BTA312Y-600C

3Q Hi-Com Triac

Rev.02 - 05 July 2021 Product data sheet

1. General description

Planar passivated high commutation three quadrant triac in an IITO220 internally insulated plastic package intended for use in circuits where high static and dynamic dV/dt and high dI/dt can occur. This "series C" triac will commutate the full RMS current at the maximum rated junction temperature without the aid of a snubber. This device has an internally isolated mounting base.

2. Features and benefits

- 3Q technology for improved noise immunity
- High commutation capability with maximum false trigger immunity
- High immunity to false turn-on by dV/dt
- Isolated mounting base with 2500 V (RMS) isolation
- Less sensitive gate for high noise immunity
- Planar passivated for voltage ruggedness and reliability
- Triggering in three quadrants only

3. Applications

- Electronic thermostats (heating and cooling)
- Motor control
- Rectifier-fed DC inductive loads e.g. DC motors and solenoids

4. Quick reference data

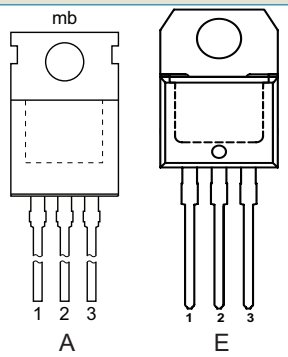
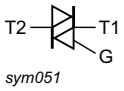
Table 1. Quick reference data

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
V_{DRM}	repetitive peak off-state voltage			-	-	600	V
$I_{T(RMS)}$	RMS on-state current	full sine wave; $T_{mb} \leq 84$ °C; Fig. 1; Fig. 2; Fig. 3		-	-	12	A
I_{TSM}	non-repetitive peak on-state current	full sine wave; $T_{j(init)} = 25$ °C; t_p =20 ms; Fig. 4; Fig. 5		-	-	100	A
		full sine wave; $T_{j(init)} = 25$ °C; t_p = 16.7 ms		-	-	110	A
T_j	junction temperature			-	-	125	°C
Symbol	**Parameter**	**Conditions**		**Min**	**Typ**	**Max**	**Unit**
Static characteristics							
I_{GT}	gate trigger current	V_D = 12 V; I_T = 100mA; T2+ G+; T_j = 25 °C; Fig. 7		2	-	35	mA
		V_D = 12 V; I_T = 100mA; T2+ G-; T_j = 25 °C; Fig. 7		2	-	35	mA

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
		V_D = 12 V; I_T = 0.1 A; T2- G+-; T_j = 25 °C; Fig. 7		2	-	35	mA
I_H	holding current	V_D = 12 V;T_j = 25 °C; Fig. 9		-	-	35	mA
V_T	on-state voltage	I_T = 15 A; T_j = 25 °C; Fig. 10		-	1.3	1.6	V
Dynamic characteristics							
dV_D/dt	rate of rise of off-state voltage	V_{DM} = 402 V; T_j = 125 °C; (V_{DM} = 67% of V_{DRM}); exponential waveform; gate open circuit		500	-	-	V/µs
d_{Icom}/dt	rate of change of commutating current	V_{DM} = 400 V; T_j = 125 °C;$I_{T(RMS)}$= 12 A; dV_{com}/dt = 20 V/µs; (snubberless condition); gate open circuit		20	-	-	A/ms

5. Pinning information

Table 2. Pinning information

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	T1	main terminal 1		
2	T2	main terminal 2		
3	G	gate		
mb	n.c.	mounting base; isolated		

6. Ordering information

Table 3. Ordering information

Type number	Package Name	Orderable part number	Packing method	Small packing quantity	Package version	Package issue date
BTA312Y-600C	IITO220	BTA312Y-600C,127	Tube	50	SOT78D (A)	07-July-2010
					IITO220E (E)	15-Dec-2017

7. Marking

Table 4. Marking codes

Type number	Marking codes	
	Assembly factory: A	Assembly factory: E
BTA312Y-600C	BTA312Y 600C PJAxxxx xx	BTA312Y 600C PJExxxx xx

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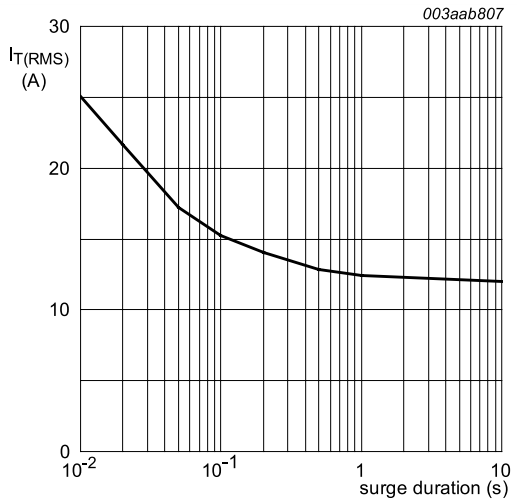
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8. Limiting values

Table 5. Limiting values

In accordance with the Absolute Maximum Rating System (IEC 60134).

Symbol	Parameter	Conditions		Min	Max	Unit
V_{DRM}	repetitive peak off-state voltage			-	600	V
$I_{T(RMS)}$	RMS on-state current	full sine wave; $T_{mb} \leq 84$ °C; Fig. 1; Fig. 2; Fig. 3		-	12	A
I_{TSM}	non-repetitive peak on-state current	full sine wave; $T_{j(init)} = 25$ °C; $t_p = 20$ ms; Fig. 4; Fig. 5		-	100	A
		full sine wave; $T_{j(init)} = 25$ °C; $t_p = 16.7$ ms		-	110	A
I^2t	I^2t for fusing	$t_p = 10$ ms; SIN		-	50	A^2s
dI_T/dt	rate of rise of on-state current	$I_G = 0.2$ A		-	100	A/µs
I_{GM}	peak gate current			-	2	A
P_{GM}	peak gate power			-	5	W
$P_{G(AV)}$	average gate power	over any 20 ms period		-	0.5	W
T_{stg}	storage temperature			-40	125	°C
T_j	junction temperature			-	125	°C



f = 50 Hz; T_{mb} =84 °C

Fig. 1. RMS on-state current as a function of surge duration; maximum values

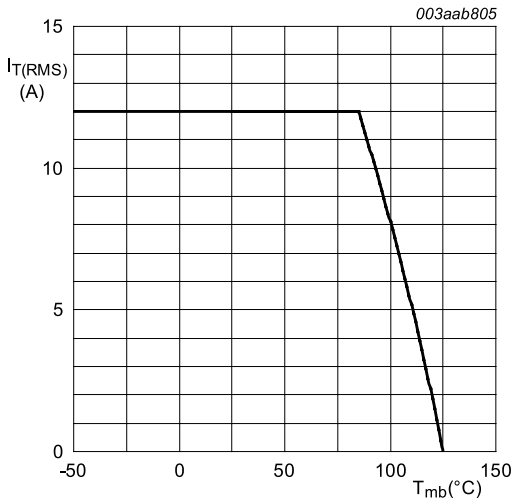
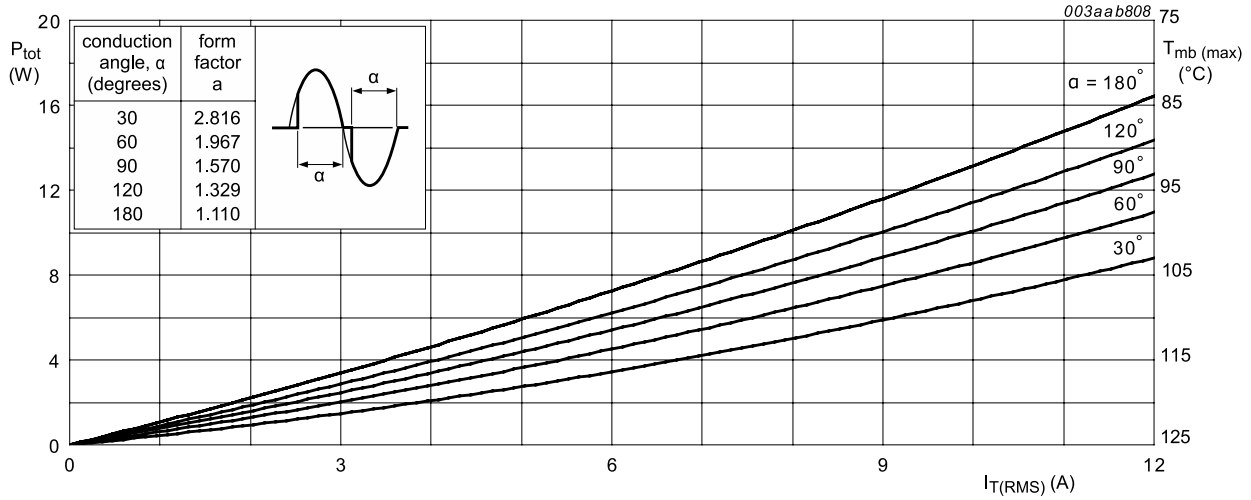


Fig. 2. RMS on-state current as a function of mounting base temperature; maximum values

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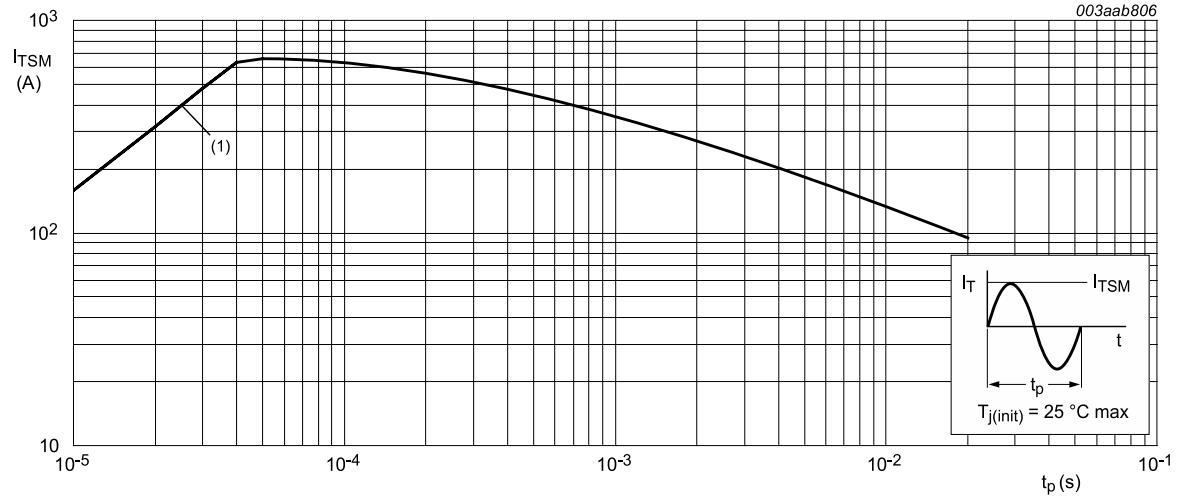
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a = form factor = $I_{T(RMS)}$ / $I_{T(AV)}$

α = conduction angle

Fig. 3. Total power dissipation as a function of RMS on-state current; maximum values



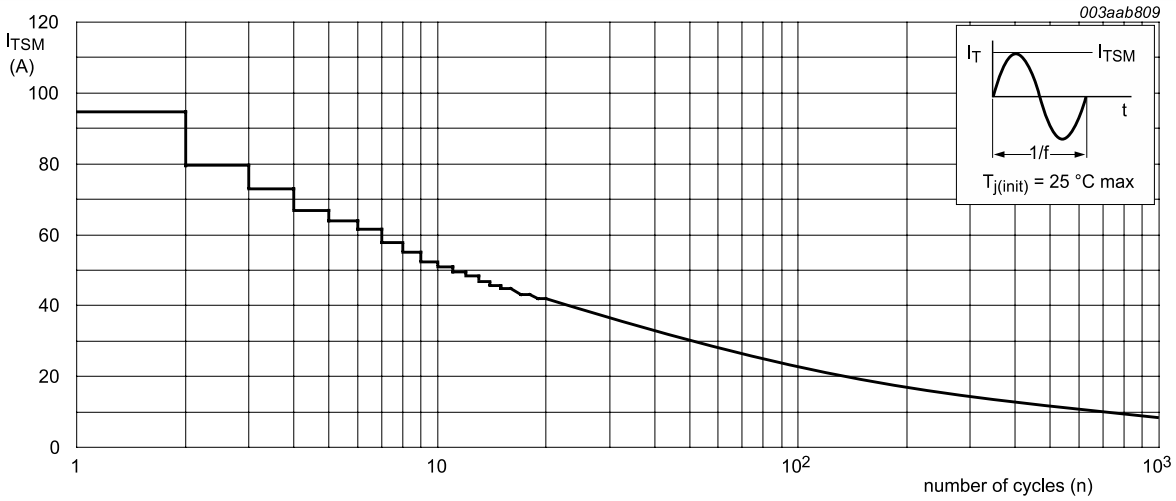
$t_p \leq 20$ ms

(1) dI_T/dt limit

Fig. 4. Non-repetitive peak on-state current as a function of pulse duration; maximum values

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f = 50 Hz

Fig. 5. Non-repetitive peak on-state current as a function of the number of sinusoidal current cycles; maximum values

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9. Thermal characteristics

Table 6. Thermal characteristics

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
$R_{th(j-mb)}$	thermal resistance from junction to mounting base	full cycle; Fig. 6		-	-	2.3	K/W
$R_{th(j-a)}$	thermal resistance from junction to ambient	in free air		-	60	-	K/W

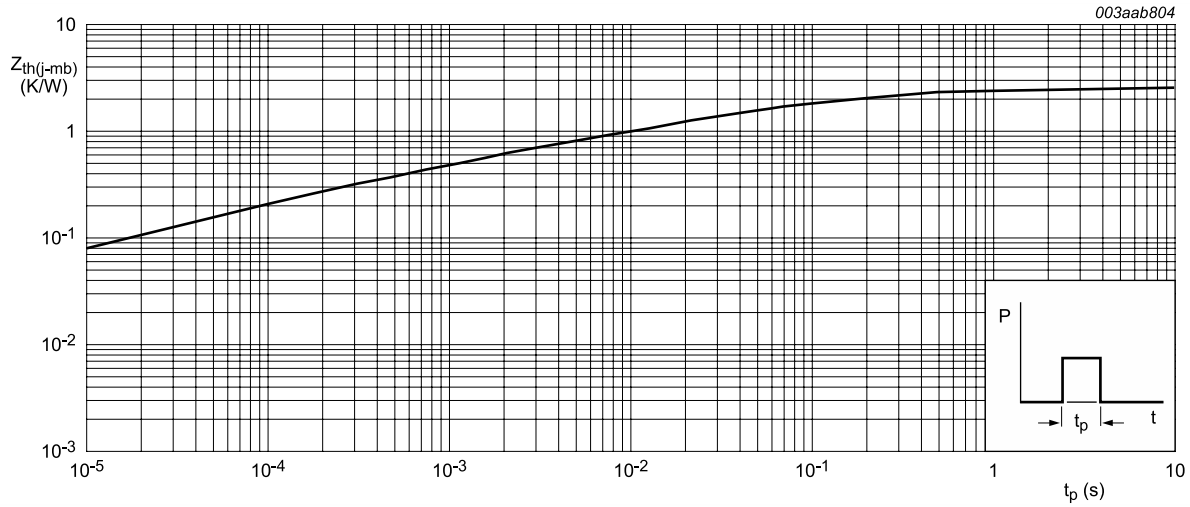


Fig. 6. Transient thermal impedance from junction to mounting base as a function of pulse duration

10. Isolation Characteristics

Table 7. Isolation Characteristics

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
$V_{isol(RMS)}$	RMS isolation voltage	from all terminals to external heatsink; sinusoidal waveform; clean and dust free; 50 Hz ≤ f ≤ 60 Hz; RH ≤ 65 %; T_{mb} = 25 °C		-	-	2500	V
C_{isol}	isolation capacitance	from main terminal 2 to external heatsink; f = 1 MHz; T_{mb} = 25 °C		-	10	-	pF

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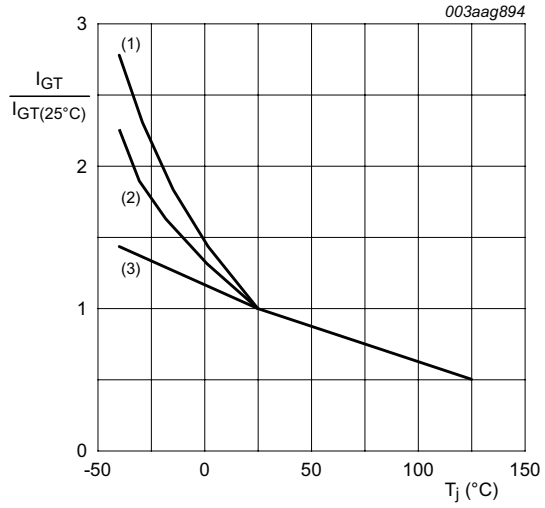
11. Characteristics

Table 8. Characteristics

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
Static characteristics							
I_{GT}	gate trigger current	V_D = 12 V; I_T = 0.1 A; T2+ G+; T_j = 25 °C; Fig. 7		2	-	35	mA
		V_D = 12 V; I_T = 0.1 A; T2+ G-; T_j = 25 °C; Fig. 7		2	-	35	mA
		V_D = 12 V; I_T = 0.1 A; T2- G-; T_j = 25 °C; Fig. 7		2	-	35	mA
I_L	latching current	V_D = 12 V; I_G = 0.1 A; T2+ G+; T_j = 25 °C; Fig. 8		-	-	50	mA
		V_D = 12 V; I_G = 0.1 A; T2+ G-; T_j = 25 °C; Fig. 8		-	-	60	mA
		V_D = 12 V; I_G = 0.1 A; T2- G-; T_j = 25 °C; Fig. 8		-	-	50	mA
I_H	holding current	V_D = 12 V;T_j = 25 °C; Fig. 9		-	-	35	mA
V_T	on-state voltage	I_T = 15 A; T_j = 25 °C; Fig. 10		-	1.3	1.6	V
V_{GT}	gate trigger voltage	V_D = 12 V; I_T = 0.1 A; T_j = 25 °C; Fig. 11		-	0.8	1	V
		V_D = 12 V; I_T = 0.1 A; T_j = 25 °C		0.25	0.4	-	V
I_D	off-state current	V_D = 600 V; T_j = 125 °C		-	0.1	0.5	mA
Dynamic characteristics							
dV_D/dt	rate of rise of off-state voltage	V_{DM} = 402 V; T_j = 125 °C; (V_{DM} = 67% of V_{DRM}); exponential waveform; gate open circuit		500	-	-	V/µs
d_{Icom}/dt	rate of change of commutating current	V_{DM} = 400 V; T_j = 125 °C;$I_{T(RMS)}$= 12 A; dV_{com}/dt = 20 V/µs; (snubberless condition); gate open circuit		20	-	-	A/ms
t_{gt}	gate-controlled turn-on time	I_{TM} = 20 A; V_D = 600 V; I_G = 0.1 A; dI_G/dt = 5 A/µs		-	2	-	µs

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(1) T2- G-
(2) T2+ G-
(3) T2+ G+

Fig. 7. Normalized gate trigger current as a function of junction temperature

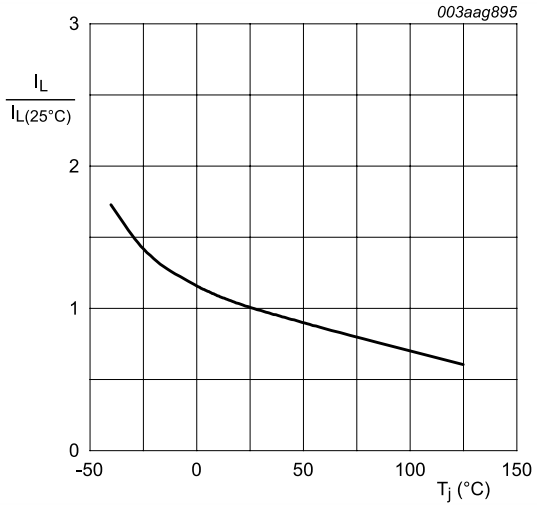


Fig. 8. Normalized latching current as a function of junction temperature

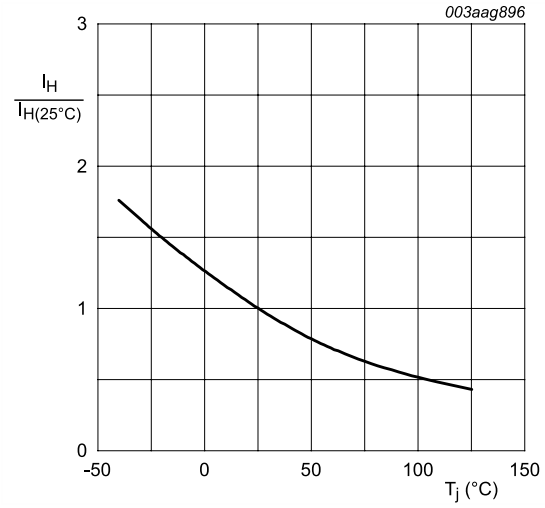
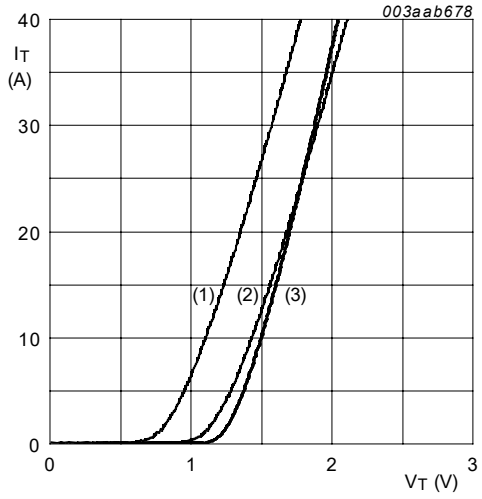


Fig. 9. Normalized holding current as a function of junction temperature



V_o = 1.164 V; R_s = 0.027Ω
(1) T_j = 125 °C; typical values
(2) T_j = 125 °C; maximum values
(3) T_j = 25 °C; maximum values

Fig. 10. On-state current as a function of on-state voltage

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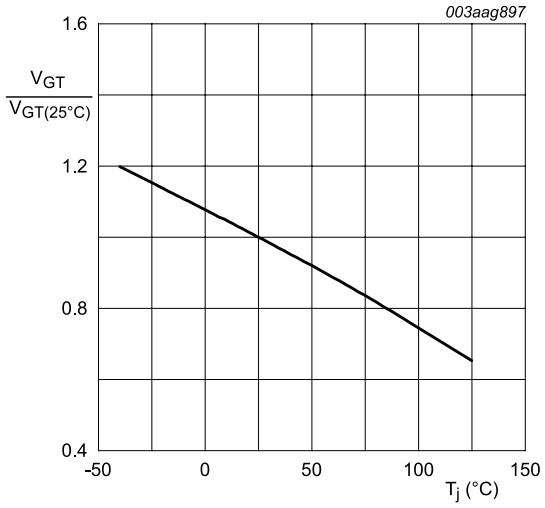


Fig. 11. Normalized gate trigger voltage as a function of junction temperature

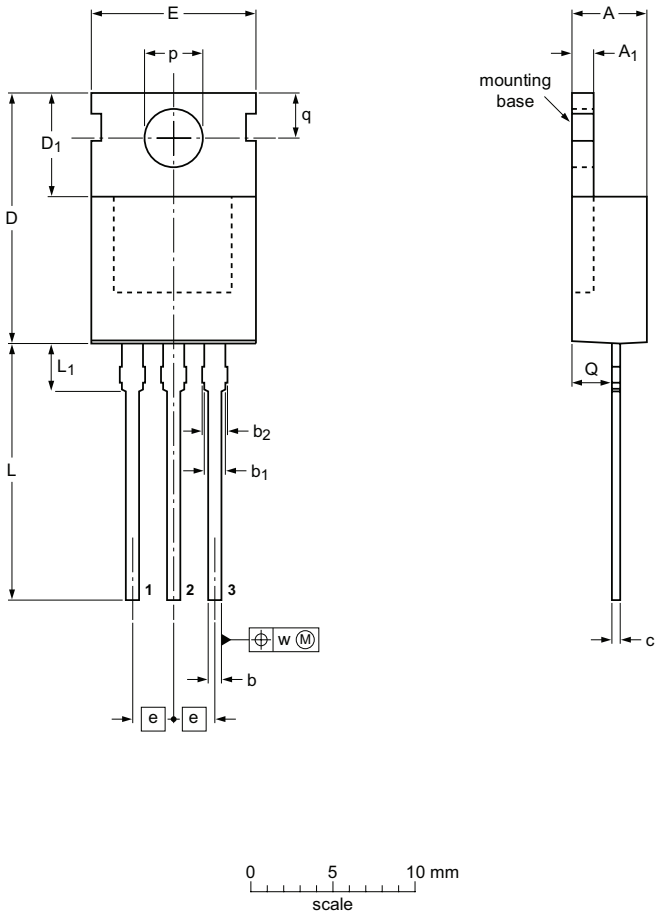
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12. Package outline

Assembly factory: A

Plastic single-ended package; isolated heatsink mounted; 1 mounting hole; 3-lead TO-220 **SOT78D**



DIMENSIONS (mm are the original dimensions)

UNIT	A	A_1	b	b_1	b_2	c	D	D_1 ref	E	e	L	L_1 ref	p	Q	q	w
mm	4.7 4.3	1.40 1.25	0.9 0.6	1.4 1.1	1.72 1.32	0.6 0.4	16.0 15.2	6.5	10.3 9.7	2.54	14.0 12.8	3.0	3.7 3.5	2.6 2.2	3.0 2.7	0.2

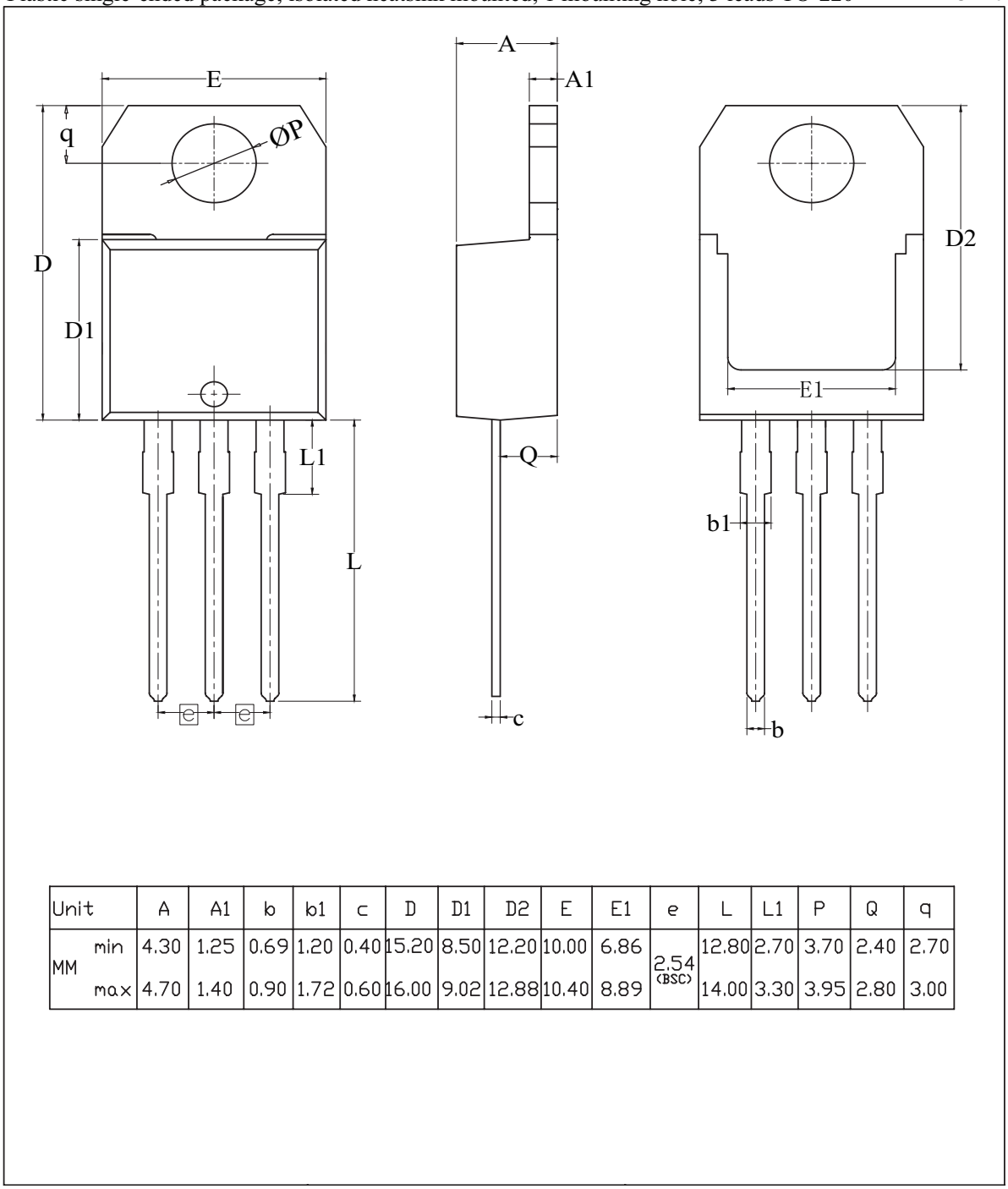
OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	JEITA			
SOT78D		TO-220				~~07-04-04~~ 07-07-10

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Assembly factory: E

Plastic single-ended package; isolated heatsink mounted; 1 mounting hole; 3 leads TO-220 IITO220



Unit		A	A1	b	b1	c	D	D1	D2	E	E1	e	L	L1	P	Q	q
MM	min	4.30	1.25	0.69	1.20	0.40	15.20	8.50	12.20	10.00	6.86	2.54 (BSC)	12.80	2.70	3.70	2.40	2.70
	max	4.70	1.40	0.90	1.72	0.60	16.00	9.02	12.88	10.40	8.89		14.00	3.30	3.95	2.80	3.00

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Preliminary [short] data sheet	Qualification	This document contains data from the preliminary specification.
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