# DATA SHEET

# BUJ105AB
## Silicon Diffused Power Transistor

Product specification

October 2018

WeEn
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# Silicon Diffused Power Transistor BUJ105AB

## GENERAL DESCRIPTION

High-voltage, high-speed planar-passivated npn power switching transistor in SOT404 ($D^2$-PAK) surface-mount package intended for use in high frequency electronic lighting ballast applications, converters, inverters, switching regulators, motor control systems, etc.

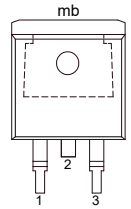
## QUICK REFERENCE DATA

| SYMBOL | PARAMETER | CONDITIONS | TYP. | MAX. | UNIT |
|---|---|---|---|---|---|
| $V_{CESM}$ | Collector-emitter voltage peak value | $V_{BE}$ = 0 V | - | 700 | V |
| $V_{CBO}$ | Collector-Base voltage (open emitter) | | - | 700 | V |
| $V_{CEO}$ | Collector-emitter voltage (open base) | | - | 400 | V |
| $I_C$ | Collector current (DC) | | - | 8 | A |
| $I_{CM}$ | Collector current peak value | | - | 16 | A |
| $P_{tot}$ | Total power dissipation | $T_{mb} \leq 25$ ˚C | - | 125 | W |
| $V_{CEsat}$ | Collector-emitter saturation voltage | $I_C$ = 4.0 A;$I_B$ = 0.8 A | 0.3 | 1.0 | V |
| $h_{FEsat}$ | | $I_C$ = 4.0 A; $V_{CE}$ = 5 V | 11 | 15 | |
| $t_f$ | Fall time | $I_C$ = 5 A; $I_{B1}$ = 1 A | 20 | 50 | ns |

## PINNING - SOT404

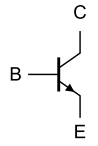
| PIN | DESCRIPTION |
|---|---|
| 1 | base |
| 2 | collector |
| 3 | emitter |
| mb | collector |

## PIN CONFIGURATION




**D2PAK (SOT404)**

## SYMBOL




*sym123*

## LIMITING VALUES

Limiting values in accordance with the Absolute Maximum Rating System (IEC 134)

| SYMBOL | PARAMETER | CONDITIONS | MIN. | MAX. | UNIT |
|---|---|---|---|---|---|
| $V_{CESM}$ | Collector to emitter voltage | $V_{BE}$ = 0 V | - | 700 | V |
| $V_{CEO}$ | Collector to emitter voltage (open base) | | - | 400 | V |
| $V_{CBO}$ | Collector to base voltage (open emitter) | | - | 700 | V |
| $I_C$ | Collector current (DC) | | - | 8 | A |
| $I_{CM}$ | Collector current peak value | | - | 16 | A |
| $I_B$ | Base current (DC) | | - | 4 | A |
| $I_{BM}$ | Base current peak value | | - | 8 | A |
| $P_{tot}$ | Total power dissipation | $T_{mb} \leq 25$ ˚C | - | 125 | W |
| $T_{stg}$ | Storage temperature | | -65 | 150 | ˚C |
| $T_j$ | Junction temperature | | - | 150 | ˚C |

## THERMAL RESISTANCES

| SYMBOL | PARAMETER | CONDITIONS | TYP. | MAX. | UNIT |
|---|---|---|---|---|---|
| $R_{th\ j\text{-}mb}$ | Thermal resistance junction to mounting base | | - | 1.0 | K/W |
| $R_{th\ j\text{-}a}$ | Thermal resistance junction to ambient | minimum footprint, FR4 board | 55 | - | K/W |

## STATIC CHARACTERISTICS

$T_{mb}$ = 25 ˚C unless otherwise specified

| SYMBOL | PARAMETER | CONDITIONS | MIN. | TYP. | MAX. | UNIT |
|---|---|---|---|---|---|---|
| $I_{CES}$,$I_{CBO}$ | Collector cut-off current [1] | $V_{BE}$ = 0 V; $V_{CE}$ = $V_{CESMmax}$ | - | - | 0.2 | mA |
| $I_{CES}$ | | $V_{BE}$ = 0 V; $V_{CE}$ = $V_{CESMmax}$; $T_j$ = 125 ˚C | - | - | 0.5 | mA |
| $I_{CEO}$ | Collector cut-off current | $V_{CEO}$ = $V_{CEOMmax}$ (400V) | - | - | 0.1 | mA |
| $I_{EBO}$ | Emitter cut-off current | $V_{EB}$ = 9 V; $I_C$ = 0 A | - | - | 1 | mA |
| $V_{CEOsust}$ | Collector-emitter sustaining voltage | $I_B$ = 0 A; $I_C$ = 10 mA; L = 25 mH | 400 | - | - | V |
| $V_{CEsat}$ | Collector-emitter saturation voltage | $I_C$ = 4.0 A;$I_B$ = 0.8 A | - | 0.3 | 1.0 | V |
| $V_{BEsat}$ | Base-emitter saturation voltage | $I_C$ = 4.0 A;$I_B$ = 0.8 A | - | 1.0 | 1.5 | V |
| $h_{FE}$ | DC current gain | $I_C$ = 1 mA; $V_{CE}$ = 5 V | 10 | 14 | 34 | |
| $h_{FE}$ | | $I_C$ = 500 mA; $V_{CE}$ = 5 V | 13 | 23 | 36 | |
| $h_{FEsat}$ | | $I_C$ = 4.0 A; $V_{CE}$ = 5 V | 8 | 11 | 15 | |

## DYNAMIC CHARACTERISTICS

$T_{mb}$ = 25 ˚C unless otherwise specified

| SYMBOL | PARAMETER | CONDITIONS | TYP. | MAX. | UNIT |
|---|---|---|---|---|---|
| | Switching times (resistive load) | $I_{Con}$ = 5 A; $I_{Bon}$ = -$I_{Boff}$ = 1 A; $R_L$ = 75 ohms; $V_{BB2}$ = 4 V; | | | |
| $t_{on}$ | Turn-on time | | 0.65 | 1 | µs |
| $t_s$ | Turn-off storage time | | 1.8 | 2.5 | µs |
| $t_f$ | Turn-off fall time | | 0.3 | 0.5 | µs |
| | Switching times (inductive load) | $I_{Con}$ = 5 A; $I_{Bon}$ = 1 A; $L_B$ = 1 µH; -$V_{BB}$ = 5 V | | | |
| $t_s$ | Turn-off storage time | | 1.2 | 1.7 | µs |
| $t_f$ | Turn-off fall time | | 20 | 50 | ns |
| | Switching times (inductive load) | $I_{Con}$ = 5 A; $I_{Bon}$ = 1 A; $L_B$ = 1 µH; -$V_{BB}$ = 5 V; $T_j$ = 100 ˚C | | | |
| $t_s$ | Turn-off storage time | | 1.4 | 1.9 | µs |
| $t_f$ | Turn-off fall time | | 25 | 100 | ns |

**1** Measured with half sine-wave voltage (curve tracer).

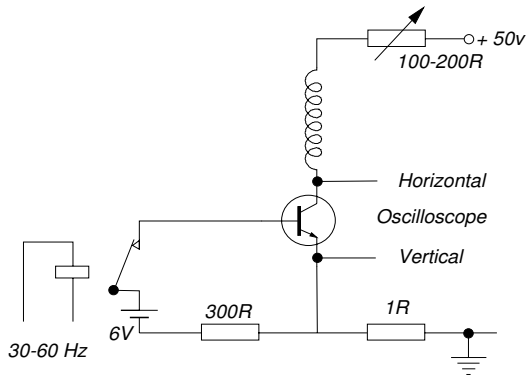



*Fig.1. Test circuit for $V_{CEOsust}$.*

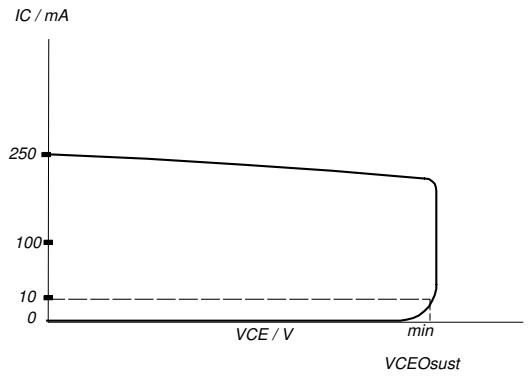



*Fig.2. Oscilloscope display for $V_{CEOsust}$.*

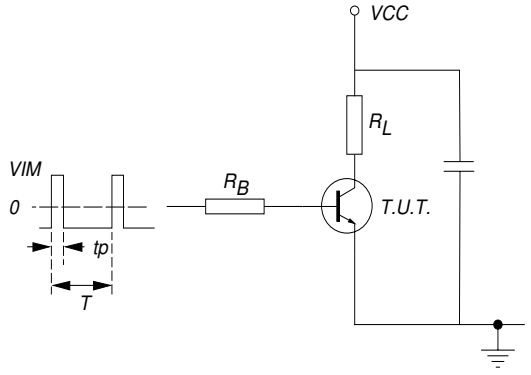



*Fig.3. Test circuit resistive load. $V_{IM}$ = -6 to +8 V*
*$V_{CC}$ = 250 V; $t_p$ = 20 μs; δ = $t_p$ / T = 0.01.*
*$R_B$ and $R_L$ calculated from $I_{Con}$ and $I_{Bon}$ requirements.*

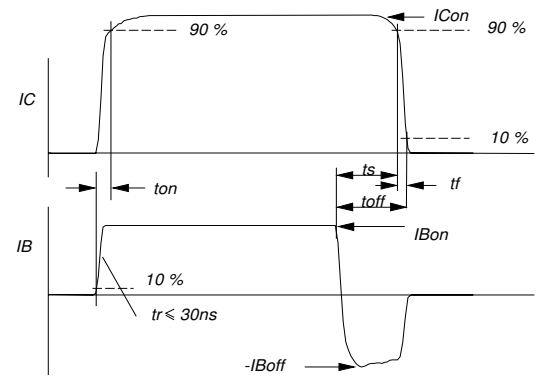



*Fig.4. Switching times waveforms with resistive load.*

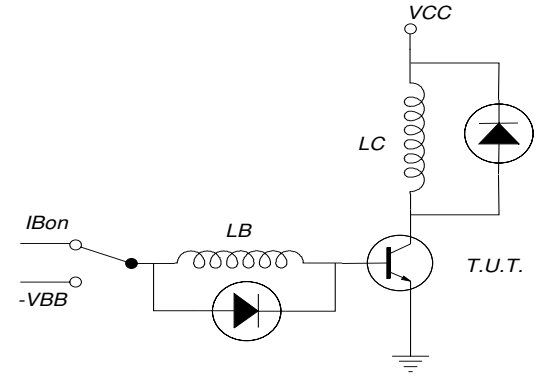



*Fig.5. Test circuit inductive load.*
*$V_{CC}$ = 300 V; -$V_{BE}$ = 5 V; $L_C$ = 200 uH; $L_B$ = 1 uH*

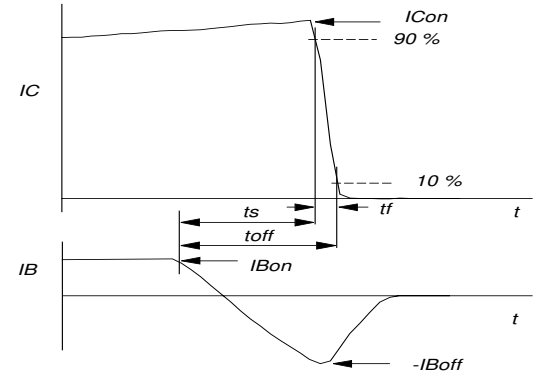



*Fig.6. Switching times waveforms with inductive load.*

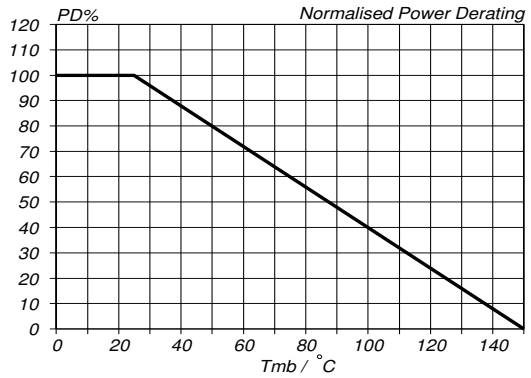



*Fig.7. Normalised power dissipation. PD% = 100·PD/PD $_{25°C}$ = f ($T_{mb}$)*

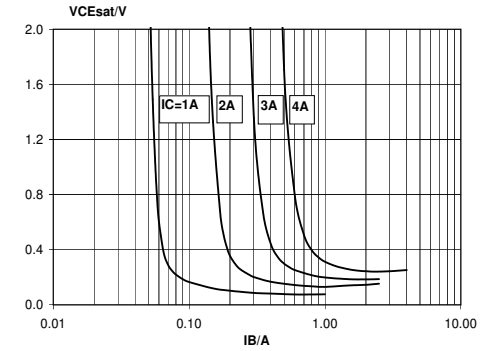



*Fig.10. Collector-Emitter saturation voltage. Solid lines = typ values, $V_{CEsat}$ = f(IB); $T_j$=25˚C.*

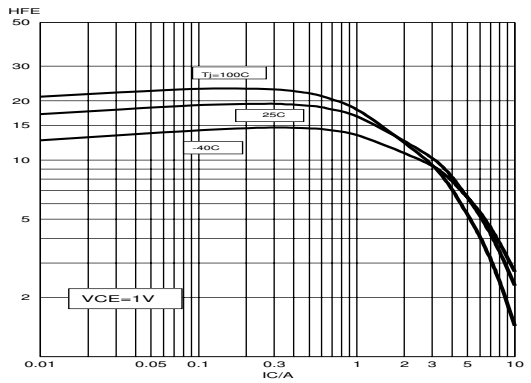



*Fig.8. Typical DC current gain. $h_{FE}$ = f($I_C$) parameter $V_{CE}$*

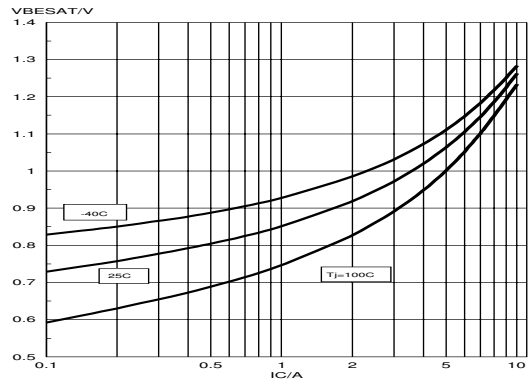



*Fig.11. Base-Emitter saturation voltage. Solid lines = typ values, $V_{BEsat}$ = f(IC); at IC/IB =4.*

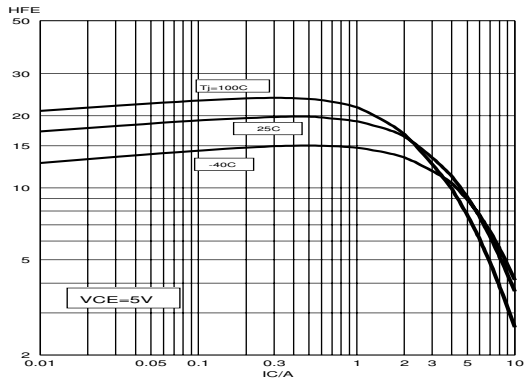



*Fig.9. Typical DC current gain. $h_{FE}$ = f($I_C$) parameter $V_{CE}$*

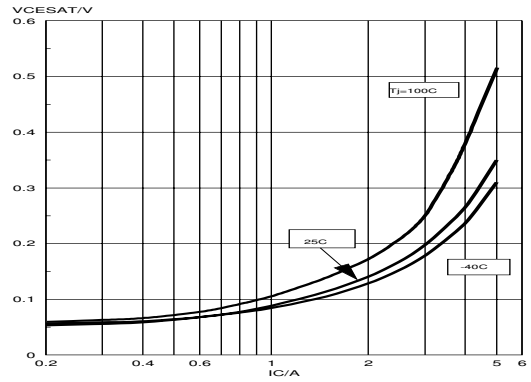



*Fig.12. Collector-Emitter saturation voltage. Solid lines = typ values, $V_{CEsat}$ = f(IC); at IC/IB =4.*

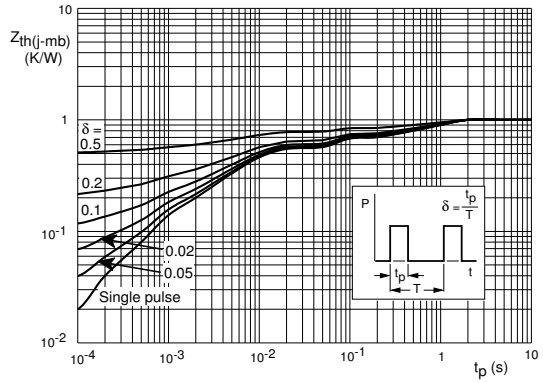



*Fig.13. Transient thermal impedance. $Z_{th\ j\text{-}mb} = f(t)$; parameter $\delta = t_p/T$*

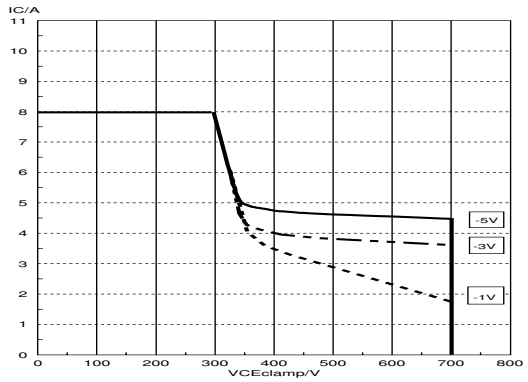



*Fig.15. Reverse bias safe operating area ($T_j < T_{jmax}$) for $-V_{BE}$ = 5V,3V & 1V.*

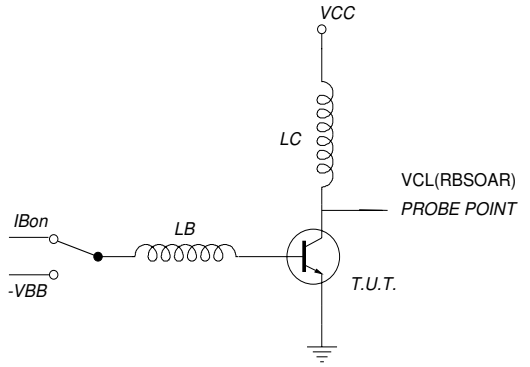
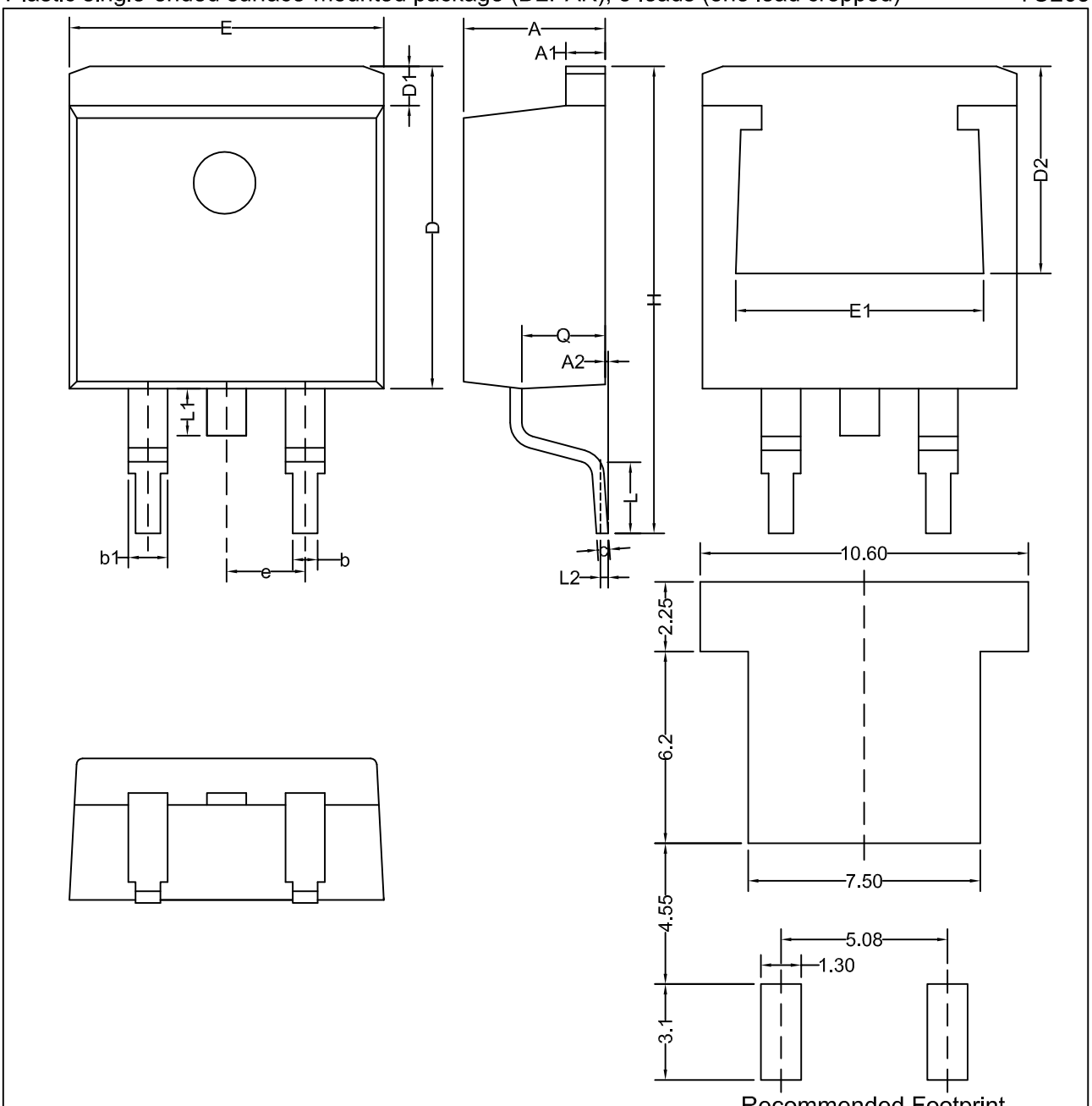



*Fig.14. Test circuit for reverse bias safe operating area.*

*$V_{clamp}$ < 700V; $V_{cc}$ = 150V; $-V_{be}$ = 5V,3V & 1V; $L_B$ = 1μH; $L_C$ = 200μH.*

## MECHANICAL DATA

Plastic single-ended surface-mounted package (D2PAK); 3 leads (one lead cropped) TO263




| | A | A1 | A2 | b | b1 | c | D | D1 | D2 | e | E | E1 | H | L | L1 | L2 | Q |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| min | 4.10 | 1.22 | 0.00 | 0.60 | 1.05 | 0.34 | --- | 1.20 | 6.60 | 2.54 (BSC) | 9.70 | 7.80 | 14.80 | 2.10 | --- | 0.25 (BSC.) | 2.20 |
| max | 4.70 | 1.40 | 0.25 | 0.90 | 1.45 | 0.64 | 11.00 | 1.60 | --- | | 10.30 | --- | 15.80 | 2.90 | 1.75 | | 2.79 |

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|---|---|---|
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