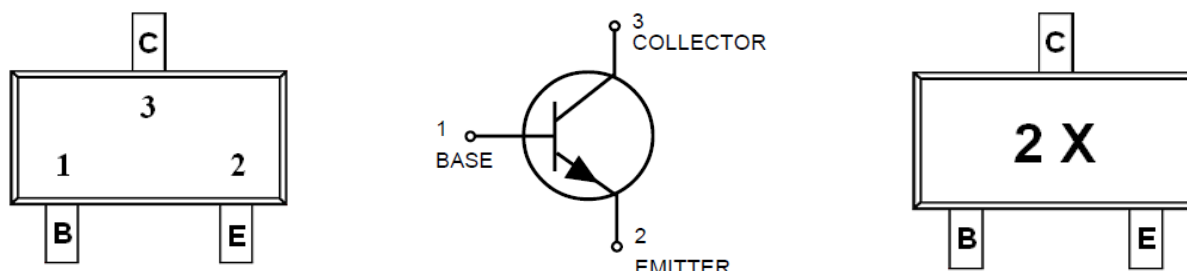




Features

- This device is designed as a general purpose amplifier and switch.

Pin Description (SOT-23)



Ordering Information

Part Ordering No.	Part Marking	Package	Unit	Quantity
AFT4401T1S23RG	2X	SOT-23	Tape & Reel	3000 EA

Absolute Maximum Ratings ($T_A=25^{\circ}\text{C}$ Unless otherwise noted)

Symbol	Parameter	Value	Unit
V_{CEO}	Collector-Emitter Voltage	40	V
V_{CBO}	Collector-Base Voltage	60	V
V_{EBO}	Emitter-Base Voltage	6.0	V
I_C	Collector Current - Continuous	600	mA
T_J, T_{stg}	Operating and Storage Junction Temperature Range	-55 to +150	$^{\circ}\text{C}$

Notes :

- 1) These ratings are based on a maximum junction temperature of 150 degrees C.
- 2) These are steady state limits. The factory should be consulted on applications involving pulsed or low duty cycle operations.

Thermal Characteristics ($T_A=25^{\circ}\text{C}$ Unless otherwise noted)

Symbol	Parameter	Max.	Unit
P_D	Total Device Dissipation FR-5 Board, (1) $T_A = 25^{\circ}\text{C}$	225	mW
	Derate above 25°C	1.8	mW/ $^{\circ}\text{C}$
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient	556	$^{\circ}\text{C}/\text{W}$
P_D	Total Device Dissipation Alumina Substrate, (2) $T_A = 25^{\circ}\text{C}$	300	mW
	Derate above 25°C	2.4	mW/ $^{\circ}\text{C}$
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient	417	$^{\circ}\text{C}/\text{W}$

Notes :

- 1) FR-5 = 1.0 x 0.75 x 0.062 in.
- 2) Alumina = 0.4 x 0.3 x 0.024 in. 99.5% alumina.
- 3) Pulse Test: Pulse Width <300 μs ; Duty Cycle <2.0%.



Electrical Characteristics ($T_A=25^{\circ}\text{C}$ Unless otherwise noted)

Symbol	Parameter	Test Condition	Min.	Max.	Unit
Off Characteristics					
$V_{(BR)CEO}$	Collector-Emmitter Breakdown Voltage *	$I_C = 1.0\text{mA}, I_B = 0$	40		V
$V_{(BR)CBO}$	Collector-Base Breakdown Voltage	$I_C = 100\mu\text{A}, I_E = 0$	60		V
$V_{(BR)EBO}$	Emmitter-Base Breakdown Voltage	$I_E = 100\mu\text{A}, I_C = 0$	6.0		V
I_{BEV}	Base Cutoff Current	$V_{CE} = 35\text{V}, V_{EB} = 0.4\text{V}$		0.1	μA
I_{CEX}	Collector Cutoff Current	$V_{CE} = 35\text{V}, V_{EB} = 0.4\text{V}$		0.1	μA
On Characteristics *					
h_{FE}	DC Current Gain	$I_C = 0.1\text{mA}, V_{CE} = 1.0\text{V}$	20		
		$I_C = 1.0\text{mA}, V_{CE} = 1.0\text{V}$	40		
		$I_C = 10\text{mA}, V_{CE} = 1.0\text{V}$	80		
		$I_C = 150\text{mA}, V_{CE} = 1.0\text{V}$	100	300	
		$I_C = 500\text{mA}, V_{CE} = 2.0\text{V}$	40		
$V_{CE(sat)}$	Collector-Emmitter Saturation Voltage	$I_C = 150\text{mA}, I_B = 15\text{mA}$		0.4	V
		$I_C = 500\text{mA}, I_B = 50\text{mA}$		0.75	
$V_{BE(sat)}$	Base-Emmitter Saturation Voltage	$I_C = 150\text{mA}, I_B = 15\text{mA}$	0.75	0.95	V
		$I_C = 500\text{mA}, I_B = 50\text{mA}$		1.2	
Small Signal Characteristics					
f_T	Current Gain - Bandwidth Product	$I_C = 20\text{mA}, V_{CE} = 10\text{V}, f = 100\text{MHz}$	250		MHz
C_{cb}	Collector-Base Capacitance	$V_{CB} = 5.0\text{V}, I_E = 0, f = 1.0\text{MHz}$		6.5	pF
C_{eb}	Emmitter-Base Capacitance	$V_{EB} = 0.5\text{V}, I_C = 0, f = 1.0\text{MHz}$		30	pF
h_{ie}	Input Impedance	$V_{CE} = 10\text{V}, I_C = 1.0\text{mA}, f = 1.0\text{kHz}$	1.0	15	k Ω
h_{re}	Voltage Feedback Ratio	$V_{CE} = 10\text{V}, I_C = 1.0\text{mA}, f = 1.0\text{kHz}$	0.1	8.0	$\times 10^{-4}$
h_{fe}	Small-Signal Current Gain	$V_{CE} = 10\text{V}, I_C = 1.0\text{mA}, f = 1.0\text{kHz}$	40	500	
h_{oe}	Output Admittance	$V_{CE} = 10\text{V}, I_C = 1.0\text{mA}, f = 1.0\text{kHz}$	1.0	30	umhos
Switching Characteristics					
t_d	Delay Time	$V_{CC} = 30\text{V}, V_{BE} = 2.0\text{V}$		15	ns
t_r	Rise Time	$I_C = 150\text{mA}, I_{B1} = 15\text{mA}$		20	ns
t_s	Storage Time	$V_{CC} = 3.0\text{V}, I_C = 150\text{mA}, I_{B1} = I_{B2} = 15\text{mA}$		225	ns
t_f	Fall Time			30	ns

* Pulse Test: Pulse Width $\leq 300\mu\text{s}$, Duty Cycle $\leq 2.0\%$

Switching Time Equivalent Test Circuits

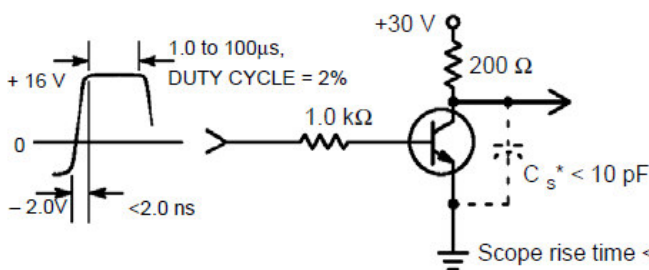


Figure 1. Turn-On Time

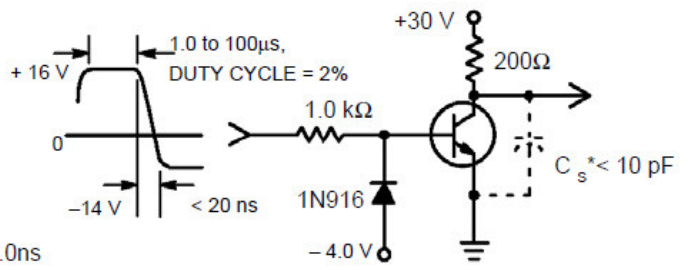


Figure 2. Turn-Off Time



Typical Characteristics (TRANSIENT)

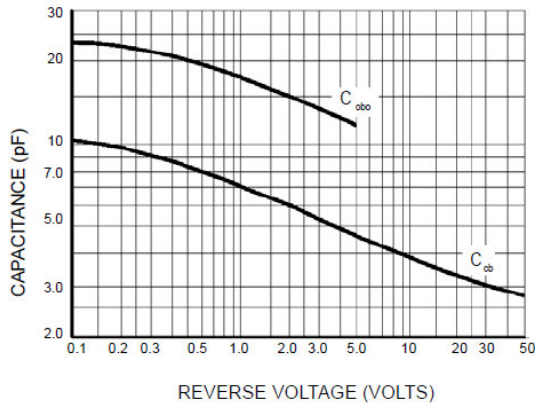


Figure 3. Capacitance

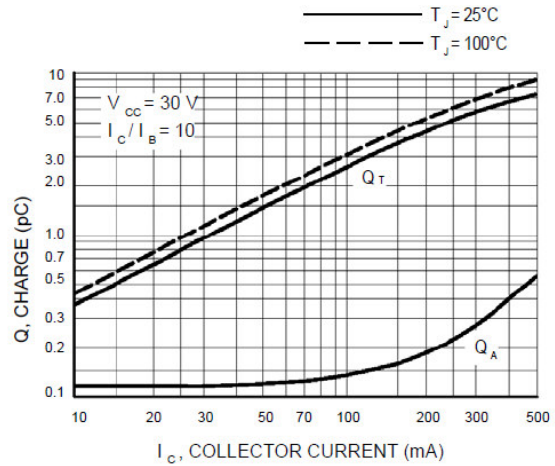


Figure 4. Charge Data

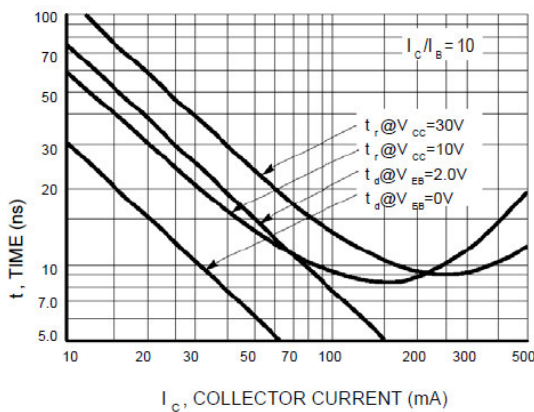


Figure 5. Turn-On Time

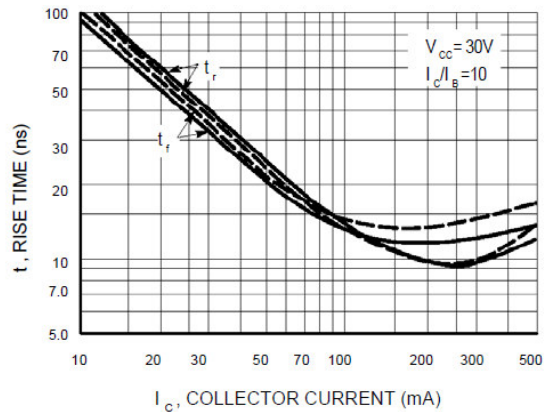


Figure 6. Rise and Fall Time

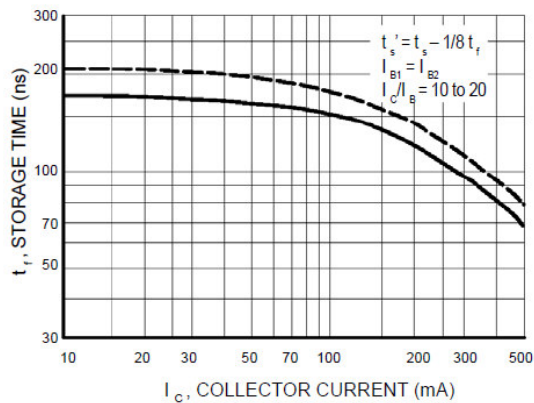


Figure 7. Storage Time

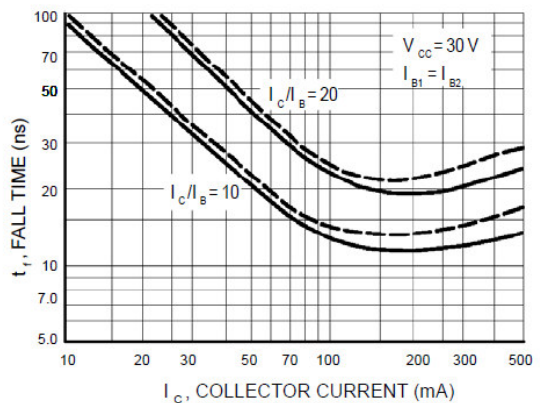


Figure 8. Fall Time



Typical Characteristics (AUDIO SMALL-SIGNAL)

NOISE FIGURE

$V_{CE} = 10 \text{ Vdc}$, $T_A = 25^\circ\text{C}$
Bandwidth = 1.0 Hz

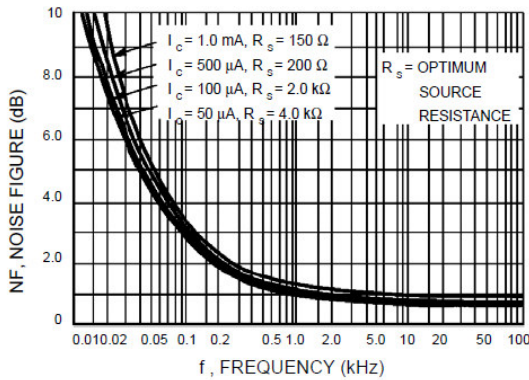


Figure 9. Frequency Effects

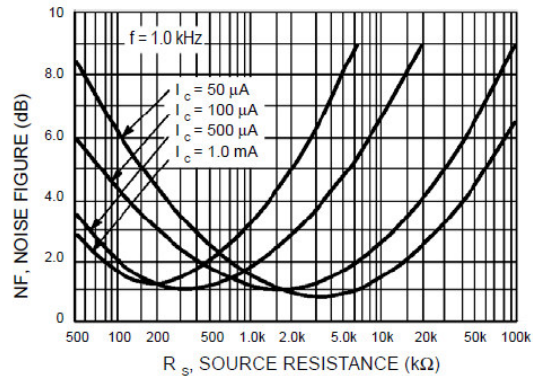


Figure 10. Source Resistance Effects

h PARAMETERS

$(V_{CE} = 10 \text{ Vdc}$, $f = 1.0 \text{ kHz}$, $T_A = 25^\circ\text{C}$)

This group of graphs illustrates the relationship between h_{fe} and other "h" parameters for this series of transistors. To obtain these curves, a high-gain and a low-gain unit were selected from the LMBT4401LT1 lines, and the same units were used to develop the correspondingly numbered curves on each graph.

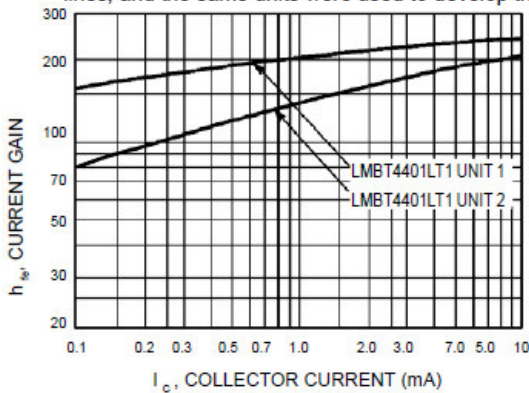


Figure 11. Current Gain

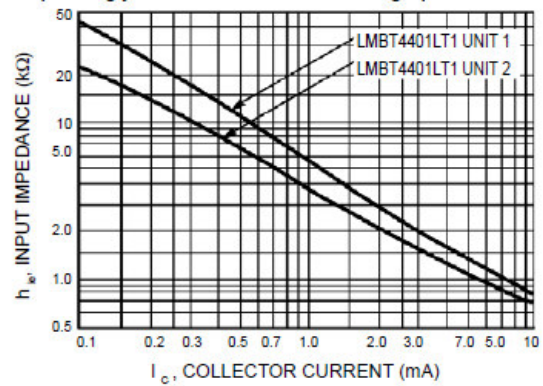


Figure 12. Input Impedance

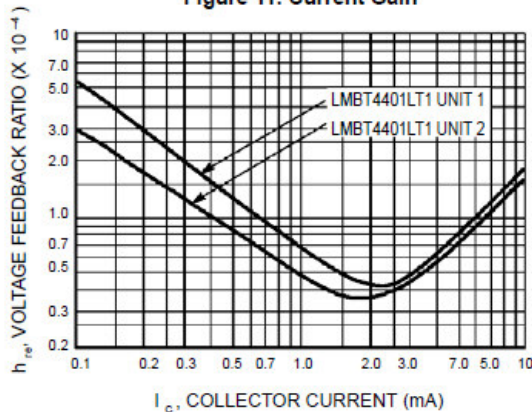


Figure 13. Voltage Feedback Ratio

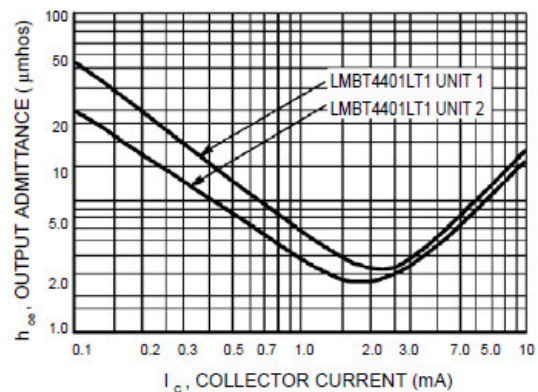


Figure 14. Output Admittance



Typical Characteristics (STATIC)

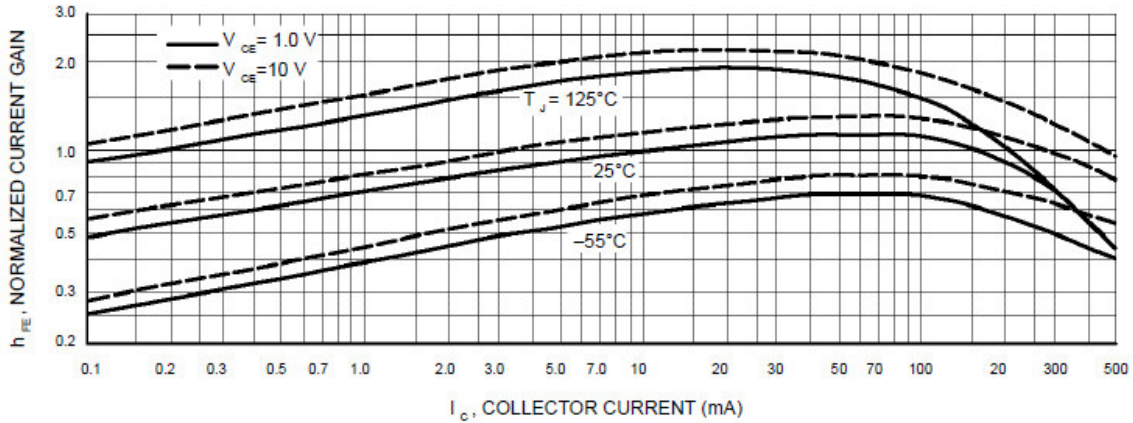


Figure 15. DC Current Gain

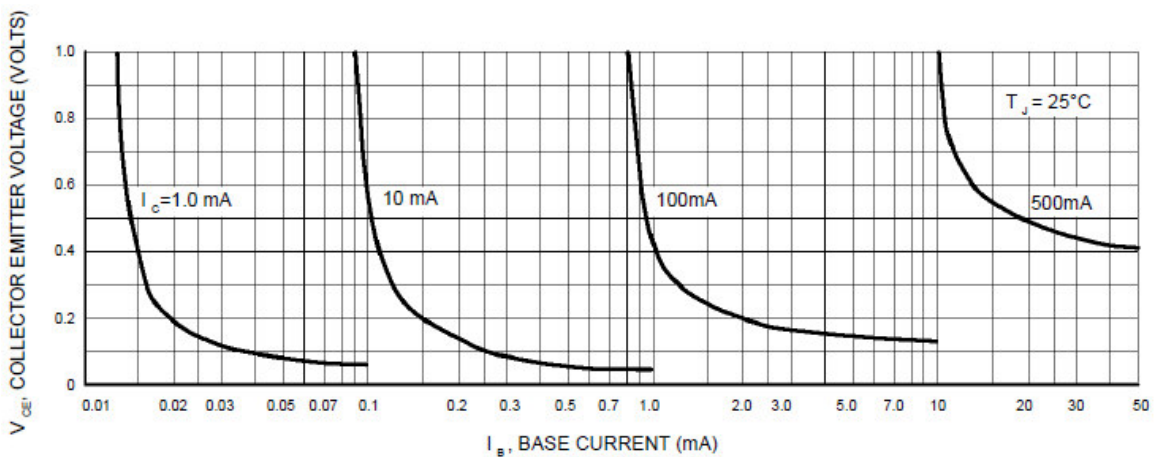


Figure 16. Collector Saturation Region

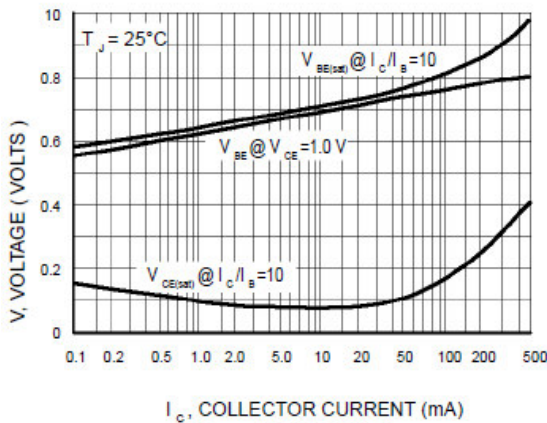


Figure 17. "On" Voltages

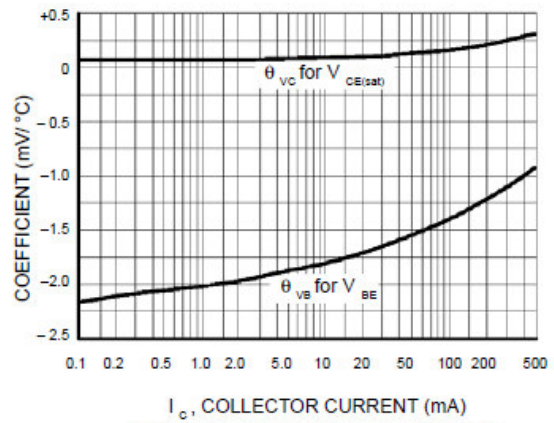
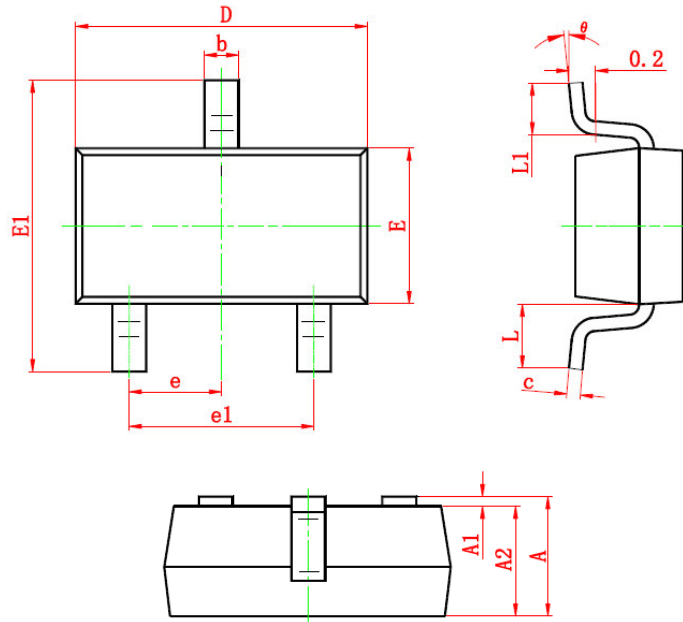


Figure 18. Temperature Coefficients



Package Information (SOT-23)



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	0.900	1.200	0.035	0.043
A1	0.000	0.100	0.000	0.004
A2	0.900	1.100	0.035	0.039
b	0.300	0.500	0.012	0.020
c	0.080	0.150	0.003	0.006
D	2.800	3.000	0.110	0.118
E	1.200	1.400	0.047	0.055
E1	2.250	2.550	0.089	0.100
e	0.950 TYP		0.037 TYP	
e1	1.800	2.000	0.071	0.079
L	0.550 REF		0.022 REF	
L1	0.300	0.500	0.012	0.020
θ	0°	8°	0°	6°

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