High-Efficiency Diode (HED) Silicon Diffused Junction

CRH01B

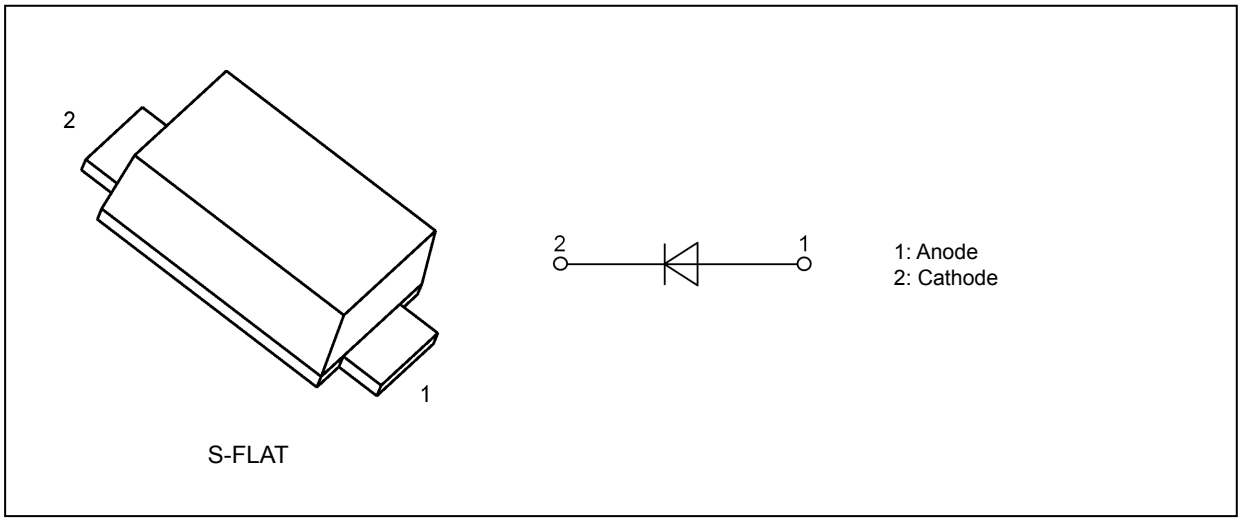
1. Applications

- Radio-Frequency Rectification in Switching Regulators

2. Features

(1) Repetitive peak reverse voltage : V_{RRM} = 200 V
(2) Average forward current : $I_{F(AV)}$ = 1.0 A
(3) Peak forward voltage : V_{FM} = 0.98 V (max) @I_{FM} = 1.0 A (pulse measurement)
(4) Reverse recovery time : t_{rr} = 35 ns (max) @I_F = 1.0 A, di/dt = -30 A/μs
(5) The use of small, thin surface-mount package is optimum way for high-density mounting.
Nickname: S-FLAT™

3. Packaging and Internal Circuit



Start of commercial production
2022-09

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4. Absolute Maximum Ratings (Note) (Unless otherwise specified, T_a = 25°C)

Characteristics		Symbol	Rating	Unit
Repetitive peak reverse voltage		V_{RRM}	200	V
Average forward current	(Note 1)	$I_{F(AV)}$	1.0	A
Non-repetitive peak forward surge current	(Note 2)	I_{FSM}	10	A
Forward pulse current	(Note 3)	I_{FP}	16	A
Junction temperature		T_j	150	°C
Storage temperature		T_{stg}	-55 to 150	°C

Note: Using continuously under heavy loads (e.g. the application of high temperature/current/voltage and the significant change in temperature, etc.) may cause this product to decrease in the reliability significantly even if the operating conditions (i.e. operating temperature/current/voltage, etc.) are within the absolute maximum ratings.
Please design the appropriate reliability upon reviewing the Toshiba Semiconductor Reliability Handbook ("Handling Precautions"/"Derating Concept and Methods") and individual reliability data (i.e. reliability test report and estimated failure rate, etc).

Note 1: T_a = 92 °C, device mounted on a ceramic board, Rectangular waveform (α = 180°)
(board size: 50 mm × 50 mm, soldering land size: 2 mm × 2 mm, board thickness: 0.64 mm)

Note 2: f = 50 Hz, half-sine wave, non-repetitive

Note 3: t = 1ms, Rectangular wave

5. Thermal Characteristics

Characteristics	Symbol	Test Condition	Max	Unit
Thermal resistance (junction-to-ambient)	$R_{th(j-a)}$	Device mounted on a ceramic board Board size: 50 mm × 50 mm Soldering land size: 2 mm × 2 mm Board thickness: 0.64 mm	70	°C/W
		Device mounted on a glass-epoxy board Board size: 50 mm × 50 mm Soldering land size: 6 mm × 6 mm Board thickness: 1.6 mm	140	
Thermal resistance (junction-to-lead)	$R_{th(j-\ell)}$	—	21	

6. Electrical Characteristics (Unless otherwise specified, T_a = 25°C)

Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit
Peak forward voltage	V_{FM}	I_{FM} = 0.1 A (pulse measurement)	—	0.71	—	V
		I_{FM} = 0.7 A (pulse measurement)	—	0.86	—	
		I_{FM} = 1.0 A (pulse measurement)	—	0.90	0.98	
Repetitive peak reverse current	I_{RRM}	V_{RRM} = 200 V (pulse measurement)	—	—	5	μA
Reverse recovery time	t_{rr}	I_F = 1.0 A, di/dt = -30 A/μs	—	—	35	ns
Forward recovery time	t_{fr}	I_F = 1.0 A	—	—	100	ns

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7. Marking

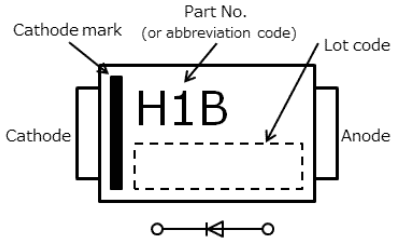

Fig. 7.1 Marking

Marking	Part Number
H1B	CRH01B

8. Land Pattern Dimensions (for reference only)

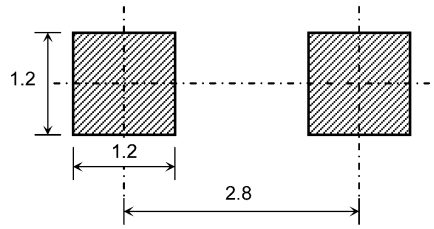

Fig. 8.1 Land Pattern Dimensions (Unit: mm)

9. Usage Considerations

(1) The absolute maximum ratings are rated values that must not be exceeded for a moment to have you use an element safely. Please refer to each following absolute maximum ratings on the occasion of use and design.

V_{RRM}: In DC circuit, the voltage peaks of applied voltage must be rated less than 80 % absolute maximum ratings.
In AC circuit, the voltage peaks of applied voltage must be rated less than 50 % absolute maximum ratings.
And, V_{RRM} has a temperature coefficient of 0.1 %/°C.
Please take this coefficient into account when designing a circuit board that will be operated in a low-temperature environment.

$I_{F(AV)}$: We recommend that the current be in less than 80 % of rating and the junction temperature (T_j) be in less than 80 % of absolute maximum rating under the worst condition.
This rating is based on the premise that the device is radiating heat enough.
Therefore, when enough heat radiation is not expected, please consider the margin to the permission curve of $T_{a(max)}$ - $I_{F(AV)}$ for using the device.

I_{FSM} : This rating specifies a non-repetitive limit value.
This only applies to an abnormal operation, which seldom occurs during the lifespan of a device.

T_j : Derate device parameters in proportion to this rating in order to ensure high reliability.
We recommend that the junction temperature (T_j) of a device be kept below 80 %.

(2) Thermal resistance (junction-to-ambient) varies with the mounting conditions of the device on the circuit board. An appropriate thermal resistance value that should be used, must be considering the heatsink, circuit board design and soldering land size.

(3) For other design considerations, see the Toshiba website.

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10. Characteristics Curves (Note)

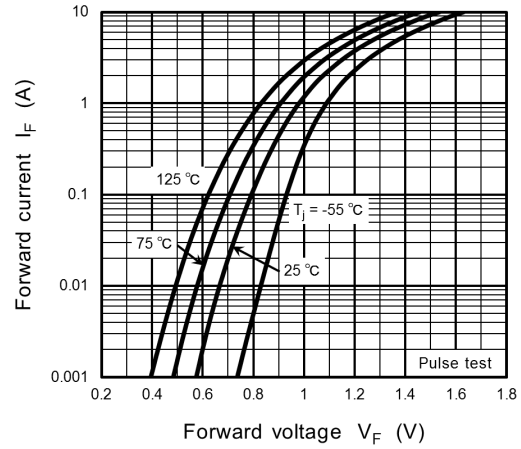

Fig. 10.1 I_F - V_F (Reference Maximum)

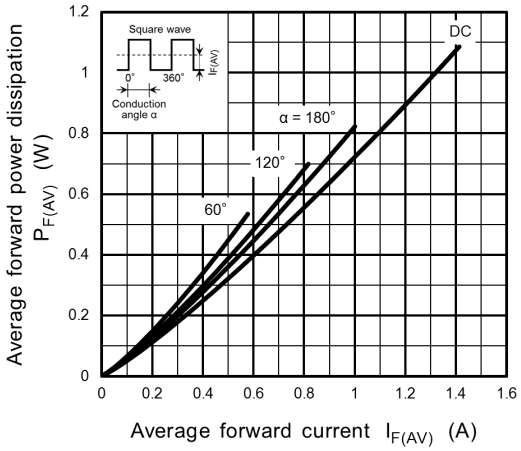

Fig. 10.2 $P_{F(AV)}$ - $I_{F(AV)}$

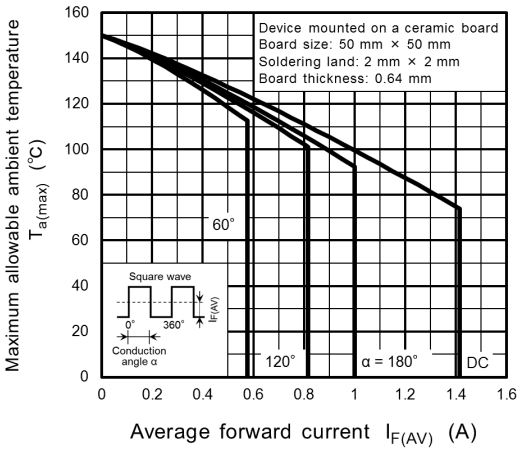

Fig. 10.3 $T_{a(max)}$ - $I_{F(AV)}$

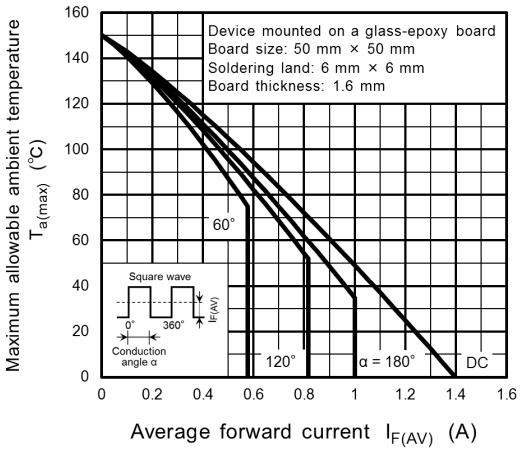

Fig. 10.4 $T_{a(max)}$ - $I_{F(AV)}$

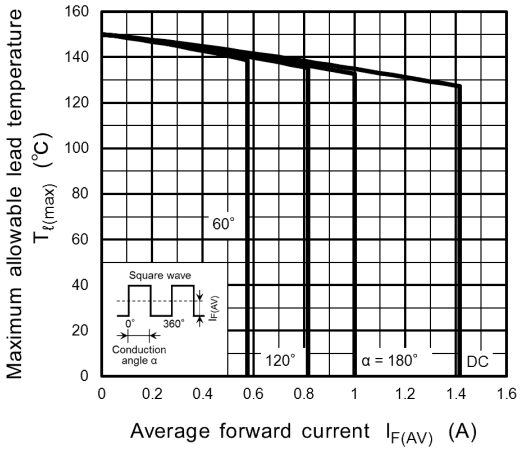

Fig. 10.5 $T_{\ell(max)}$ - $I_{F(AV)}$

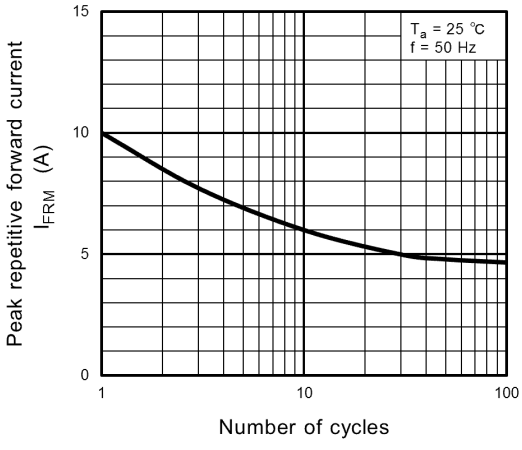

Fig. 10.6 I_{FRM} - Number of cycles (Guaranteed Maximum)

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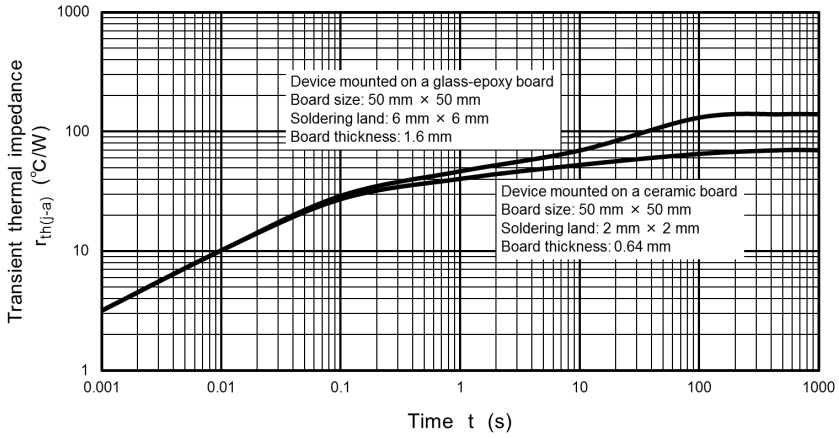

Fig. 10.7 $r_{th(j-a)}$ - t

Note: The above characteristics curves are presented for reference only and not guaranteed by production test, unless otherwise noted.

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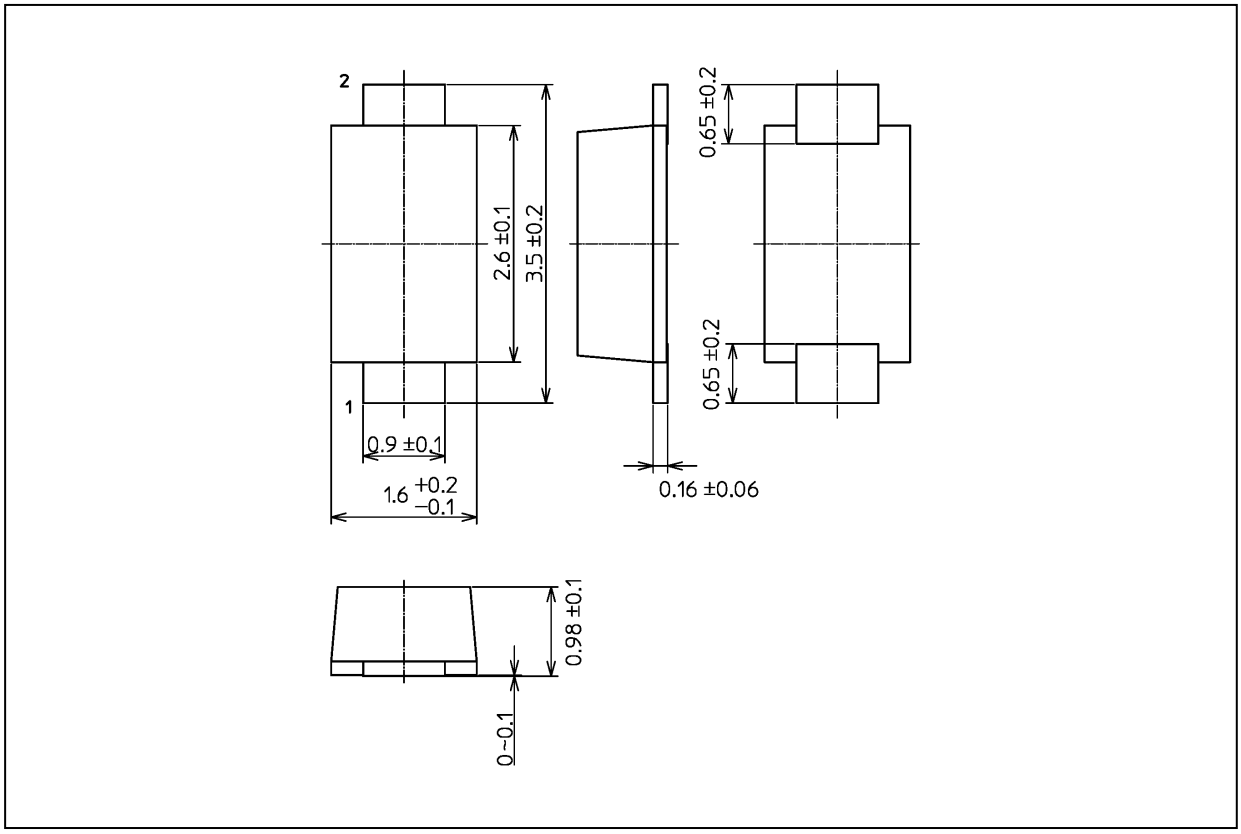
Package Dimensions

Unit: mm



Weight: 0.011 g (typ.)

Package Name(s)
TOSHIBA: 3-2A1S
Nickname: S-FLAT

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