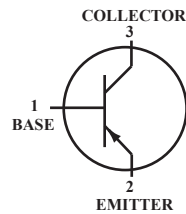


### Switching Transistor PNP Silicon

**(Pb)** Lead(Pb)-Free



### Maximum Ratings

Rating	Symbol	Value	Unit
Collector-Emitter Voltage	V <sub>CEO</sub>	-40	V <sub>dc</sub>
Collector-Base Voltage	V <sub>CBO</sub>	-40	V <sub>dc</sub>
Emitter-Base Voltage	V <sub>EBO</sub>	-5.0	V <sub>dc</sub>
Collector Current-Continuous	I <sub>C</sub>	-600	mA <sub>dc</sub>

### Thermal Characteristics

Characteristics	Symbol	Max	Unit
Total Device Dissipation FR-5 Board <sup>(1)</sup> TA=25°C Derate above 25°C	P <sub>D</sub>	225	mW
Thermal Resistance, Junction to Ambient	R <sub>θJA</sub>	556	°C/W
Total Device Dissipation Alumina Substrate, <sup>(2)</sup> TA=25°C Derate above 25°C	P <sub>D</sub>	300	mW
Thermal Resistance, Junction to Ambient	R <sub>θJA</sub>	417	°C/W
Junction and Storage, Temperature	T <sub>J, Tstg</sub>	-55 to +150	°C

### Device Marking

MMBT4403=2T

### Electrical Characteristics (TA=25°C Unless Otherwise noted)

Characteristics	Symbol	Min	Max	Unit
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### Off Characteristics

Collector-Emitter Breakdown Voltage <sup>(3)</sup> (I <sub>C</sub> =-1.0mA <sub>dc</sub> , I <sub>B</sub> =0)	V(BR)CEO	-40	-	V <sub>dc</sub>
Collector-Base Breakdown Voltage (I <sub>C</sub> =-0.1mA <sub>dc</sub> , I <sub>E</sub> =0)	V(BR)CBO	-40	-	V <sub>dc</sub>
Emitter-Base Breakdown Voltage (I <sub>E</sub> =-0.1mA <sub>dc</sub> , I <sub>C</sub> =0)	V(BR)EBO	-5.0	-	V <sub>dc</sub>
Base Cutoff Current (V <sub>CE</sub> =-35V <sub>dc</sub> , V <sub>EB</sub> =-0.4V <sub>dc</sub> )	I <sub>BEV</sub>	-	-0.1	μA <sub>dc</sub>
Collector Cutoff Current (V <sub>CE</sub> =-35V <sub>dc</sub> , V <sub>EB</sub> =-0.4V <sub>dc</sub> )	I <sub>CEx</sub>	-	-0.1	μA <sub>dc</sub>

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) (Continued)

Characteristics	Symbol	Min	Max	Unit
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### On Characteristics <sup>(3)</sup>

DC Current Gain ( $I_C = -0.1\text{ mA}$ , $V_{CE} = -1.0\text{ Vdc}$ ) ( $I_C = -1.0\text{ mA}$ , $V_{CE} = -1.0\text{ Vdc}$ ) ( $I_C = -10\text{ mA}$ , $V_{CE} = -1.0\text{ Vdc}$ ) ( $I_C = 150\text{ mA}$ , $V_{CE} = -2.0\text{ Vdc}$ ) <sup>(3)</sup> ( $I_C = -500\text{ mA}$ , $V_{CE} = -2.0\text{ Vdc}$ ) <sup>(3)</sup>	$H_{FE}$	30 60 100 100 20	. . 300 .	-
Collector-Emitter Saturation Voltage <sup>(3)</sup> ( $I_C = -150\text{ mA}$ , $I_B = -15\text{ mA}$ ) ( $I_C = -500\text{ mA}$ , $I_B = -50\text{ mA}$ )	$V_{CE(sat)}$	. .	-0.4 -0.75	Vdc
Base-Emitter Saturation Voltage <sup>(3)</sup> ( $I_C = -150\text{ mA}$ , $I_B = -15\text{ mA}$ ) ( $I_C = -500\text{ mA}$ , $I_B = -50\text{ mA}$ )	$V_{BE(sat)}$	-0.75	-0.95 -1.3	Vdc

### Small-signal Characteristics

Current-Gain-Bandwidth Product <sup>(4)</sup> ( $I_C = -20\text{ mA}$ , $V_{CE} = -10\text{ Vdc}$ , $f = 100\text{ MHz}$ )	$f_T$	200	-	MHz
Collector-Base Capacitance ( $V_{CB} = -10\text{ Vdc}$ , $I_E = 0$ , $f = 1.0\text{ MHz}$ )	$C_{cb}$	-	8.5	pF
Emitter-Base Capacitance ( $V_{EB} = -0.5\text{ Vdc}$ , $I_C = 0$ , $f = 1.0\text{ MHz}$ )	$C_{eb}$	-	30	pF
Input Impedance ( $V_{CE} = -10\text{ Vdc}$ , $I_C = -1.0\text{ mA}$ , $f = 1.0\text{ kHz}$ )	$h_{ie}$	1.5	15	k ohms
Voltage Feedback Ratio ( $V_{CE} = -10\text{ Vdc}$ , $I_C = -1.0\text{ mA}$ , $f = 1.0\text{ kHz}$ )	$h_{re}$	0.1	8	$\times 10^{-4}$
Small-Signal Current Gain ( $V_{CE} = -10\text{ Vdc}$ , $I_C = -1.0\text{ mA}$ , $f = 1.0\text{ kHz}$ )	$h_{fe}$	60	500	.
Output Admittance ( $V_{CE} = -10\text{ Vdc}$ , $I_C = -1.0\text{ mA}$ , $f = 1.0\text{ kHz}$ )	$h_{oe}$	1.0	100	$\mu\text{mhos}$

### Switching Characteristics

Delay Time	(Vcc = -30 Vdc, VEB = -2.0 Vdc Ic = -150 mA, IB1 = -15 mA)	td	-	15	ns
Rise Time		tr	-	20	
Storage Time	(Vcc = -30 Vdc, Ic = -150 mA, IB1 = IB2 = -15 mA)	ts	-	225	ns
Fall Time		tf	-	30	

## SWITCHING TIME EQUIVALENT TEST CIRCUIT

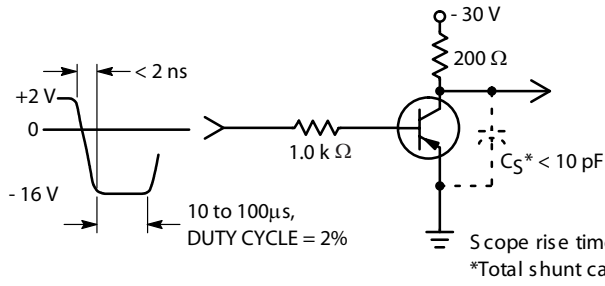


Figure 1. Turn-On Time

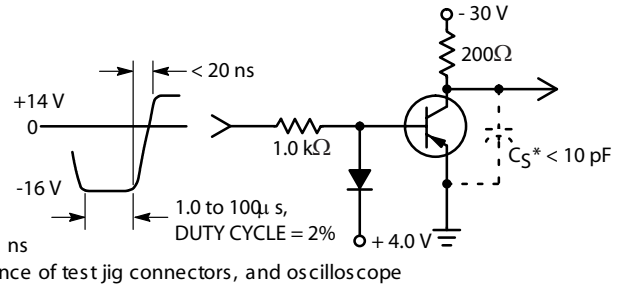


Figure 2. Turn-Off Time

## TRANSIENT CHARACTERISTICS

— 25 °C    - - - 105 °C

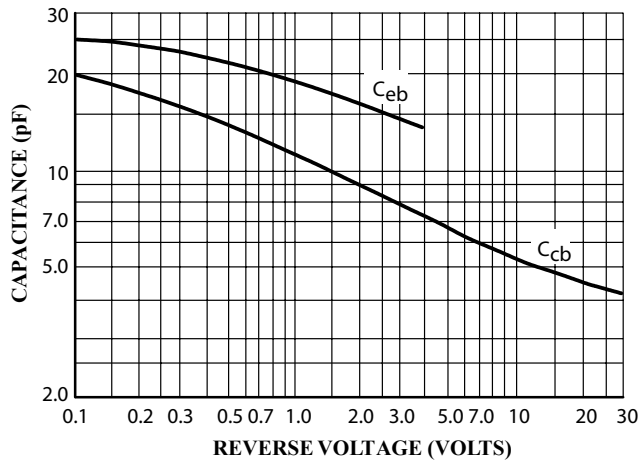


Figure 3. Capacitances

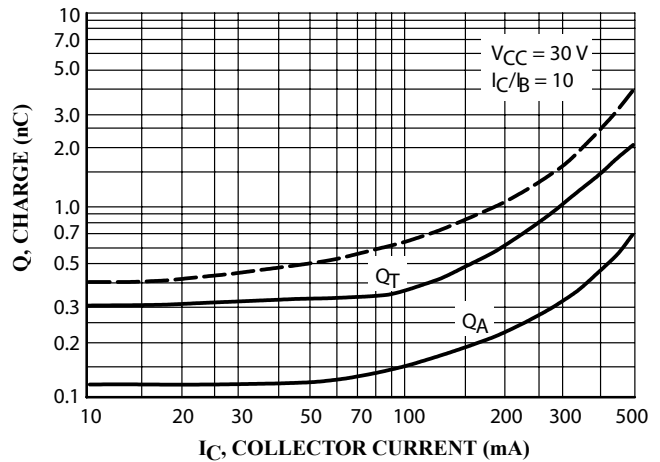


Figure 4. Charge Data

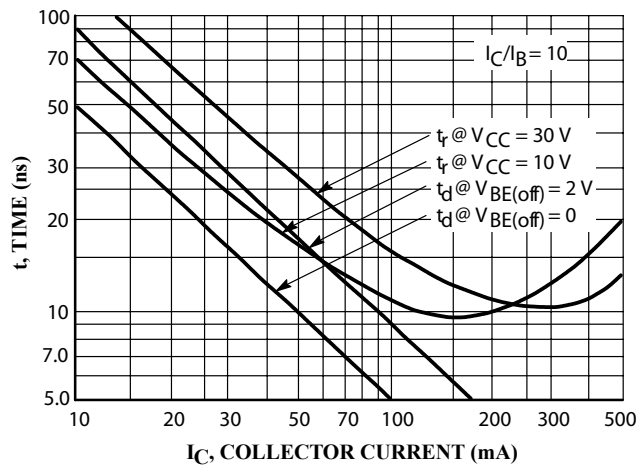


Figure 5. Turn-On Time

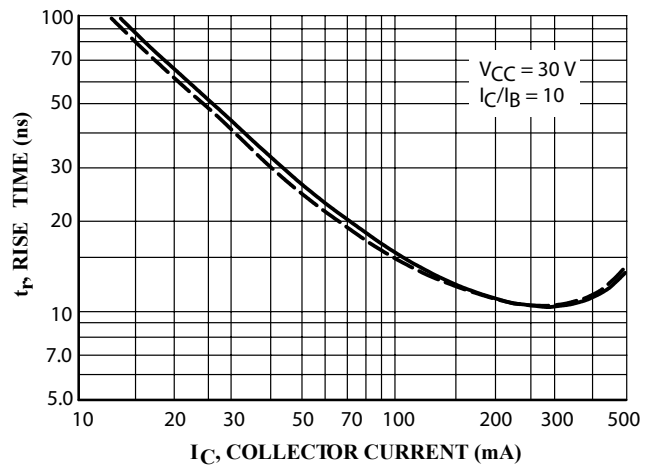


Figure 6. Rise Time

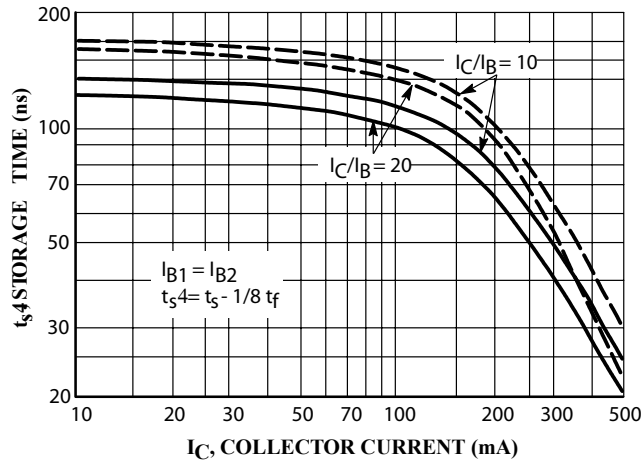


Figure 7. Storage Time

### h P ARAMETERS

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

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 MMBT4403LT1 lines, and the same units were used to develop the correspondingly±numbered curves on each graph.

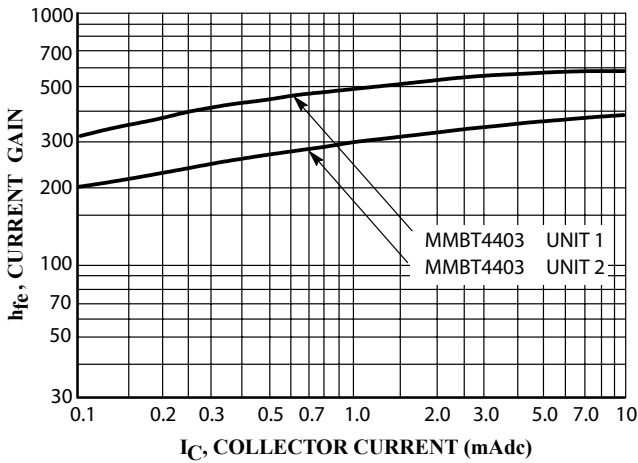


Figure 10. Current Gain

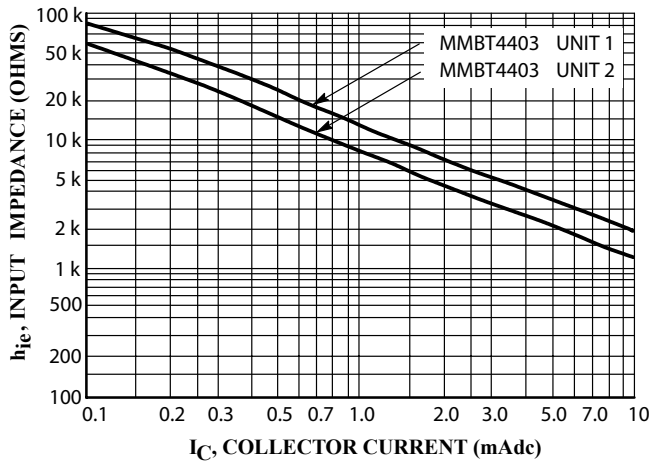


Figure 11. Input Impedance

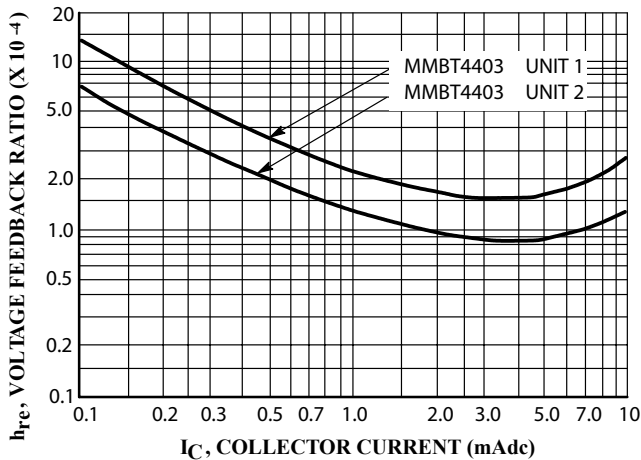


Figure 12. Voltage Feedback Ratio

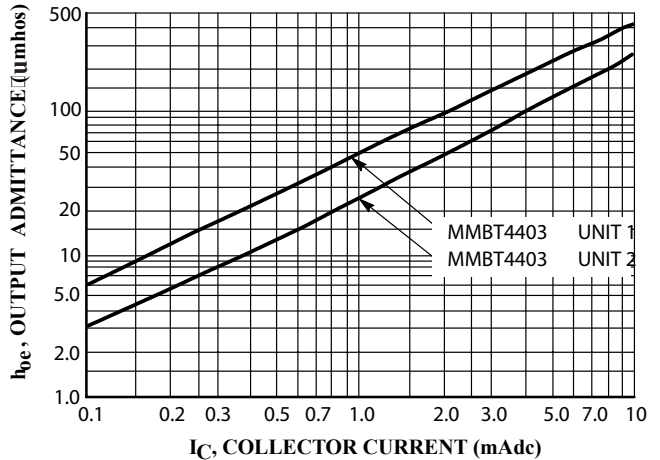


Figure 13. Output Admittance

## STATIC CHARACTERISTICS

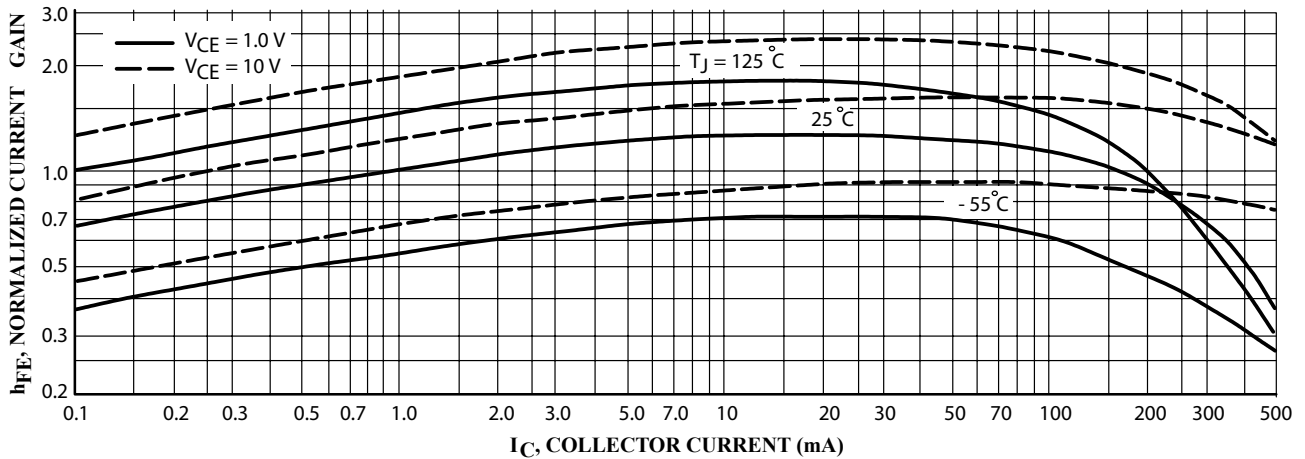


Figure 14. DC Current Gain

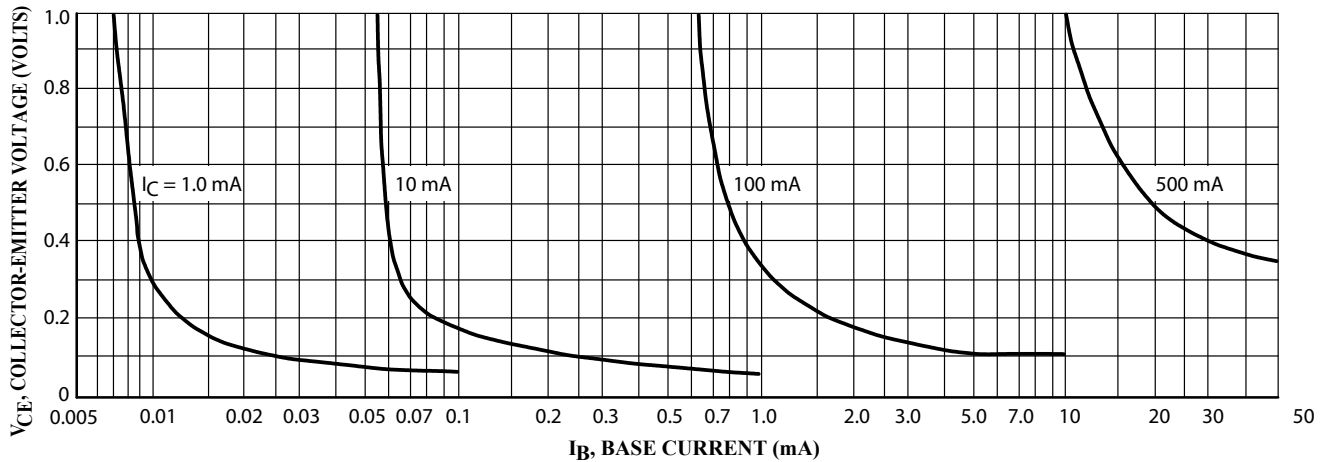


Figure 15. Collector Saturation Region

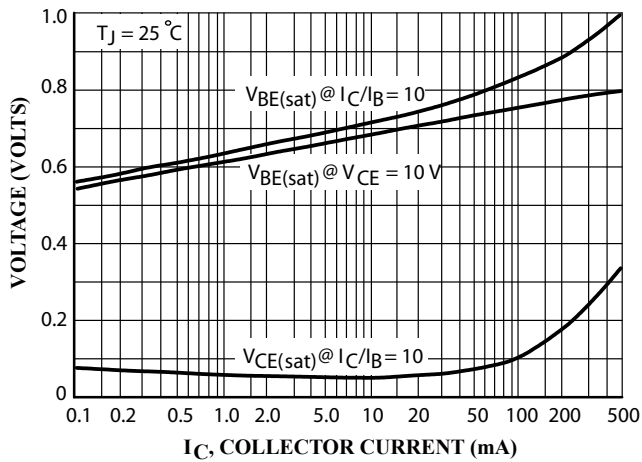


Figure 16. "On" Voltages

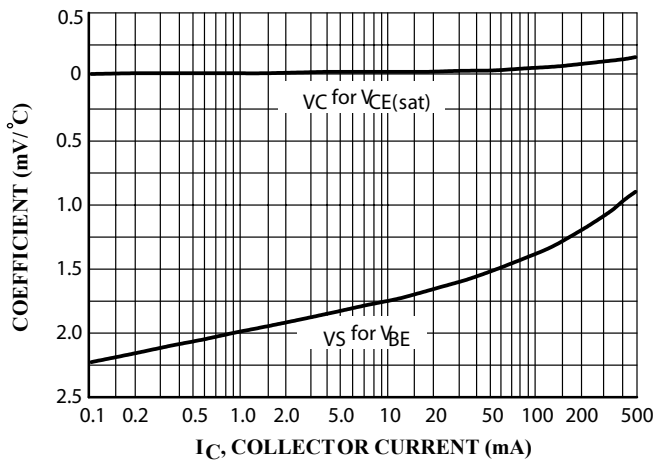
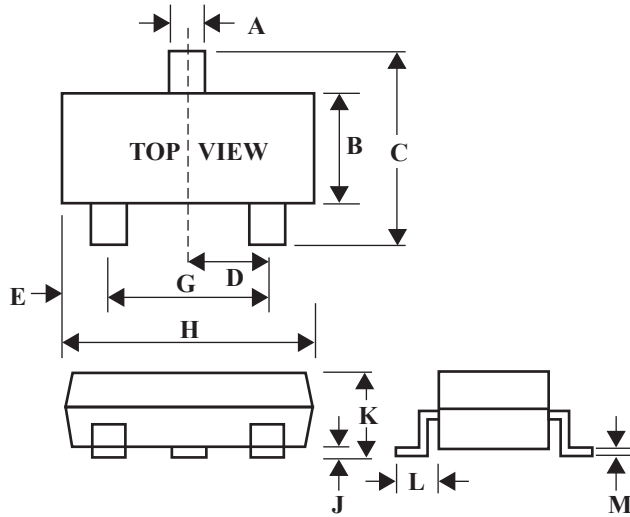


Figure 17. Temperature Coefficients

**SOT-23 Package Outline Dimensions**

Unit:mm



Dim	Min	Max
A	0.35	0.51
B	1.19	1.40
C	2.10	3.00
D	0.85	1.05
E	0.46	1.00
G	1.70	2.10
H	2.70	3.10
J	0.01	0.13
K	0.89	1.10
L	0.30	0.61
M	0.076	0.25