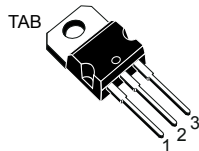
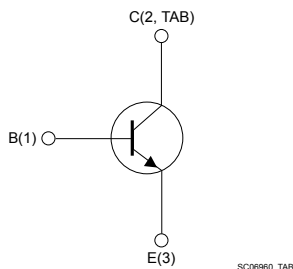


High voltage fast-switching NPN power transistor


TO-220


Features

- High voltage capability
- Low spread of dynamic parameters
- Minimum lot-to-lot spread for reliable operation
- Very high switching speed

Applications

- Electronic ballast for fluorescent lighting
- Switch mode power supplies

Description

The BUL1203E is manufactured using diffused collector in planar technology to enhance switching speeds and tight h_{FE} range while maintaining a wide RBSOA.

Thanks to his enhanced high voltage structure 1 (EHVS1) it has an intrinsic ruggedness which enables the transistor to withstand a high collector current level during breakdown condition, without using the transil protection usually necessary in typical converters for lamp ballast.



Product status link

[BUL1203E](#)

Product summary

Order code	BUL1203E
Marking	BUL1203E
Package	TO-220
Packing	Tube

1 Electrical ratings

$T_{\text{case}} = 25\text{ °C}$ unless otherwise specified.

Table 1. Electrical characteristics

Symbol	Parameter	Value	Unit
V_{CBO}	Collector-base voltage ($I_{\text{E}} = 0\text{ A}$)	1200	V
V_{CES}	Collector-emitter voltage ($V_{\text{BE}} = 0\text{ V}$)	1200	V
V_{CEO}	Collector-emitter voltage ($I_{\text{B}} = 0\text{ A}$)	550	V
V_{EBO}	Collector-base voltage ($I_{\text{C}} = 0\text{ A}$)	9	V
I_{C}	Collector current	5	A
I_{CM}	Collector peak current ($t_{\text{p}} < 5\text{ ms}$)	8	A
I_{B}	Base current	2	A
I_{BM}	Base peak current ($t_{\text{p}} < 5\text{ ms}$)	4	A
P_{TOT}	Total power dissipation at $T_{\text{C}} = 25\text{ °C}$	100	W
T_{stg}	Storage temperature range	-65 to 150	°C
T_{J}	Operating junction temperature range		°C

Table 2. Thermal data

Symbol	Parameter	Value	Unit
R_{thJC}	Thermal resistance, junction-to-case	1.25	°C/W
R_{thJA}	Thermal resistance, junction-to-ambient	62.5	°C/W

2 Electrical characteristics

$T_{\text{case}} = 25^{\circ}\text{C}$ unless otherwise specified.

Table 3. Electrical characteristics

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
I_{CES}	Collector cut-off current	$V_{\text{CE}} = 1200 \text{ V}, V_{\text{BE}} = 0 \text{ V}$			100	μA
I_{CEO}	Emitter cut-off current	$V_{\text{CE}} = 550 \text{ V}$			100	μA
$V_{\text{CEO(sus)}}^{(1)}$	Collector-emitter sustaining voltage	$I_{\text{C}} = 100 \text{ mA}, I_{\text{B}} = 0 \text{ A}$	550			V
V_{EBO}	Emitter-base voltage	$I_{\text{C}} = 0 \text{ A}, I_{\text{E}} = 10 \text{ mA}$	9			V
$V_{\text{CE(sat)}}^{(1)}$	Collector-emitter saturation voltage	$I_{\text{C}} = 1 \text{ A}, I_{\text{B}} = 0.2 \text{ A}$			0.5	V
		$I_{\text{C}} = 2 \text{ A}, I_{\text{B}} = 0.4 \text{ A}$			0.7	
		$I_{\text{C}} = 3 \text{ A}, I_{\text{B}} = 1 \text{ A}$			1.5	
$V_{\text{BE(sat)}}^{(1)}$	Base-emitter saturation voltage	$I_{\text{C}} = 2 \text{ A}, I_{\text{B}} = 0.4 \text{ A}$			1.5	V
		$I_{\text{C}} = 3 \text{ A}, I_{\text{B}} = 1 \text{ A}$			1.5	
$h_{\text{FE}}^{(1)}$	DC current gain	$I_{\text{C}} = 1 \text{ mA}, V_{\text{CE}} = 5 \text{ V}$	10			
		$I_{\text{C}} = 10 \text{ mA}, V_{\text{CE}} = 5 \text{ V}$	10			
		$I_{\text{C}} = 0.8 \text{ A}, V_{\text{CE}} = 3 \text{ V}$	14		32	
		$I_{\text{C}} = 2 \text{ A}, V_{\text{CE}} = 5 \text{ V}$	9		28	
	Resistive load					
t_{on}	Turn-on time	$I_{\text{C}} = 2 \text{ A}, I_{\text{B1}} = 0.4 \text{ A}, I_{\text{B2}} = -0.8 \text{ A},$ $t_{\text{p}} = 30 \mu\text{s}, V_{\text{CC}} = 150 \text{ V}$ (see Figure 11. Resistive load switching test circuit)			0.5	μs
t_{s}	Storage time			2.5	3.0	
t_{f}	Fall time			0.2	0.3	
E_{AR}	Repetitive avalanche energy	$L = 2 \text{ mH}, C = 1.8 \text{ nF}, V_{\text{CC}} = 50 \text{ V},$ $V_{\text{BE}} = -5 \text{ V}$ (see Figure 12. Energy rating test circuit)	6			mJ

1. Pulsed: Pulse duration = 300 μs , duty cycle 1.5%.

2.1 Electrical characteristics (curves)

Figure 1. Safe operating area

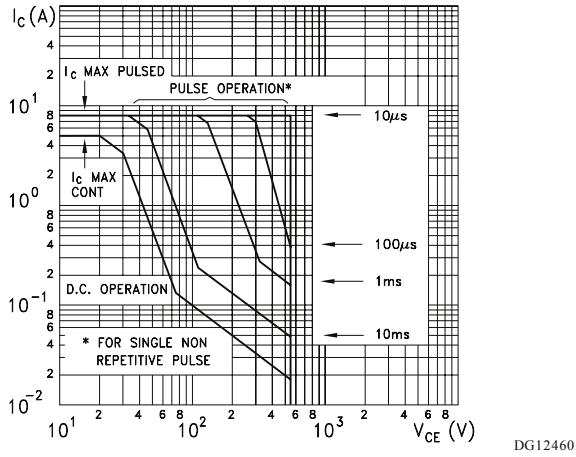


Figure 2. Derating curve

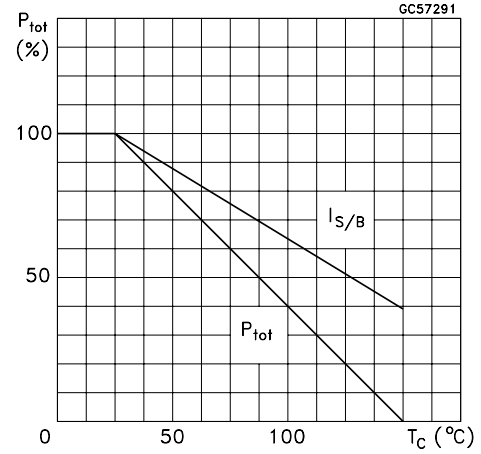


Figure 3. DC current gain at $V_{CE} = 1.5V$

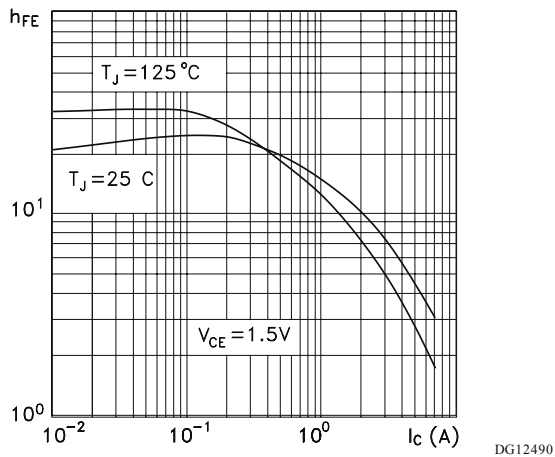


Figure 4. DC current gain at $V_{CE} = 5V$

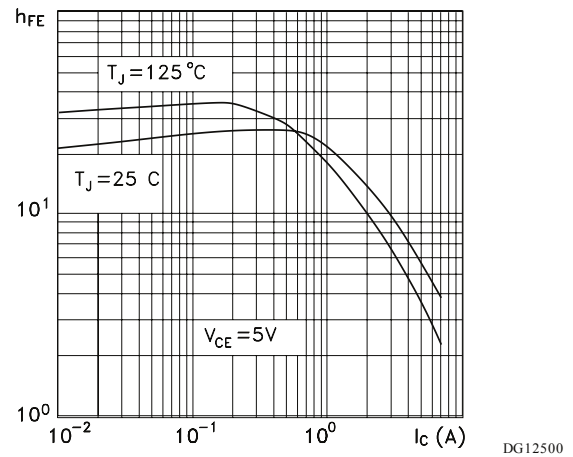


Figure 5. Collector emitter saturation voltage

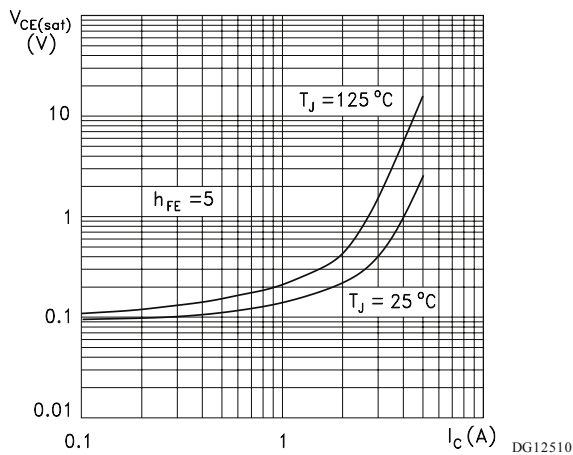


Figure 6. Base emitter saturation voltage

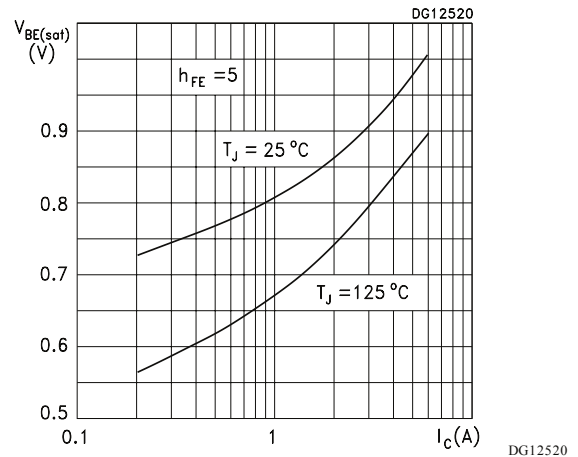


Figure 7. Inductive load storage time

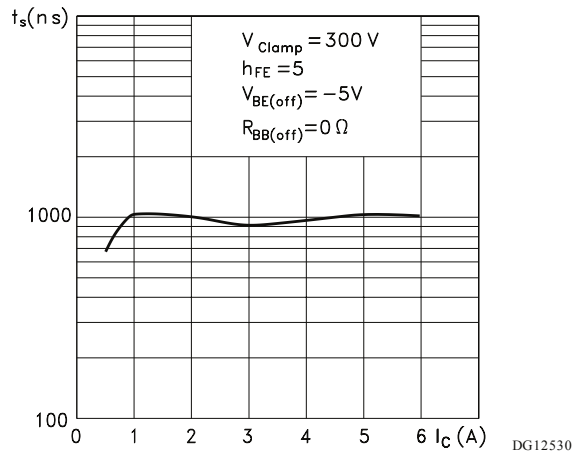


Figure 8. Inductive load fall time

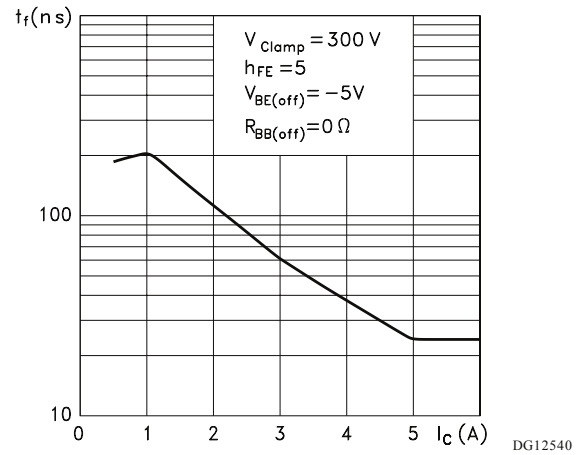
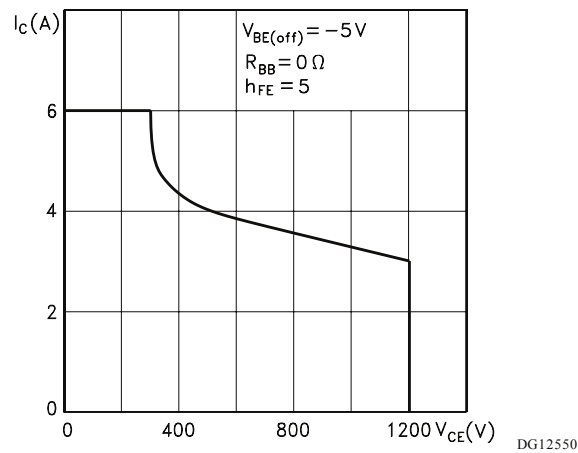


Figure 9. Reverse biased safe operating area



3 Test circuits

Figure 10. Inductive load switching test circuit

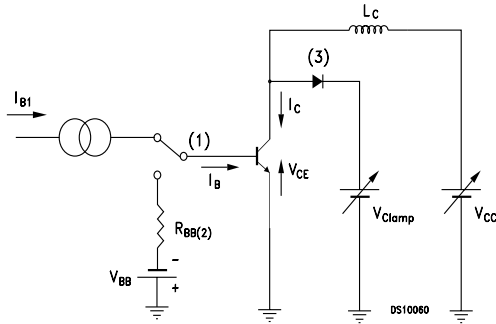


Figure 11. Resistive load switching test circuit

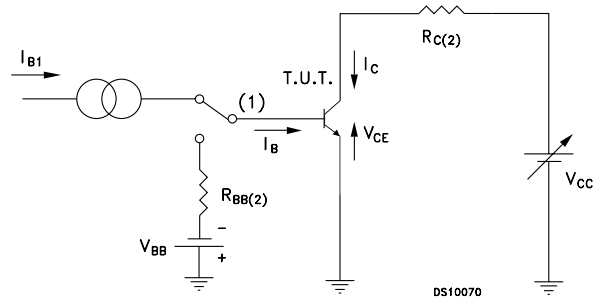
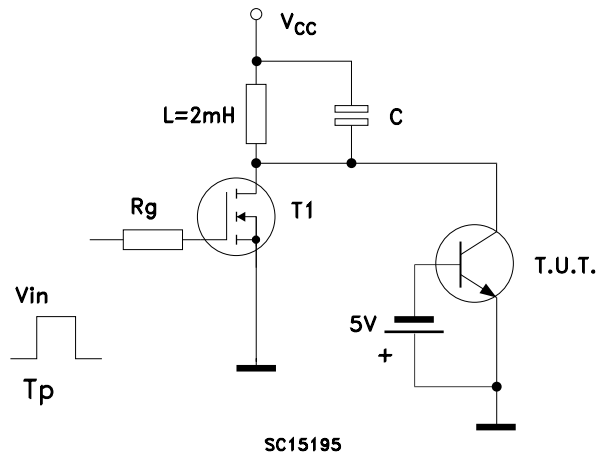


Figure 12. Energy rating test circuit

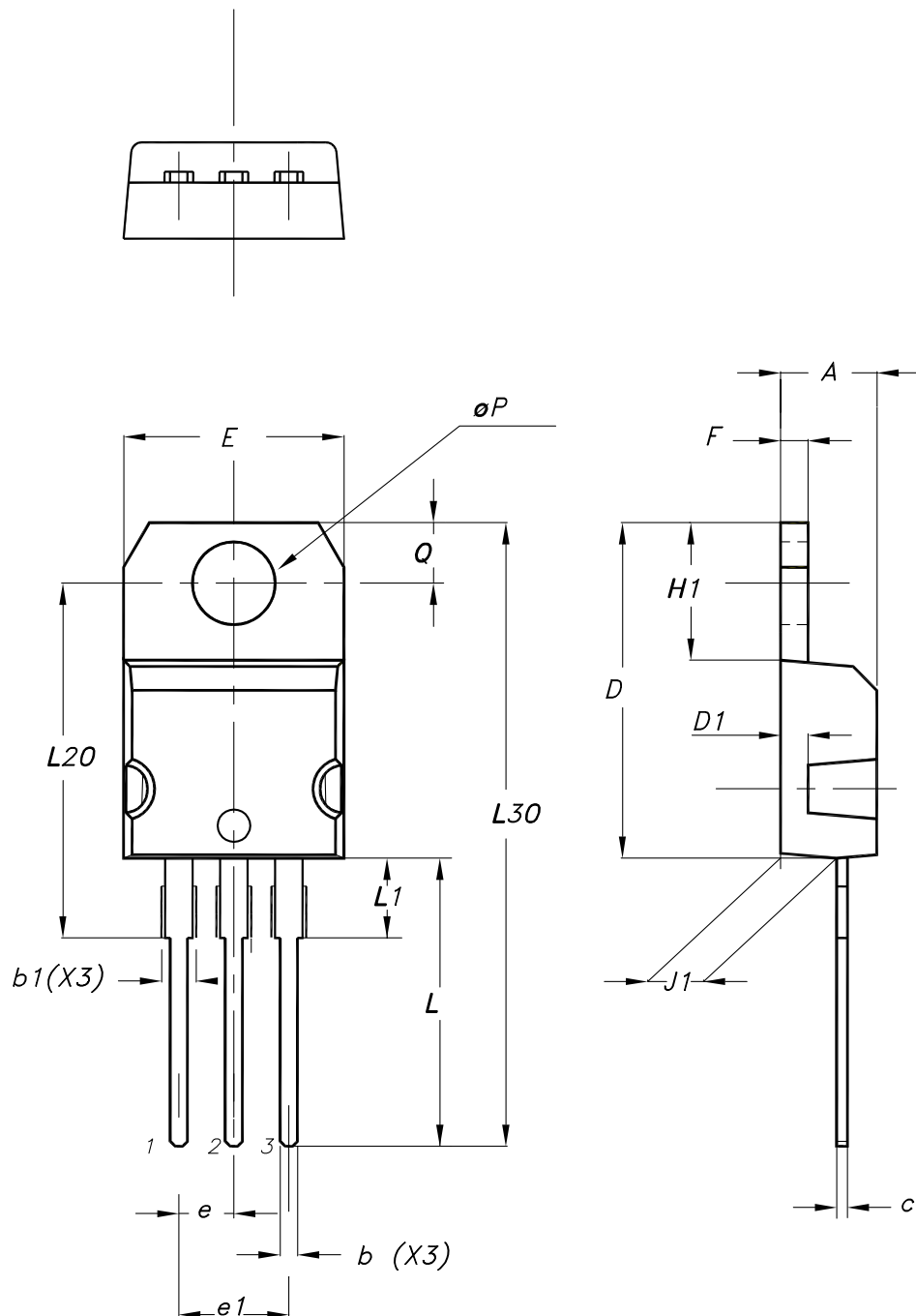


4 Package information

In order to meet environmental requirements, ST offers these devices in different grades of **ECOPACK** packages, depending on their level of environmental compliance. ECOPACK specifications, grade definitions and product status are available at: www.st.com. ECOPACK is an ST trademark.

4.1 TO-220 type A package information

Figure 13. TO-220 type A package outline



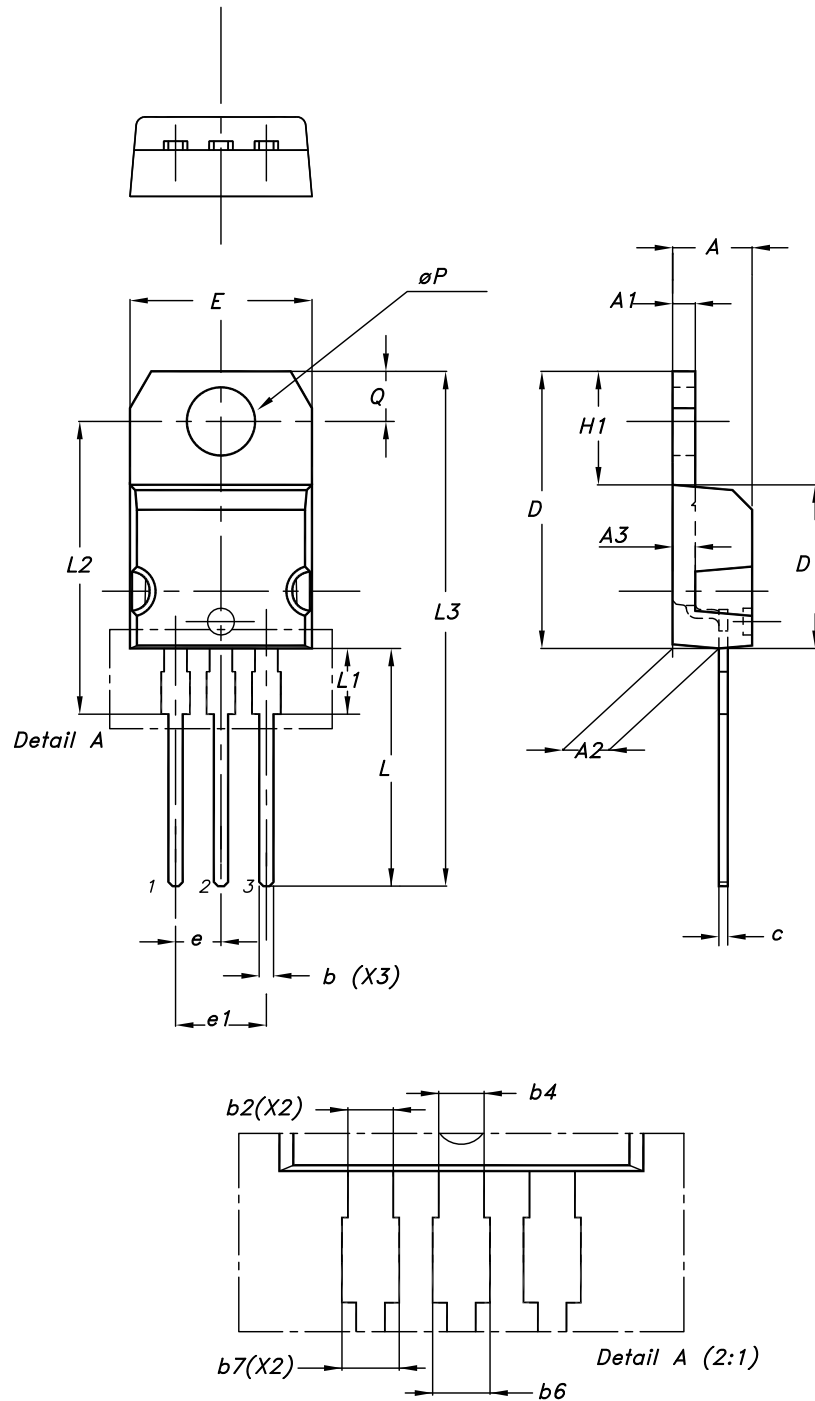
0015988_typeA_Rev_23

Table 4. TO-220 type A package mechanical data

Dim.	mm		
	Min.	Typ.	Max.
A	4.40		4.60
b	0.61		0.88
b1	1.14		1.55
c	0.48		0.70
D	15.25		15.75
D1		1.27	
E	10.00		10.40
e	2.40		2.70
e1	4.95		5.15
F	1.23		1.32
H1	6.20		6.60
J1	2.40		2.72
L	13.00		14.00
L1	3.50		3.93
L20		16.40	
L30		28.90	
øP	3.75		3.85
Q	2.65		2.95
Slug flatness		0.03	0.10

4.2 TO-220 type H package information

Figure 14. TO-220 type H package outline



0015988_H_23

Table 5. TO-220 type H package mechanical data

Dim.	mm		
	Min.	Typ.	Max.
A	4.40	4.45	4.50
A1	1.22		1.32
A2	2.49	2.59	2.69
A3	1.17	1.27	1.37
b	0.78		0.87
b2	1.25		1.34
b4	1.20		1.29
b6			1.50
b7			1.45
c	0.49		0.56
D	15.40	15.50	15.60
D1	9.05	9.15	9.25
E	10.08	10.18	10.28
e	2.44	2.54	2.64
e1	4.98	5.08	5.18
H1	6.25	6.35	6.45
L	13.20	13.40	13.60
L1	3.50	3.70	3.90
L2	16.30	16.40	16.50
L3	28.70	28.90	29.10
∅P	3.75	3.80	3.85
Q	2.70	2.80	2.90
Slug flatness		0.03	0.10

Revision history

Table 6. Document revision history

Date	Revision	Changes
8-Dec-2003	3	Minor text changes.
12-Apr-2021	4	Updated package and related information. Added Section 4.2 TO-220 type H package information . Minor text changes.

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