BT137-600G0

4Q Triac

Rev.01 - 11 July 2018 Product data sheet

1. General description

Planar passivated four quadrant triac in a SOT78 (TO-220AB) plastic package intended for use in general purpose bidirectional switching and phase control applications.

2. Features and benefits

- High blocking voltage capability
- Least sensitive gate for highest noise immunity
- High minimum I_{GT} for guaranteed immunity to gate noise
- Planar passivated for voltage ruggedness and reliability
- Triggering in all four quadrants

3. Applications

- General purpose motor controls
- Lighting controls
- Applications where only positive gate drive is avaliable
- Applications where gate noise or interference may occur

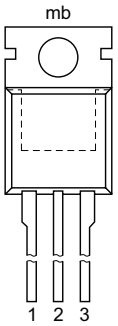
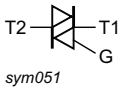
4. Quick reference data

Table 1. Quick reference data

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
V_{DRM}	repetitive peak off-state voltage			-	-	500	V
$I_{T(RMS)}$	RMS on-state current	full sine wave; $T_{mb} \leq 102$ °C; Fig. 1; Fig. 2; Fig. 3		-	-	8	A
T_j	junction temperature			-	-	125	°C
I_{TSM}	non-repetitive peak on-state current	full sine wave; $T_{j(init)} = 25$ °C; $t_p = 20$ ms; Fig. 4; Fig. 5		-	-	65	A
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		10	-	50	mA
		$V_D = 12$ V; $I_T = 0.1$ A; T2+ G-; $T_j = 25$ °C; Fig. 7		10	-	50	mA
		$V_D = 12$ V; $I_T = 0.1$ A; T2- G-; $T_j = 25$ °C; Fig. 7		10	-	50	mA
		$V_D = 12$ V; $I_T = 0.1$ A; T2- G-; $T_j = 25$ °C; Fig. 7		10	-	100	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		200	-	-	V/µs

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	T2	mounting base; main terminal 2		

6. Ordering information

Table 3. Ordering information

Type number	Package		
	Name	Description	Version
BTA137-600G0	TO-220AB	plastic single-ended package; heatsink mounted; 1 mounting hole; 3-lead TO-220AB	SOT78

7. Limiting values

Table 4. 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; $T_{mb} \leq 102$ °C; Fig. 1; Fig. 2; Fig. 3		-	8	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		-	65	A
		full sine wave; $T_{j(init)} = 25$ °C; $t_p = 16.7$ ms		-	71	A
I^2t	I^2t for fusing	$t_p = 10$ ms; sine-wave pulse		-	21	A^2s
dI_T/dt	rate of rise of on-state current	$I_G = 0.1$ A; T2+ G+		-	50	A/µs
		$I_G = 0.1$ A; T2+ G-		-	50	A/µs
		$I_G = 0.1$ A; T2- G-		-	50	A/µs
		$I_G = 0.2$ A; T2- G+		-	10	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	150	°C
T_j	junction temperature			-	125	°C

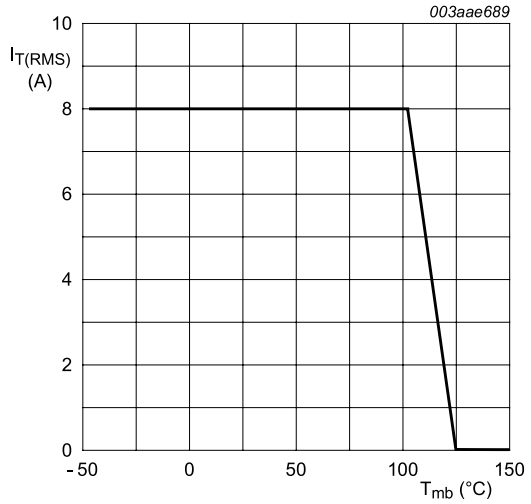
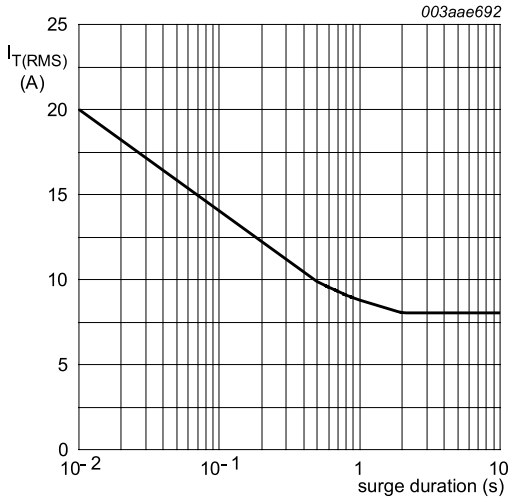
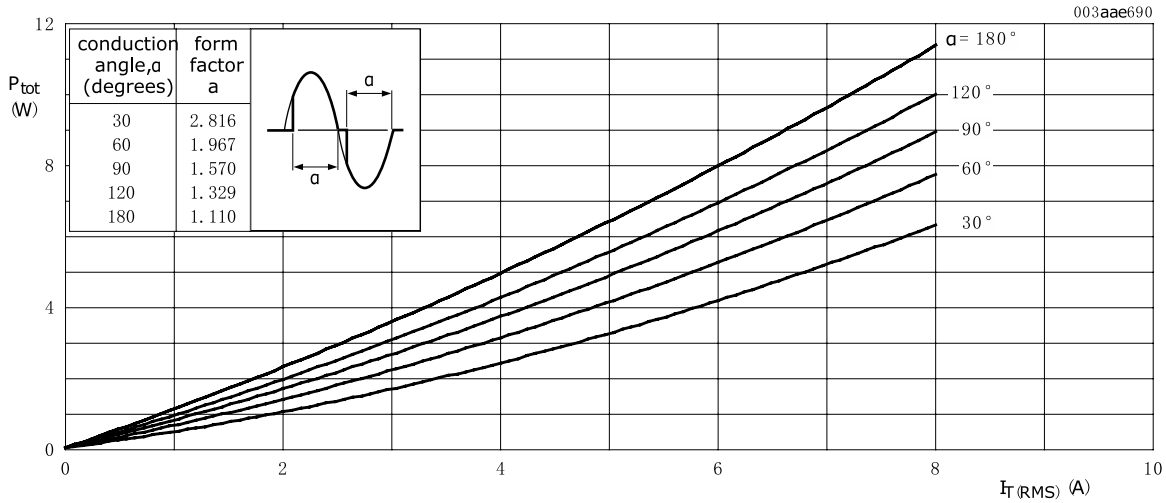


Fig. 1. RMS on-state current as a function of mounting base temperature; maximum values



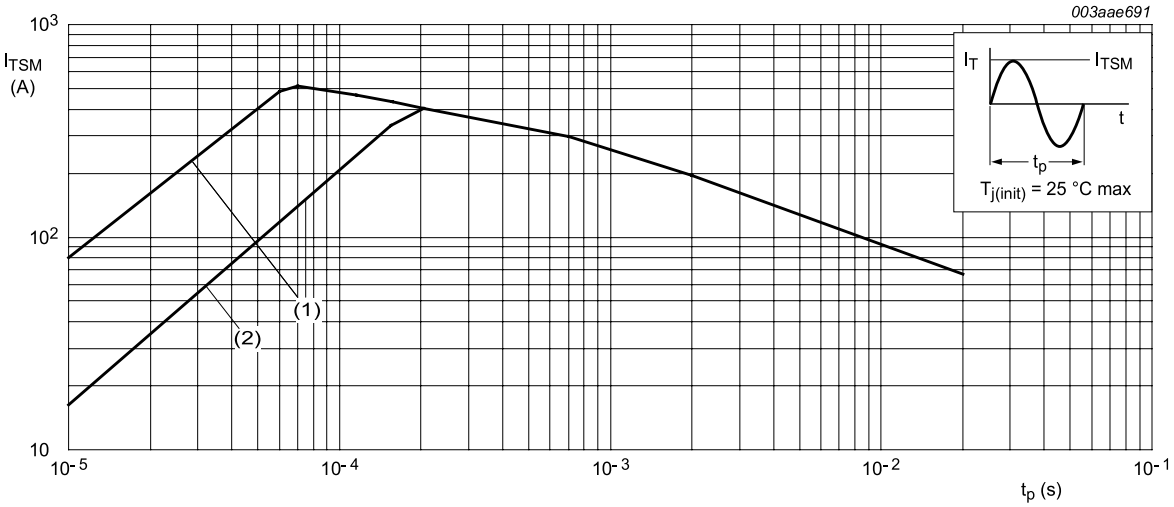
f = 50 Hz; $T_{mb} \leq 102$ °C

Fig. 2. RMS on-state current as a function of surge duration; maximum values



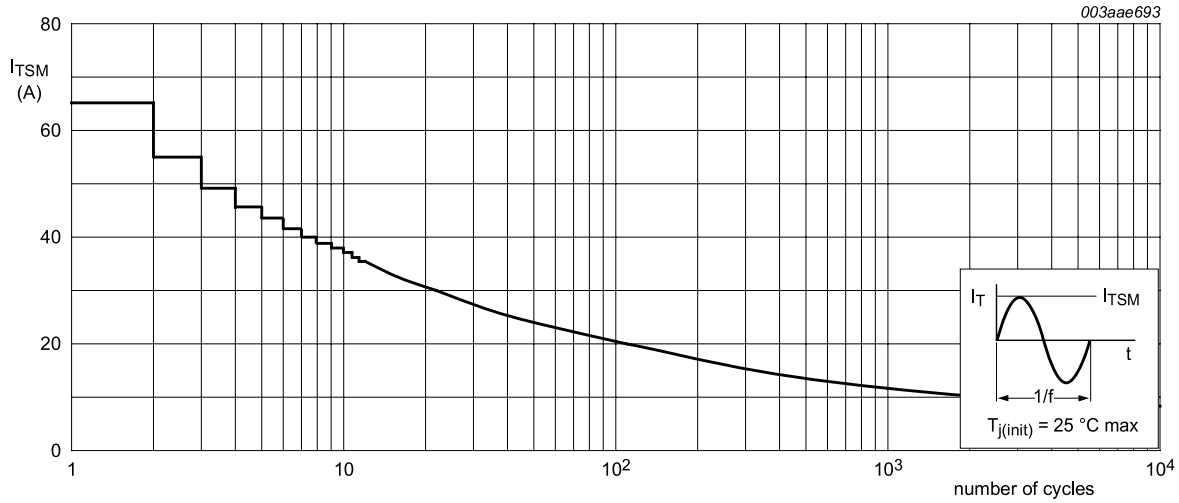
α = conduction angle
a = form factor = $I_{T(RMS)}$ / $I_{T(AV)}$

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



t_p ≤ 20 ms
(1) dI_T/dt limit
(2) T2- G+ quadrant limit

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



f = 50 Hz

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

8. Thermal characteristics

Table 5. 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	K/W
		half cycle; Fig. 6		-	-	2.4	K/W
$R_{th(j-a)}$	thermal resistance from junction to ambient	in free air		-	60	-	K/W

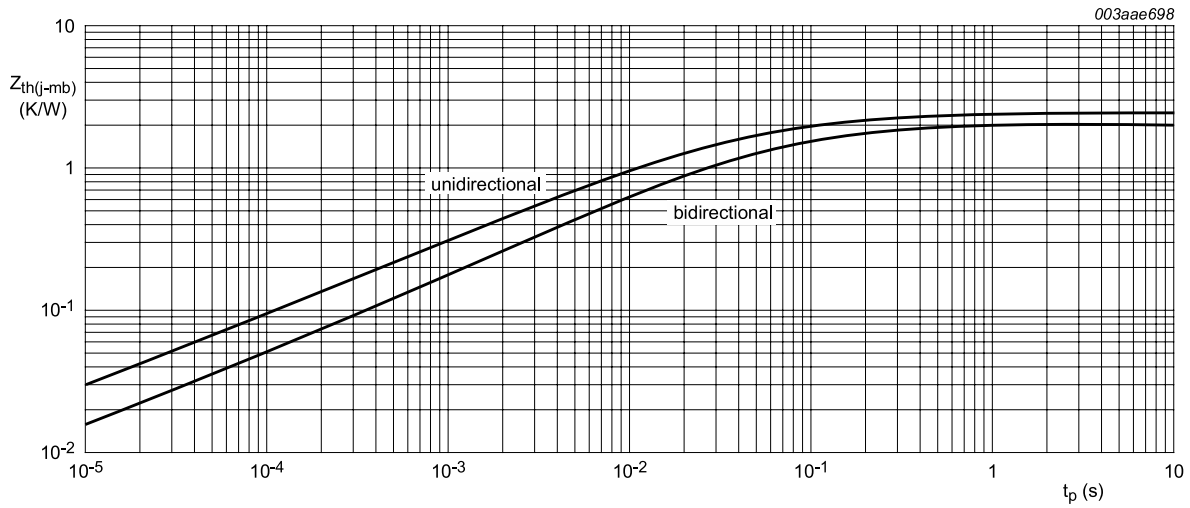
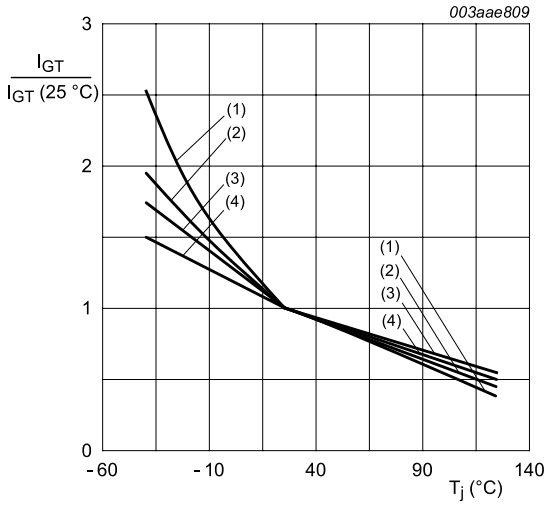


Fig. 6. Transient thermal impedance from junction to mounting base as a function of pulse width

9. Characteristics

Table 6. 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		10	-	50	mA
		V_D = 12 V; I_T = 0.1 A; T2+ G-; T_j = 25 °C; Fig. 7		10	-	50	mA
		V_D = 12 V; I_T = 0.1 A; T2- G-; T_j = 25 °C; Fig. 7		10	-	50	mA
		V_D = 12 V; I_T = 0.1 A; T2- G+; T_j = 25 °C; Fig. 7		10	-	100	mA
I_L	latching current	V_D = 12 V; I_G = 0.1 A; T2+ G+; T_j = 25 °C; Fig. 8		-	-	45	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		-	-	45	mA
		V_D = 12 V; I_G = 0.1 A; T2- G+; T_j = 25 °C; Fig. 8		-	-	60	mA
I_H	holding current	V_D = 12 V; T_j = 25 °C; Fig. 9		-	-	40	mA
V_T	on-state voltage	I_T = 10 A; T_j = 25 °C; Fig. 10		-	1.3	1.65	V
V_{GT}	gate trigger voltage	V_D = 12 V; I_T = 0.1 A;T_j = 25 °C; Fig. 11		-	0.7	1	V
		V_D = 400V; I_T = 0.1 A;T_j = 25 °C; Fig. 11		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		200	-	-	V/µs
dV_{com}/dt	rate of change of commutating voltage	V_D = 400 V; Tj = 95 °C; dI_{com}/dt = 3.6 A/ms; IT = 8 A; gate open circuit		10	-	-	V/µs
t_{gt}	gate-controlled turn-on time	I_{TM} = 12 A; V_D = 600 V; I_G = 0.1 A; dI_G/dt = 5 A/µs		-	2	-	µs



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

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

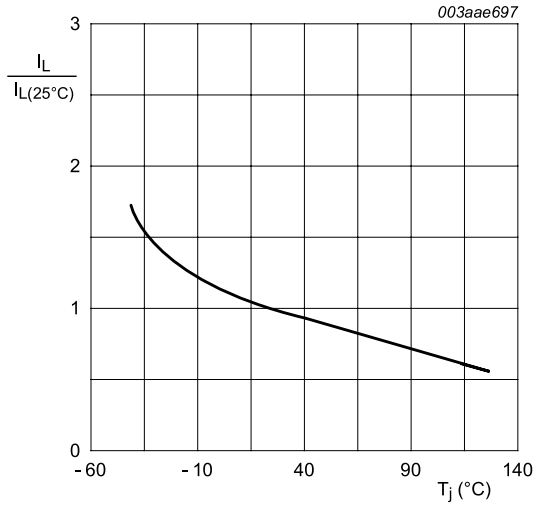


Fig. 8. Normalized latching current as a function of junction temperature

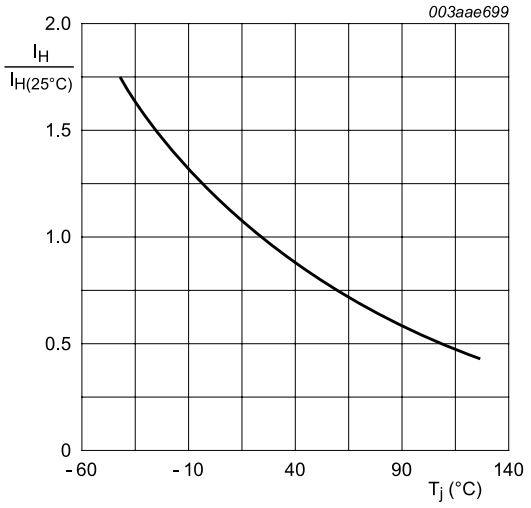
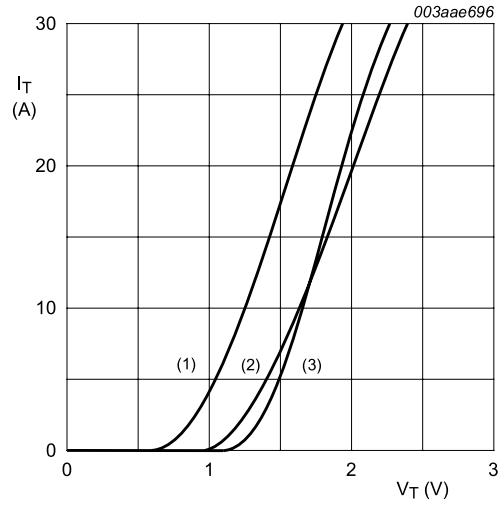


Fig. 9. Normalized holding current as a function of junction temperature



V_o = 1.264 V; Rs = 0.038 Ω
(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

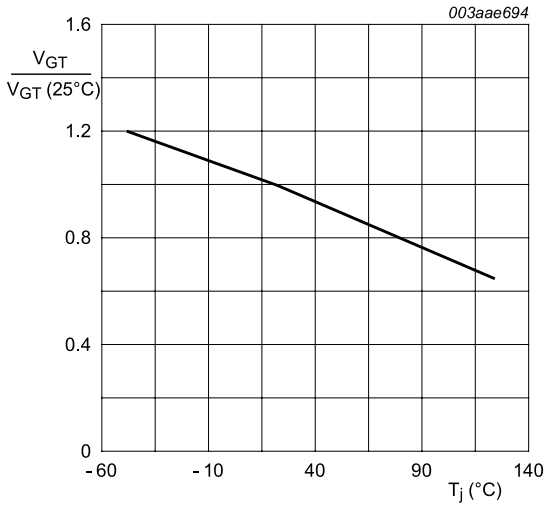
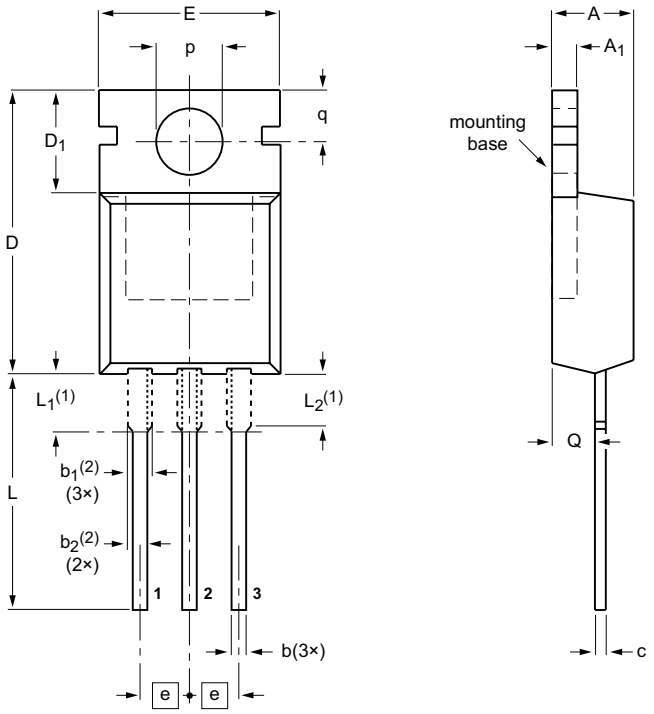


Fig. 11. Normalized gate trigger voltage as a function of junction temperature

10. Package outline

Plastic single-ended package; heatsink mounted; 1 mounting hole; 3-lead TO-220AB **SOT78**



DIMENSIONS (mm are the original dimensions)

UNIT	A	A_1	b	b_1(2)	b_2(2)	c	D	D_1	E	e	L	L_1(1)	L_2(1) max.	p	q	Q
mm	4.7 4.1	1.40 1.25	0.9 0.6	1.6 1.0	1.3 1.0	0.7 0.4	16.0 15.2	6.6 5.9	10.3 9.7	2.54	15.0 12.8	3.30 2.79	3.0	3.8 3.5	3.0 2.7	2.6 2.2

Notes

1. Lead shoulder designs may vary.
2. Dimension includes excess dambar.

OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	JEITA			
SOT78		3-lead TO-220AB	SC-46			~~08-04-23~~ 08-06-13

11. Legal information

Data sheet status

Document status [1][2]	Product status [3]	Definition
Objective [short] data sheet	Development	This document contains data from the objective specification for product development.
Preliminary [short] data sheet	Qualification	This document contains data from the preliminary specification.
Product [short] data sheet	Production	This document contains the product specification.

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[2] The term 'short data sheet' is explained in section "Definitions".
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