded signal, relative stops, and their practical meaning.

Scene reflection	Encoded signal		Relative Stops	Practical Meaning
	Float	10-bit, full range		
0	0.125124	128	-12	Black level
0.01	0.206562	211	-4.17	1% Black
0.18	0.527859	540	0	Middle Gray
0.90	0.708700	725	2.32	90% White
12.0	1.0	1023	6	Samsung Log White limit

Table 1. The representative point of scene reflection and the corresponding encoded signal, relative stops, and their practical meaning

The colorimetric characteristics

The color space is defined according to ITU-R BT.2020-2 color primaries and color space. The white point is set to the D65 illuminant.

	CIE chromaticity coordinates							
Color Space	Red		Green		Blue		White point (D65)	
	x_R	y_R	x_G	y_G	x_B	y_B	x_W	y_W
sRGB	0.64	0.33	0.30	0.60	0.15	0.06	0.3127	0.329
DCI-P3 (D65)	0.68	0.32	0.265	0.69	0.15	0.06	0.3127	0.329
BT.2020	0.708	0.292	0.17	0.797	0.131	0.046	0.3127	0.329

Table 2. The CIE x and y of color space in CIE chromaticity coordinates

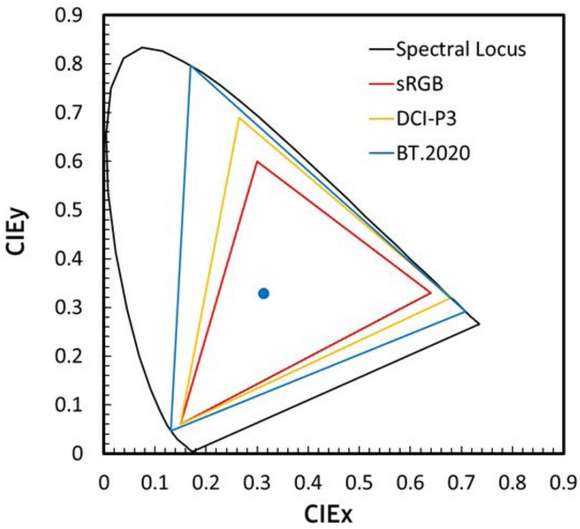

Figure 4. The color space comparison (sRGB, DCI-P3, and BT.2020)

Appendix

1. Samsung Log for Best Image Quality

Example of applying 3D LUT

<table>
<tr><th>Samsung Log</th><th>Rec. 709</th></tr>
<tr><td>
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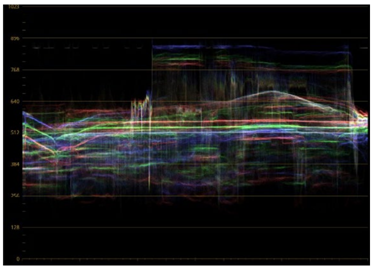
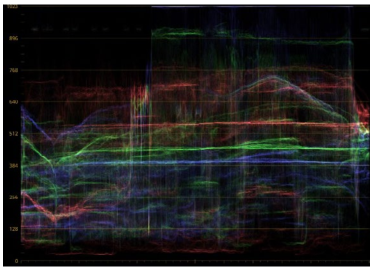
<tr><td></td><td></td></tr>
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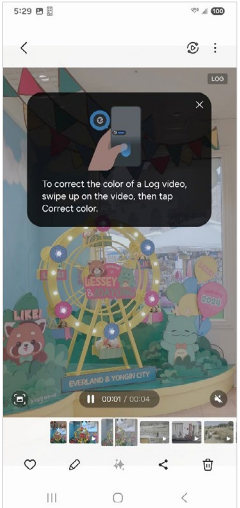
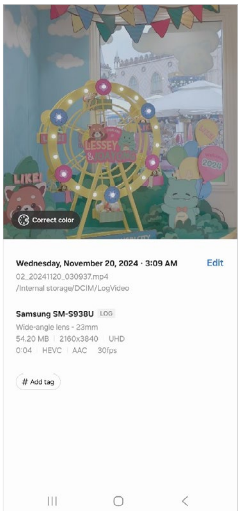
2. Correct colors of Log videos with Galaxy devices

Log Videos can be easily color-corrected with the Edit Suggestion feature in Gallery with Galaxy devices, allowing you to check for Rec. 709-standard colors.





1. Select a Log video and swipe up on the screen.	2. Select the “Correct Color” option from the Edit Suggestion.	3. Save or share the Rec. 709 preview video.

4. You can edit a video saved with Rec. 709 colors in the video editor. Various editing options such as Instant slow-mo, Filter, and Capture frame are available.