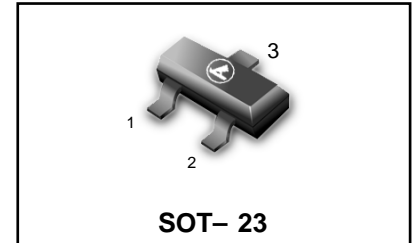


General Purpose Transistors

NPN Silicon

- We declare that the material of product compliance with RoHS requirements.

LMBT2222LT1G
LMBT2222ALT1G

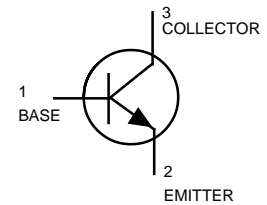


MAXIMUM RATINGS

| Rating | Symbol | 2222 | 2222A | Unit |
|--------------------------------|-----------|------|-------|------|
| Collector-Emitter Voltage | V_{CEO} | 30 | 40 | Vdc |
| Collector-Base Voltage | V_{CBO} | 60 | 75 | Vdc |
| Emitter-Base Voltage | V_{EBO} | 5.0 | 6.0 | Vdc |
| Collector Current — Continuous | I_C | 600 | 600 | mAdc |

THERMAL CHARACTERISTICS

| Characteristic | Symbol | Max | Unit |
|---|-----------------|-------------|---------------------------|
| Total Device Dissipation FR-5 Board, (1) $T_A = 25^\circ\text{C}$ | P_D | 225 | mW |
| Derate above 25°C | | 1.8 | mW/ $^\circ\text{C}$ |
| Thermal Resistance, Junction to Ambient | $R_{\theta JA}$ | 556 | $^\circ\text{C}/\text{W}$ |
| Total Device Dissipation Alumina Substrate, (2) $T_A = 25^\circ\text{C}$ | P_D | 300 | mW |
| Derate above 25°C | | 2.4 | mW/ $^\circ\text{C}$ |
| Thermal Resistance, Junction to Ambient | $R_{\theta JA}$ | 417 | $^\circ\text{C}/\text{W}$ |
| Junction and Storage Temperature | T_J, T_{stg} | -55 to +150 | $^\circ\text{C}$ |



ORDERING INFORMATION

| Device | Marking | Shipping |
|---------------|---------|-------------------|
| LMBT2222LT1G | M1B | 3000/Tape & Reel |
| LMBT2222LT3G | M1B | 10000/Tape & Reel |
| LMBT2222ALT1G | 1P | 3000/Tape & Reel |
| LMBT2222ALT3G | 1P | 10000/Tape & Reel |

DEVICE MARKING

LMBT2222LT1G = M1B; LMBT2222ALT1G = 1P

ELECTRICAL CHARACTERISTICS ($T_A = 25^\circ\text{C}$ unless otherwise noted.)

| Characteristic | Symbol | Min | Max | Unit |
|----------------|--------|-----|-----|------|
|----------------|--------|-----|-----|------|

OFF CHARACTERISTICS

| | | | | | |
|--|-----------------------|---------------|------------|------|-----------------|
| Collector-Emitter Breakdown Voltage ($I_C = 10 \text{ mAdc}, I_E = 0$) | LMBT2222 LMBT2222A | $V_{(BR)CEO}$ | 30 40 | — | Vdc |
| Collector-Base Breakdown Voltage ($I_C = 10 \mu\text{Adc}, I_E = 0$) | LMBT2222 LMBT2222A | $V_{(BR)CBO}$ | 60 75 | — | Vdc |
| Emitter-Base Breakdown Voltage ($I_E = 10 \mu\text{Adc}, I_C = 0$) | LMBT2222 LMBT2222A | $V_{(BR)EBO}$ | 5.0 6.0 | — | Vdc |
| Collector Cutoff Current ($V_{CE} = 60 \text{ Vdc}, I_{EB(off)} = 3.0 \text{ Vdc}$) | LMBT2222A | I_{CEX} | — | 10 | nAdc |
| Collector Cutoff Current ($V_{CB} = 50 \text{ Vdc}, I_E = 0$) | LMBT2222 | I_{CBO} | — | 0.01 | μAdc |
| ($V_{CB} = 60 \text{ Vdc}, I_E = 0$) | LMBT2222A | | — | 0.01 | |
| ($V_{CB} = 50 \text{ Vdc}, I_E = 0, T_A = 125^\circ\text{C}$) | LMBT2222 | | — | 10 | |
| ($V_{CB} = 60 \text{ Vdc}, I_E = 0, T_A = 125^\circ\text{C}$) | LMBT2222A | | — | 10 | |
| Emitter Cutoff Current ($V_{EB} = 3.0 \text{ Vdc}, I_C = 0$) | LMBT2222A | I_{EBO} | — | 100 | nAdc |
| Base Cutoff Current ($V_{CE} = 60 \text{ Vdc}, V_{EB(off)} = 3.0 \text{ Vdc}$) | LMBT2222A | I_{BL} | — | 20 | nAdc |

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.

LMBT2222LT1G LMBT2222ALT1G
ELECTRICAL CHARACTERISTICS (T_A = 25°C unless otherwise noted) (Continued)

| Characteristic | Symbol | Min | Max | Unit |
|----------------|--------|-----|-----|------|
|----------------|--------|-----|-----|------|

DC CHARACTERISTICS

| | | | | |
|--|----------------------|-----|-----|-----|
| DC Current Gain | h_{FE} | | | — |
| (I _C = 0.1 mAdc, V _{CE} = 10 Vdc) | | 35 | — | |
| (I _C = 1.0 mAdc, V _{CE} = 10 Vdc) | | 50 | — | |
| (I _C = 10 mAdc, V _{CE} = 10 Vdc) | | 75 | — | |
| (I _C = 10 mAdc, V _{CE} = 10 Vdc, T _A = -55°C) | LMBT2222A only | 35 | — | |
| (I _C = 150 mAdc, V _{CE} = 10 Vdc) (3) | | 100 | 300 | |
| (I _C = 150 mAdc, V _{CE} = 1.0 Vdc) (3) | | 50 | — | |
| (I _C = 500 mAdc, V _{CE} = 10 Vdc)(3) | LMBT2222 | 30 | — | |
| | LMBT2222A | 40 | — | |
| Collector-Emitter Saturation Voltage(3) | V _{CE(sat)} | | | Vdc |
| (I _C = 150 mAdc, I _B = 15 mAdc) | LMBT2222 | — | 0.4 | |
| | LMBT2222A | — | 0.3 | |
| (I _C = 500mAdc, I _B = 50 mAdc) | LMBT2222 | — | 1.6 | |
| | LMBT2222A | — | 1.0 | |
| Base-Emitter Saturation Voltage | V _{BE(sat)} | | | Vdc |
| (I _C = 150 mAdc, I _B = 15 mAdc) | LMBT2222 | — | 1.3 | |
| | LMBT2222A | 0.6 | 1.2 | |
| (I _C = 500 mAdc, I _B = 50 mAdc) | LMBT2222 | — | 2.6 | |
| | LMBT2222A | — | 2.0 | |

SMALL-SIGNAL CHARACTERISTICS

| | | | | | |
|---|-----------|---------------------------------|------|------|--------------------|
| Current-Gain — Bandwidth Product(4) | LMBT2222 | f _T | 250 | — | MHz |
| (I _C = 20mAdc, V _{CE} = 20Vdc, f = 100MHz) | LMBT2222A | | 300 | — | |
| Output Capacitance(V _{CB} = 10 Vdc, I _E = 0, f = 1.0 MHz) | | C _{obo} | — | 8.0 | pF |
| Input Capacitance | LMBT2222 | C _{ibo} | — | 30 | pF |
| (V _{EB} = 0.5 Vdc, I _C = 0, f = 1.0 MHz) | LMBT2222A | | — | 25 | |
| Input Impedance(V _{CE} = 10 Vdc, I _C = 1.0 mAdc, f = 1.0 kHz) | LMBT2222A | h _{ie} | 2.0 | 8.0 | kΩ |
| (V _{CE} = 10 Vdc, I _C = 10 mAdc, f = 1.0 kHz) | LMBT2222A | | 0.25 | 1.25 | |
| Voltage Feedback Ratio(V _{CE} = 10 Vdc, I _C = 1.0 mAdc, f = 1.0 kHz) | LMBT2222A | h _{re} | — | 8.0 | X 10 ⁻⁴ |
| (V _{CE} = 10 Vdc, I _C = 10 mAdc, f = 1.0 kHz) | LMBT2222A | | — | 4.0 | |
| Small-Signal Current Gain(V _{CE} = 10 Vdc, I _C = 1.0 mAdc, f = 1.0 kHz) | LMBT2222A | h _{fe} | 50 | 300 | — |
| (V _{CE} = 10 Vdc, I _C = 10 mAdc, f = 1.0 kHz) | LMBT2222A | | 75 | 375 | |
| Output Admittance(V _{CE} = 10 Vdc, I _C = 1.0 mAdc, f = 1.0 kHz) | LMBT2222A | h _{oe} | 5.0 | 35 | μmhos |
| (V _{CE} = 10 Vdc, I _C = 10 mAdc, f = 1.0 kHz) | LMBT2222A | | 25 | 200 | |
| Current Base Time Constant | | r _b , C _C | — | 150 | ps |
| (V _{CB} = 20 Vdc, I _E = 20 mAdc, f = 31.8 MHz) | LMBT2222A | | — | 150 | |
| Noise Figure(V _{CE} = 10 Vdc, I _C = 100 μAdc, R _S = 1.0 kΩ, f = 1.0 kHz) | LMBT2222A | NF | — | 4.0 | dB |

SWITCHING CHARACTERISTICS

| | | | | | |
|--------------|---|----------------|---|-----|----|
| Delay Time | (V _{CC} = 30 Vdc, V _{EB(off)} = -0.5 Vdc) | t _d | — | 10 | ns |
| Rise Time | I _C = 150 mAdc, I _{B1} = 15 mAdc) | t _r | — | 25 | |
| Storage Time | (V _{CC} = 30 Vdc, I _C = 150 mAdc) | t _s | — | 225 | ns |
| Fall Time | I _{B1} = I _{B2} = 15 mAdc) | t _f | — | 60 | |

3. Pulse Test: Pulse Width ≤ 300 μs, Duty Cycle ≤ 2.0%.

4. f_T is defined as the frequency at which |h_{ie}| extrapolates to unity.

LMBT2222LT1G LMBT2222ALT1G

SWITCHING TIME EQUIVALENT TEST CIRCUITS

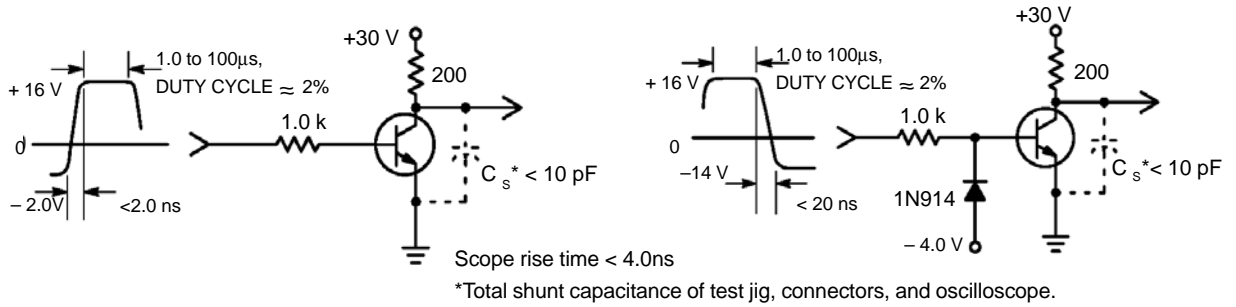


Figure 1. Turn-On Time

Figure 2. Turn-Off Time

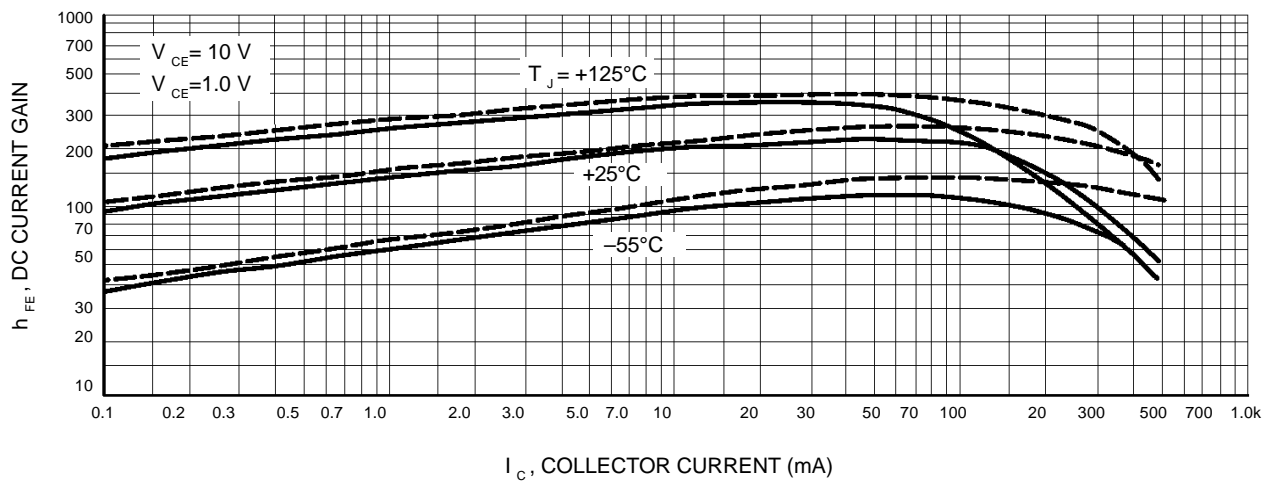


Figure 3. DC Current Gain

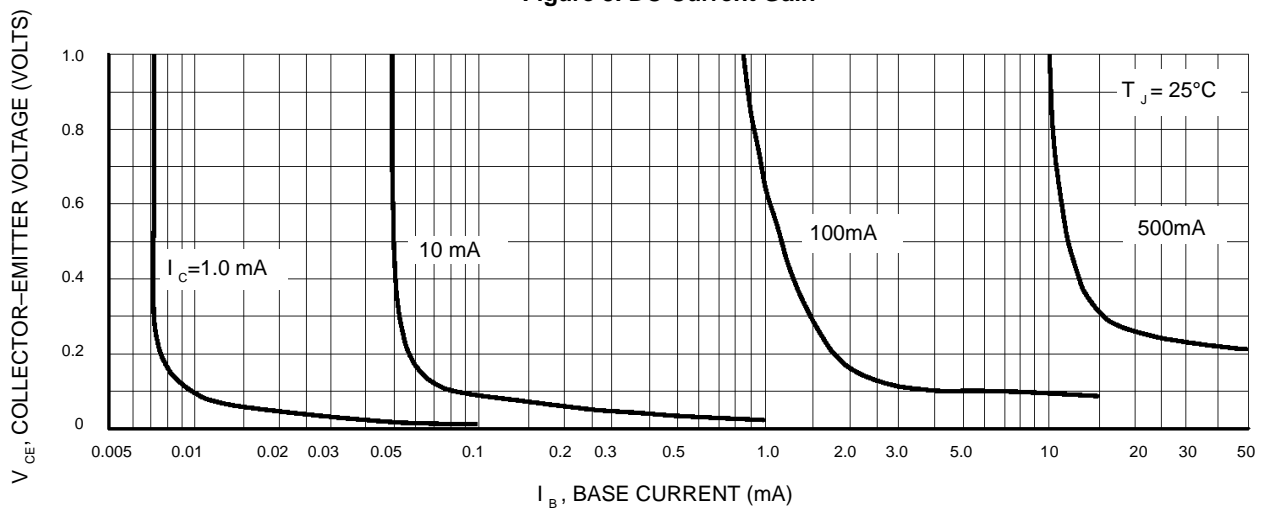


Figure 4. Collector Saturation Region

LMBT2222LT1G LMBT2222ALT1G

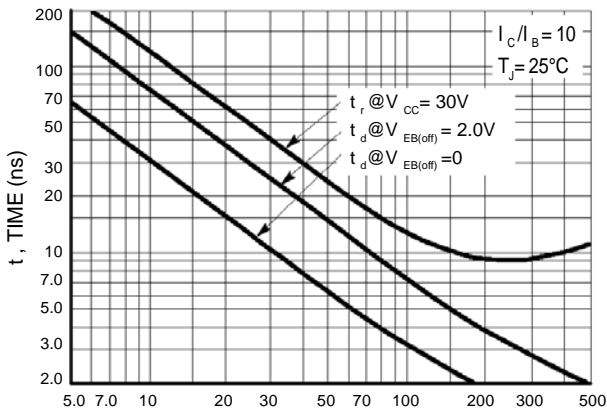


Figure 5. Turn-On Time

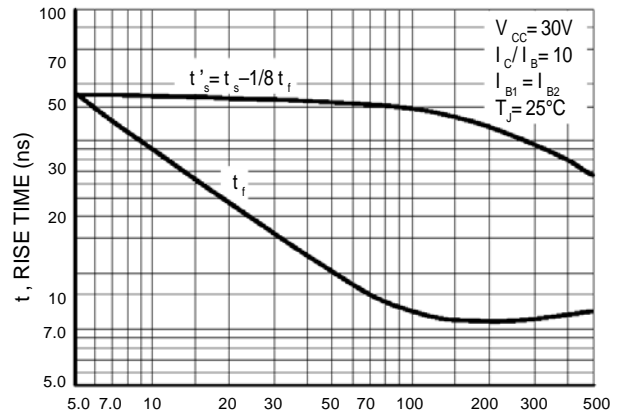


Figure 6. Turn - Off Time

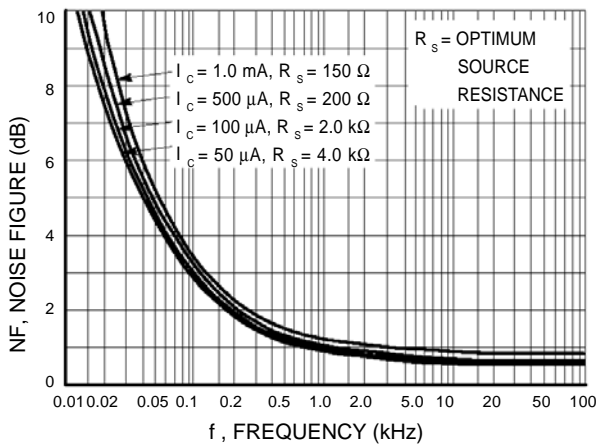


Figure 7. Frequency Effects

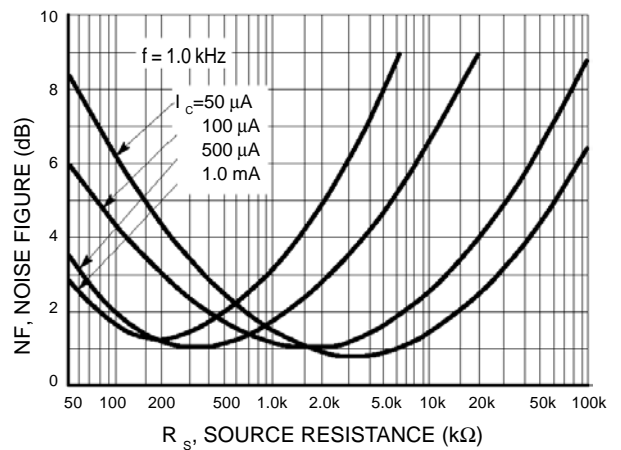


Figure 8. Source Resistance Effects

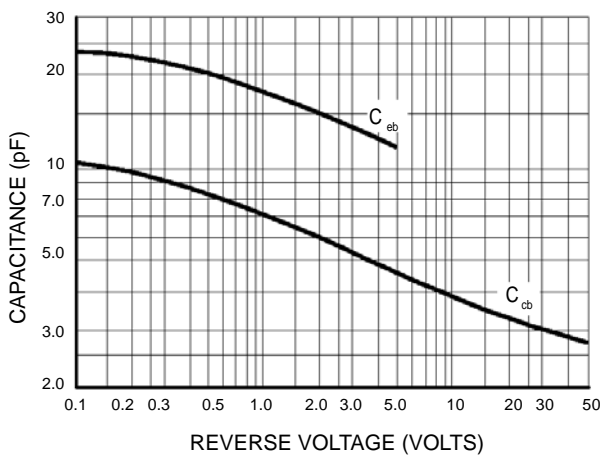


Figure 9. Capacitance

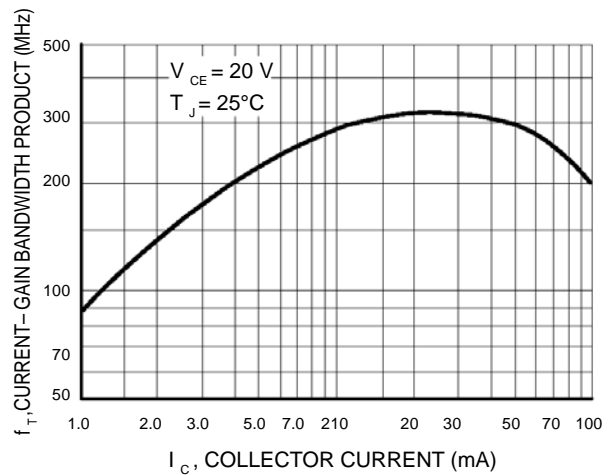


Figure 10. Current-Gain Bandwidth Product

LMBT2222LT1G LMBT2222ALT1G

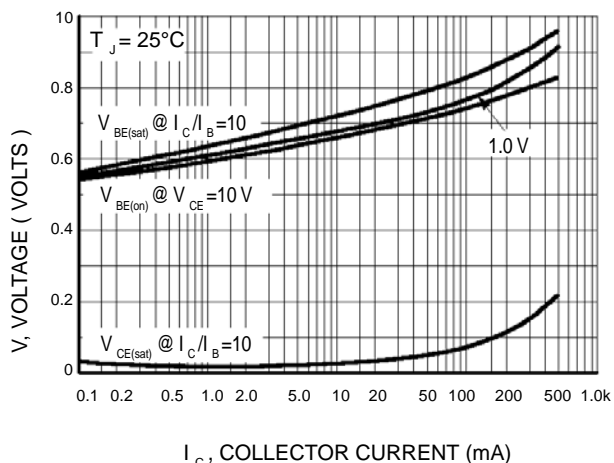


Figure 11. "On" Voltages

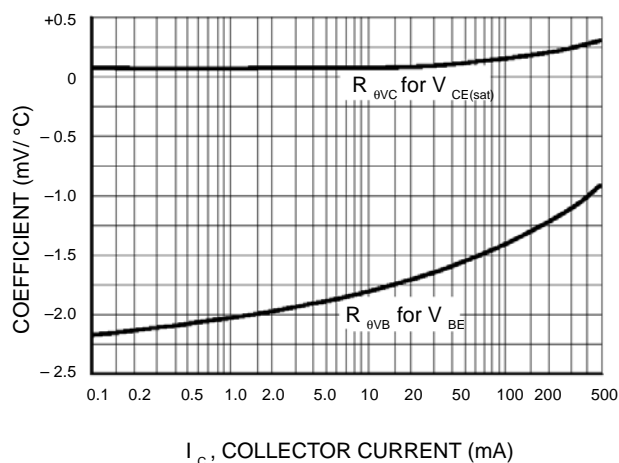
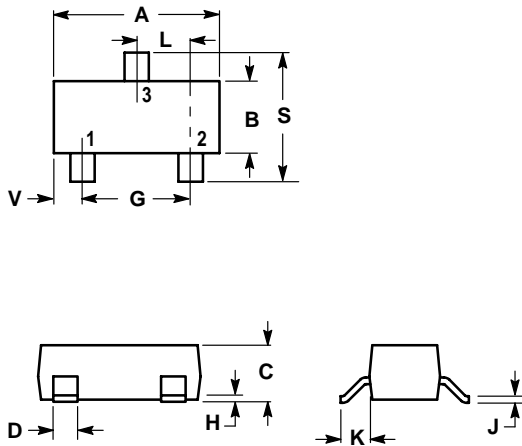


Figure 12. Temperature Coefficients

LMBT2222LT1G LMBT2222ALT1G
SOT-23
NOTES:

1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M,1982
2. CONTROLLING DIMENSION: INCH.



| DIM | INCHES | | MILLIMETERS | |
|-----|--------|--------|-------------|-------|
| | MIN | MAX | MIN | MAX |
| A | 0.1102 | 0.1197 | 2.80 | 3.04 |
| B | 0.0472 | 0.0551 | 1.20 | 1.40 |
| C | 0.0350 | 0.0440 | 0.89 | 1.11 |
| D | 0.0150 | 0.0200 | 0.37 | 0.50 |
| G | 0.0701 | 0.0807 | 1.78 | 2.04 |
| H | 0.0005 | 0.0040 | 0.013 | 0.100 |
| J | 0.0034 | 0.0070 | 0.085 | 0.177 |
| K | 0.0140 | 0.0285 | 0.35 | 0.69 |
| L | 0.0350 | 0.0401 | 0.89 | 1.02 |
| S | 0.0830 | 0.1039 | 2.10 | 2.64 |
| V | 0.0177 | 0.0236 | 0.45 | 0.60 |

