Schottky Barrier Diode

CMS20I40A

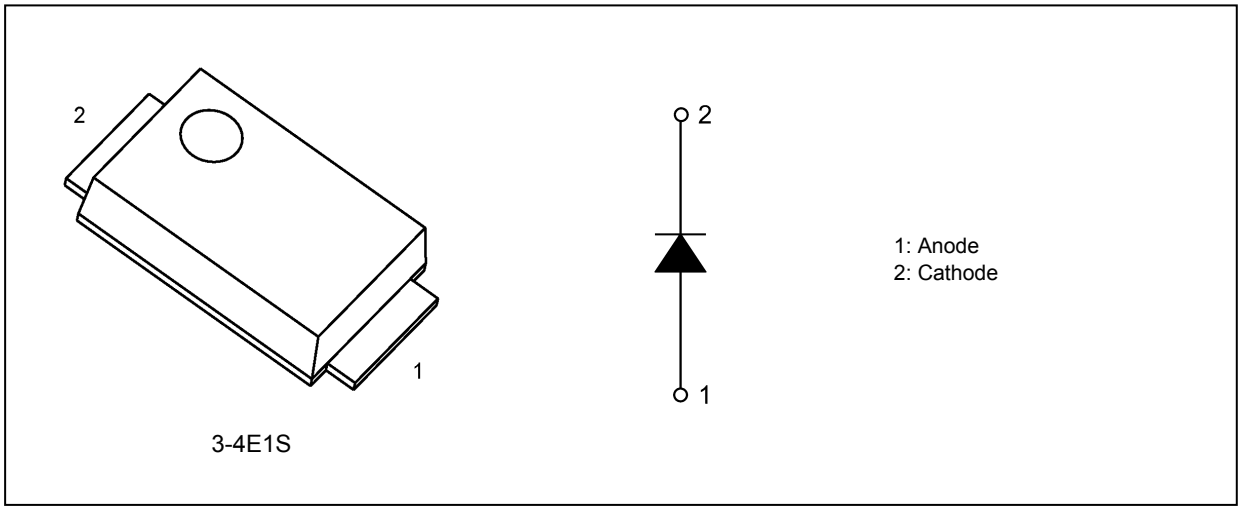
1. Applications

- Secondary Rectification in Switching Regulators
- Reverse-Current Protection in Mobile Devices

2. Features

(1) Peak forward voltage: V_{FM} = 0.52 V (max) @I_{FM} = 2 A
(2) Average forward current: $I_{F(AV)}$ = 2 A
(3) Repetitive peak reverse voltage: V_{RRM} = 40 V
(4) Small, thin package suitable for high-density board assembly
Toshiba Nickname: M-FLAT™

3. Packaging and Internal Circuit



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

Characteristics	Symbol	Note	Rating	Unit
Repetitive peak reverse voltage	V_{RRM}		40	V
Average forward current	$I_{F(AV)}$	(Note 1)	2	A
Non-repetitive peak forward surge current	I_{FSM}	(Note 2)	25	
Junction temperature	T_j		150	°C
Storage temperature	T_{stg}		-55 to 150	

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_ℓ = 119 °C, square wave (α = 180°), V_R = 20 V
Note 2: f = 50 Hz, half-sine wave

Start of commercial production
2010-10

5. Thermal Characteristics

Characteristics	Symbol	Note	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)	60	°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)	135	
Thermal resistance (junction-to-lead)	$R_{th(j-\ell)}$		Junction to cathode lead	16	°C/W

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

Characteristics	Symbol	Note	Test Condition	Min	Typ.	Max	Unit
Peak forward voltage	$V_{FM(1)}$		I_{FM} = 0.1 A (pulse measurement)	—	0.26	—	V
	$V_{FM(2)}$		I_{FM} = 1 A (pulse measurement)	—	0.37	—	
	$V_{FM(3)}$		I_{FM} = 2 A (pulse measurement)	—	0.45	0.52	
Repetitive peak reverse current	$I_{RRM(1)}$		V_{RRM} = 5 V (pulse measurement)	—	8	—	μA
	$I_{RRM(2)}$		V_{RRM} = 40 V (pulse measurement)	—	17	100	
Junction capacitance	C_j		V_R = 10 V, f = 1 MHz	—	62	—	pF

7. Marking

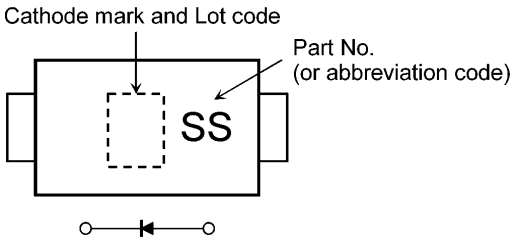


Fig. 7.1 Marking

Marking Code	Part Number
SS	CMS20I40A

8. Usage Considerations

(1) Schottky barrier diodes (SBDs) have reverse current greater than other types of diodes. This makes SBDs more vulnerable to damage due to thermal runaway under high-temperature and high-voltage conditions. Thus, both forward and reverse power losses of SBDs should be considered for thermal and safety design.

(2) The absolute maximum ratings are rated values that must not be exceeded during operation, even for an instant. The following are the recommended general derating methods for designing a circuit board using this device.

V_{RRM}:Use this rating with reference to (1) above. V_{RRM} has a temperature coefficient of 0.1 %/℃ at low temperatures. 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 worst-case current be no greater than 80 % of the absolute maximum rating of $I_{F(AV)}$ and that the worst-case junction temperature, T_j, be kept below 120 ℃. When using this device,
allow margins, referring to the $T_{a(max)}$-$I_{F(AV)}$ curve.

I_{FSM}:This rating specifies peak non-repetitive forward surge current. 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 120 ℃.

(3) Thermal resistance (junction-to-ambient) varies with the mounting conditions of a device on a circuit board. An appropriate thermal resistance value should be used, considering the heat sink, circuit board design and land pattern dimensions (provided for reference only).

(4) For other design considerations, see the Rectifiers databook or the Toshiba Semiconductor website.

9. Land Pattern Dimensions (for reference only)

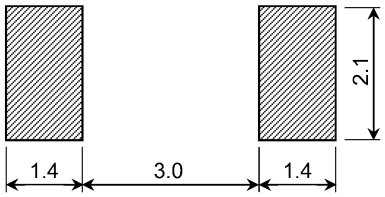


Fig. 9.1 Land Pattern Dimensions for Reference Only (Unit: mm)

10. Characteristics Curves (Note)

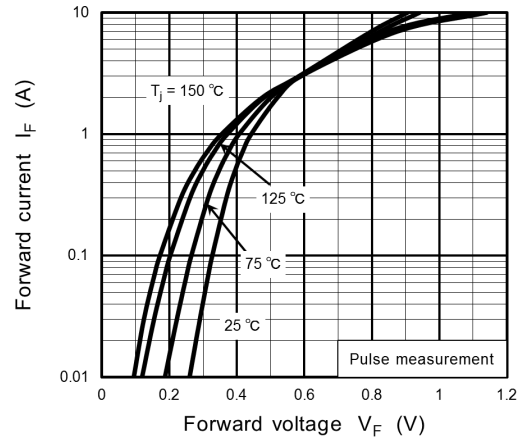


Fig. 10.1 I_F - V_F

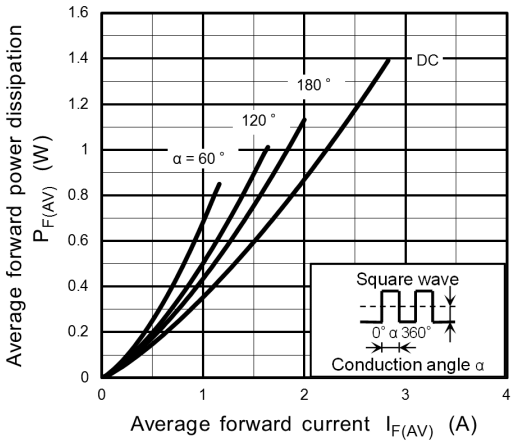


Fig. 10.2 $P_{F(AV)}$ - $I_{F(AV)}$

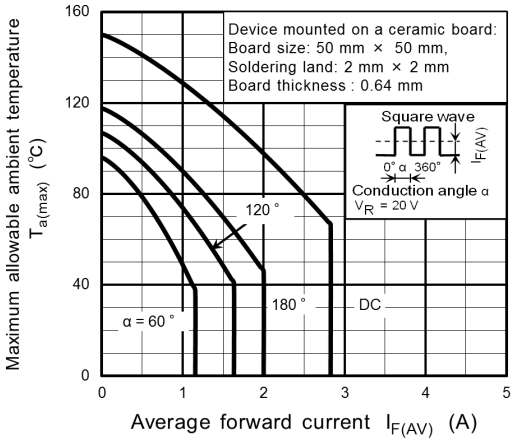


Fig. 10.3 $T_{a(max)}$ - $I_{F(AV)}$

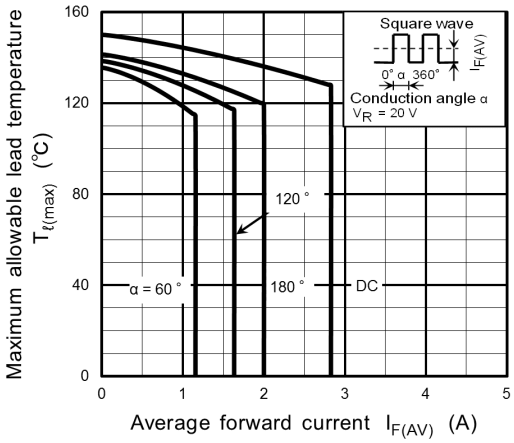


Fig. 10.4 $T_{\ell(max)}$ - $I_{F(AV)}$

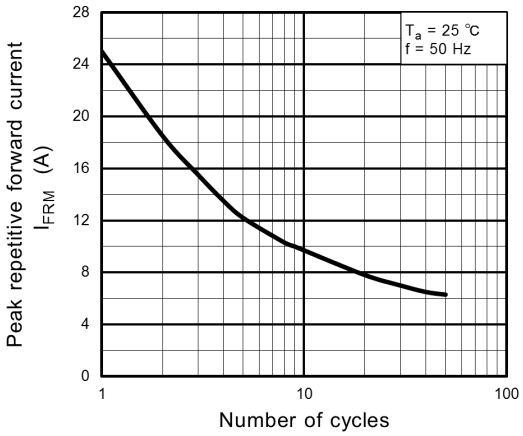


Fig. 10.5 Peak Repetitive Forward Current

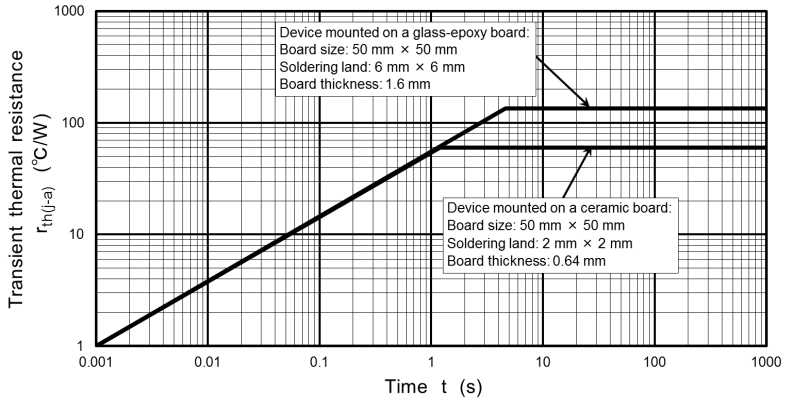


Fig. 10.6 $r_{th(j-a)}$ - t

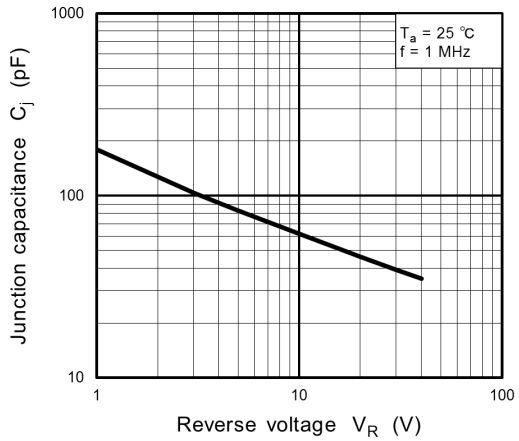


Fig. 10.7 C_j - V_R

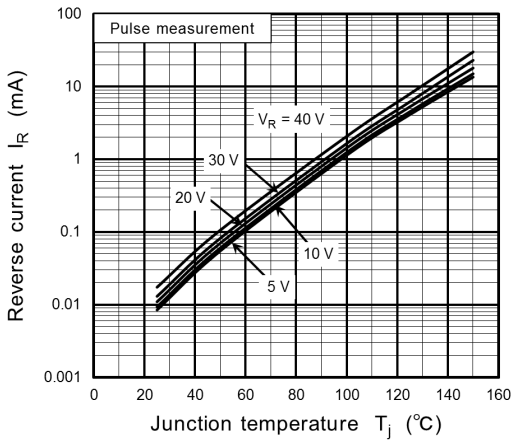
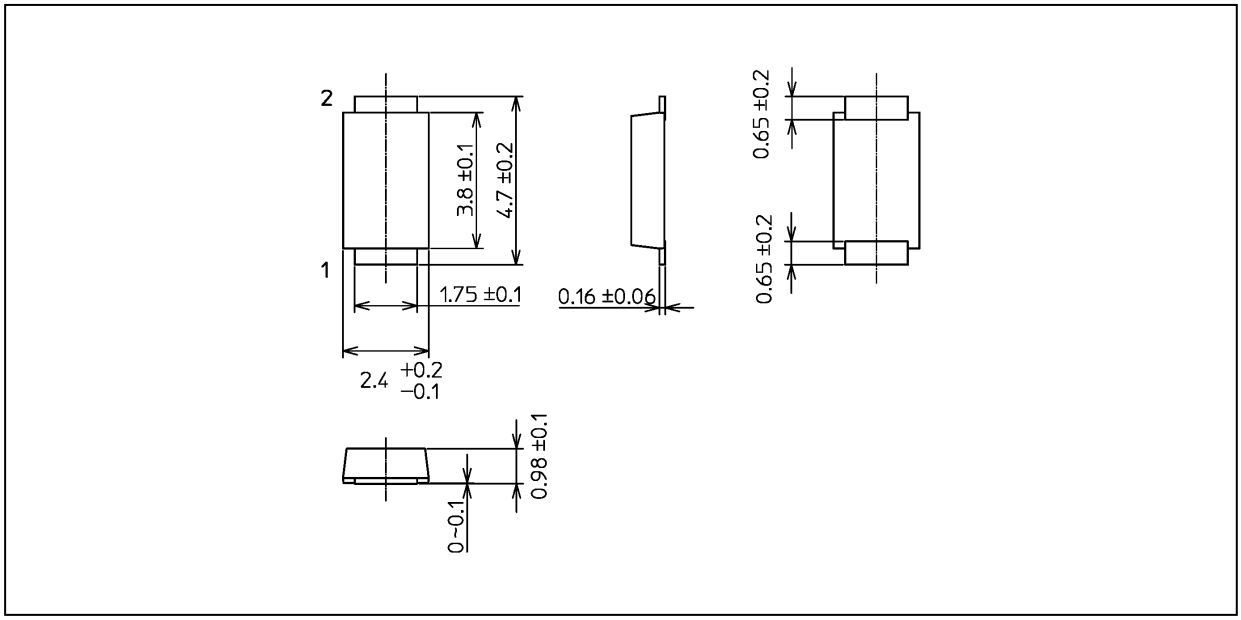


Fig. 10.8 I_R - T_j

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

Package Dimensions

Unit: mm



Weight: 0.023 g (typ.)

Package Name(s)
TOSHIBA: 3-4E1S
Nickname: M-FLAT

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