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Small and Medium Diodes

SEMICONDUCTOR & STORAGE PRODUCTS
http://toshiba.semicon-storage.com/

Small and Medium Diodes

Recently, many products ranging from computers and home appliances to automobiles and industrial equipment have been driving the need for effective solutions to reduce size and weight. Semiconductor requirements differ from application to application. Take power supplies for example, which are being required to accommodate higher capacity in smaller dimensions. This increases the temperature at which systems are operated.

To meet these requirements, Toshiba offers an extensive portfolio of small, high-efficiency diodes, including Schottky barrier diodes (SBDs) featuring high-speed operation and low forward loss.

Diodes

Schottky Barrier Diodes (SBDs)

Toshiba offers low-loss SBDs fabricated with a next-generation process. These SBDs will help increase the performance of equipment that requires a small form factor and high efficiency, such as mobile devices and switching power supplies.
SBDs with a reverse voltage of 20 V to 60 V and an average forward current of 0.7 A to 5 A are available in small surface-mount packages. You will find SBDs that best suit your applications.

Rectifier Diodes

General-Purpose Rectifiers and reverse-current protection

Super-Fast-Recovery Diodes (S-FRDs)

High-Efficiency Diodes (HEDs)

Diodes with a reverse voltage of 200 V to 1000 V and an average forward current of 0.5 A to 3 A are available in small surface-mount packages. Toshiba's product portfolio also includes diodes with high ESD performance ideal for automotive applications.

Zener Diodes

Zener diodes are available with a wide range of Zener voltage specifications from 6.2 V to 82 V. They can be used for a wide range of applications such as consumer, automotive and industrial electronics.

CONTENTS

This brochure contains information on small and medium diodes only. For switching diodes, small-signal Schottky barrier diodes and ESD protection diodes, see the following brochure or our homepage:

◆ Homepage http://toshiba.semicon-storage.com/
◆ Brochure Discrete Semiconductors, Linear ICs, Logic ICs

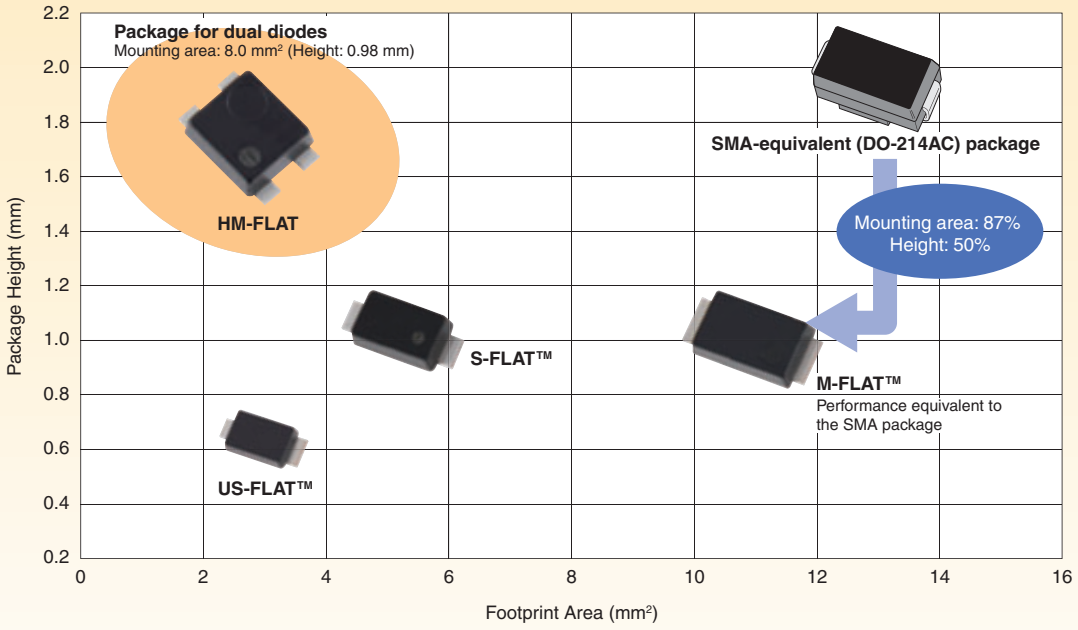
Product Lineup

SMALL & MEDIUM DIODES

Surface-Mount Package Trend for Diodes

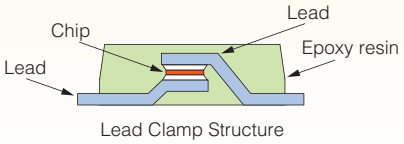
In order to help improve the performance of information and communications equipment, Toshiba offers high-efficiency diodes in small surface-mount packages.

Package Mounting Areas and Heights



Internal Structure of FLAT Packages

The FLAT packages have a lead clamp structure to reduce wire inductance and resistance and improve heat dissipation performance. Without a conventional wirebonded structure, these packages provide a higher surge capability.

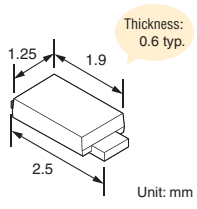


FLAT Package Series

US-FLAT™

Ultra Small Flat Package

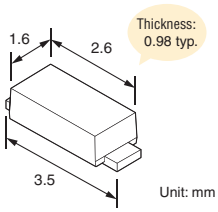
Typical product: CUS01, CUS10I30A



S-FLAT™

Small Flat Package

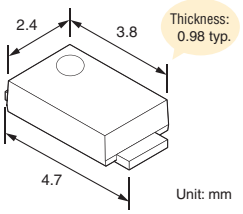
Typical product: CRS01, CRS10I30A



M-FLAT™

Middle Flat Package

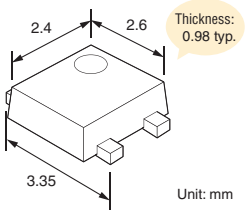
Typical product: CMS01, CMS10I30A



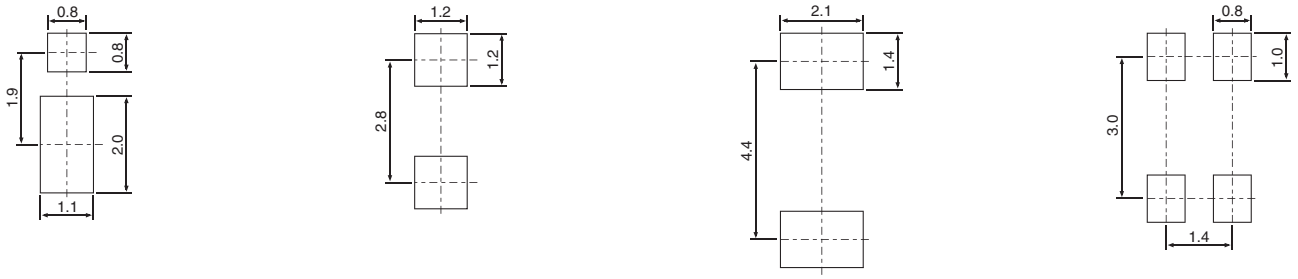
HM-FLAT

Hybrid Middle Flat Package

Typical product: HMG02



Recommended PCB land pattern dimensions
(Unit: mm)



Note: The PCB land pattern dimensions shown above are for reference only and should be determined empirically.

Schottky Barrier Diodes (SBDs)

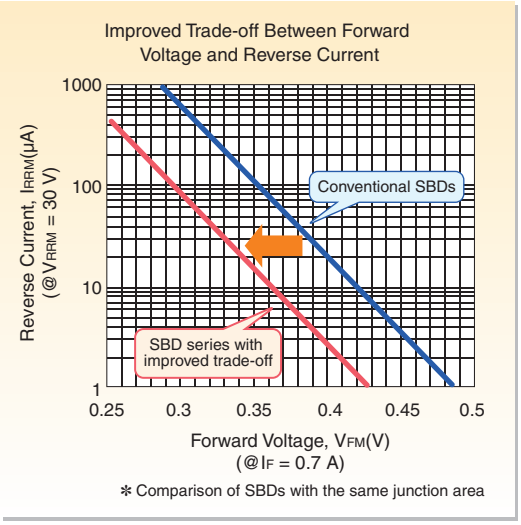
▶ SMALL & MEDIUM DIODES

Schottky barrier diodes (SBDs) have a junction formed between a semiconductor and a metal such as molybdenum, instead of a PN junction. Unlike PN junction diodes, SBDs are majority carrier devices. Therefore, SBDs feature low forward voltage and short reverse recovery time, making them ideal for high-speed switching applications.
Toshiba offers SBDs fabricated using a new process that provides an improved V_F-I_{RRM} trade-off. These new SBDs, together with conventional SBDs, will meet diverse design requirements.

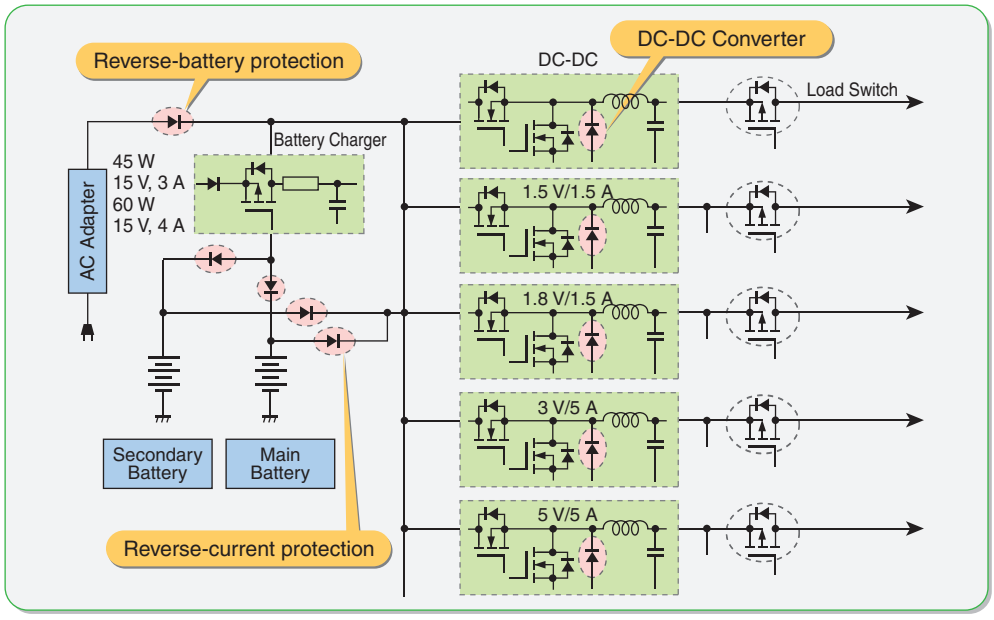
Schottky-Barrier Diodes (SBDs) with Improved Trade-Off

Toshiba now offers small to medium SBDs fabricated with a new process. Owing to low peak forward voltage (V_{FM}) and low repetitive peak reverse current (I_{RRM}) characteristics, these SBDs provide low power loss and thus help reduce the size and improve the power efficiency of mobile handsets, switching power supplies, etc.

- Voltage rating: V_{RRM} = 30 V, 40 V
- Current rating: $I_{F(AV)}$ =1 A to 3 A
- Peak forward voltage (Typical characteristics: CRS10I30A)
  V_{FM} = 0.35 V typ.
  0.39 V max (@I_{FM} = 0.7 A)
- Small surface-mount packages (US-FLAT™/S-FLAT™/M-FLAT™)



Application Example: Notebook PC



Applications	Package	Recommended Diodes
Reverse-battery and reverse-current protection	US-FLAT™	CUS01, CUS02, CUS10I30A, CUS15I30A
	S-FLAT™	CRS01, CRS03, CRS05, CRS06, CRS08, CRS09, CRS11, CRS14
	M-FLAT™	CMS01, CMS03, CMS06, CMS07, CMS08, CMS09, CMS16
DC-DC converters	S-FLAT™	CRS03, CRS04, CRS05, CRS09, CRS13, CRS10I30A, CRS15I30A, CRS20I30A
	M-FLAT™	CMS03, CMS05, CMS14, CMS15, CMS20I30A, CMS30I30A, CMS20I40A, CMS30I40A

Product Selection Guide

See page 10 for electrical specifications.

Average Forward Current, $I_{F(AV)}$	Package	Repetitive Peak Reverse Voltage, V_{RRM}			
		20 V	**30 V**	**40 V**	**60 V**
0.7 A	US-FLAT™			CUS03	CUS04
1 A	US-FLAT™	CUS05 CUS06	CUS01 CUS02 CUS10I30A	CUS10I40A	
	S-FLAT™	CRS06	CRS01 CRS03 CRS05 CRS11 CRS10I30A CRS10I30B CRS10I30C	CRS04 CRS10I40A CRS10I40B	CRS12 CRS13
	M-FLAT™		CMS08 CMS09 CMS10I30A	CMS10 CMS10I40A	
1.5 A	US-FLAT™		CUS15I30A		
	S-FLAT™		CRS08 CRS09 CRS15I30A CRS15I30B	CRS15I40A	
	M-FLAT™			CMS15I40A	
2 A	S-FLAT™		CRS14 CRS20I30A CRS20I30B	CRS20I40A CRS20I40B	
	M-FLAT™		CMS06 CMS07 CMS17 CMS20I30A	CMS11 CMS20I40A	CMS14
3 A	S-FLAT™		CRS15◇ CRS30I30A		
	M-FLAT™		CMS01 CMS03 CMS30I30A	CMS16 CMS30I40A	CMS15
5 A	M-FLAT™		CMS04 CMS05		

◇: $I_{F(DC)}$ = 3 A

Part Naming Conventions — SBDs with improved trade-offs

CR S 10 I 30 A

① ② ③ ④ ⑤ ⑥

① Package style	
CU	US-FLAT
CR	S-FLAT
CM	M-FLAT

② Diode type	
S	Schottky barrier diode

③ Average forward current, $I_{F(AV)}$
Integer indicating ten times the rated current
Example: 1.0 A → 10

④ Product feature	
I	Low forward voltage & low leakage current (New SBD series)

⑤ Reverse voltage, V_{RRM} (Repetitive peak reverse voltage)
Integer indicating the rated voltage
Example: 30 V → 30

⑥ Additional feature
Suffix that indicates an additional feature
Uppercase letter starting with A

Part Naming Conventions — Conventional SBDs

CR S 01

① ② ③

① Package style	
CU	US-FLAT
CR	S-FLAT
CM	M-FLAT

② Diode type	
S	Schottky barrier diode

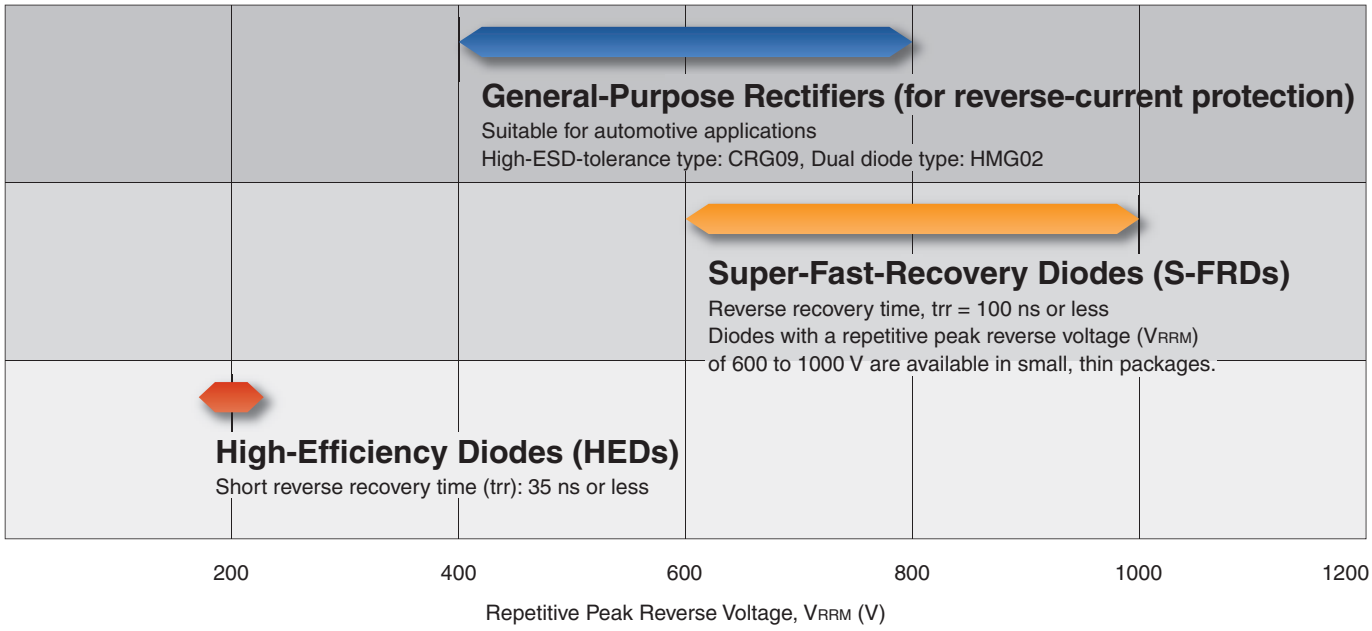
③ Part number
Two-digit sequential number starting with 01

Rectification Diodes

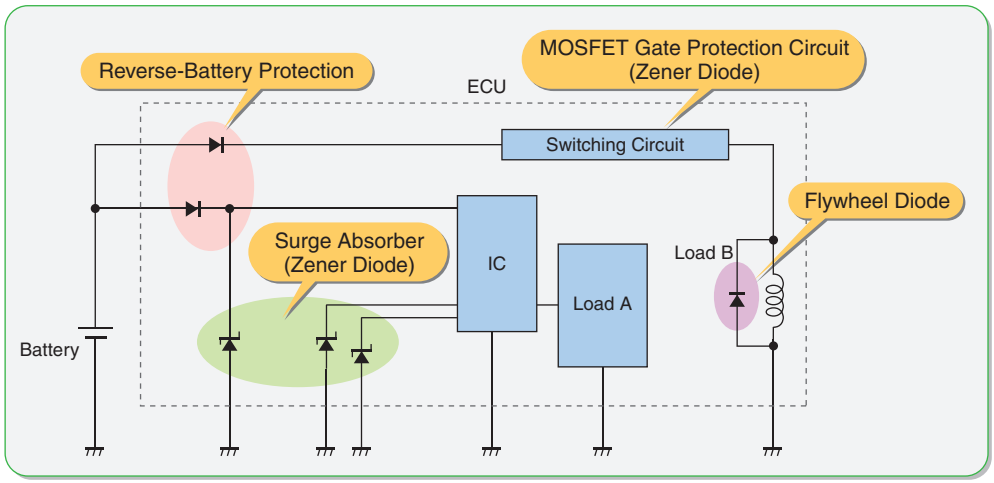
SMALL & MEDIUM DIODES

Toshiba offers rectification diodes in surface-mount packages with a reverse voltage ranging from 200 V to 1000 V and an average forward current ranging from 0.5 A to 3 A.
Toshiba's product portfolio of General-Purpose Rectifiers (for reverse-current protection) includes diodes with high ESD tolerance and dual diode devices suitable for automotive applications. Super-Fast Recovery Diodes (S-FRDs) are available in small, thin packages with a V_{RRM} of up to 1000 V. High-Efficiency Diodes (HEDs) provide a short reverse recovery time of 35 ns or less.

Product Lines



Application Example: Automobiles



Applications	Package	Recommended Diodes
Reverse-battery and reverse-current protection	S-FLAT™	CRG04, CRG05, CRG07, CRG09, CRG03, HMG02
	M-FLAT™	CMG02, CMG03, CMG05, CMG06, CMG07, CMG08
Flywheeling	S-FLAT™	CRH01, CRH02
	M-FLAT™	CMH01, CMH04, CMH07

✻ See "Zener Diodes" on pages 8-9 for a description of diodes for MOSFET gate protection and surge absorber applications.

Product Selection Guide

▶ General-Purpose Rectifiers (for reverse-current protection)

See page 11 for electrical specifications.

Average Forward Current, $I_{F(AV)}$	Package	Repetitive Peak Reverse Voltage, V_{RRM}		
		400 V	**600 V**	**800 V**
0.7 A	HM-FLAT	HMG02 (1)		
	S-FLAT™	CRG07		
1 A	S-FLAT™	CRG03 CRG09 (2)	CRG04	CRG05
	M-FLAT™	CMC02 (3) CMG05 CMG07	CMG06 CMG08	
2 A	M-FLAT™	CMG02	CMG03	

(1) Dual diodes (two separate diodes)
(2) High ESD protection
(3) Designed for strobe discharge applications.

▶ Super-Fast-Recovery Diodes (S-FRDs)

Average Forward Current, $I_{F(AV)}$	Package	Reverse Recovery Time, t_{rr} (Max)	Repetitive Peak Reverse Voltage, V_{RRM}			
			600 V	**800 V**	**900 V**	**1000 V**
0.5 A	S-FLAT™	100 ns		CRF02		
	M-FLAT™			CMF04	CMF03	CMF05
0.7 A	S-FLAT™		CRF03			
1 A	M-FLAT™		CMF02			
2 A	M-FLAT™		CMF01			

▶ High-Efficiency Diodes (HEDs)

Average Forward Current, $I_{F(AV)}$	Package	Reverse Recovery Time, t_{rr} (Max)	Repetitive Peak Reverse Voltage, V_{RRM}
			200 V
0.5 A	S-FLAT™	35 ns	CRH02
1 A	S-FLAT™		CRH01
	M-FLAT™		CMH04
2 A	M-FLAT™		CMH07
3 A	M-FLAT™		CMH01

Part Naming Conventions

CR G 03
① ② ③

① Package style	
CR	S-FLAT
CM	M-FLAT
HM	HM-FLAT

② Diode type	
G	General-Purpose Rectifiers
F	Super-fast-recovery diodes (S-FRDs)
H	High-efficiency diodes (HEDs)
C	For strobe flash dischargers

③ Part number
Two-digit sequential number starting with 01

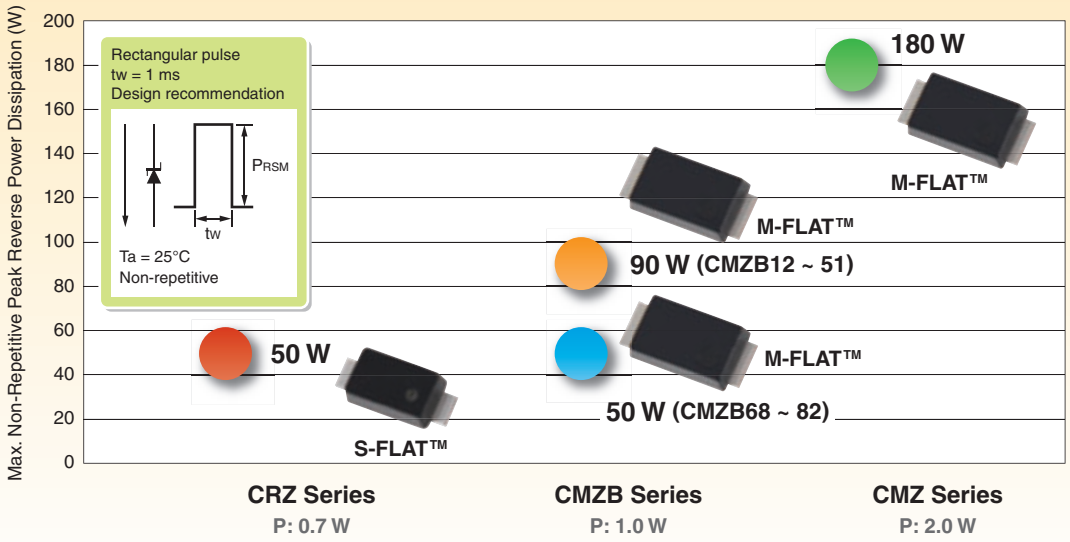
Zener Diodes

SMALL & MEDIUM DIODES

Recent electronic circuits generally incorporate microcontrollers and memory chips to provide complicated control functions. High-precision voltage regulation is required to drive these advanced devices. To address this need, Toshiba offers Zener diodes for constant-voltage regulation for a wide range of input voltage from 6.2 V to 82 V. Zener diodes can also be used for circuit protection purposes such as surge absorption and noise limiting. They are suitable for a broad spectrum of applications, including commercial, automotive and industrial equipment.

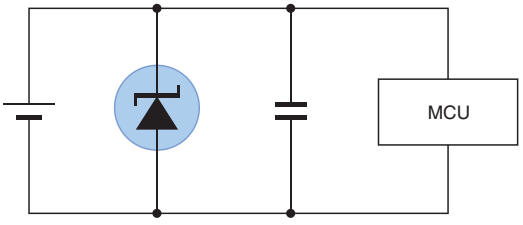
Features

Toshiba offers Zener diodes in small, thin packages with a power dissipation of 0.7 W to 2 W featuring a high current surge capability.

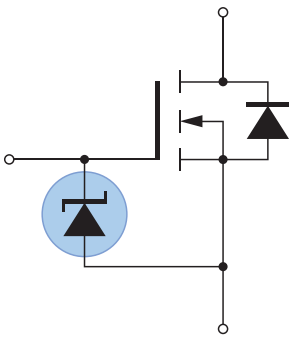


Design Recommendation for Maximum Non-Repetitive Peak Reverse Power Dissipation (Pulse Width, tw = 1 ms)

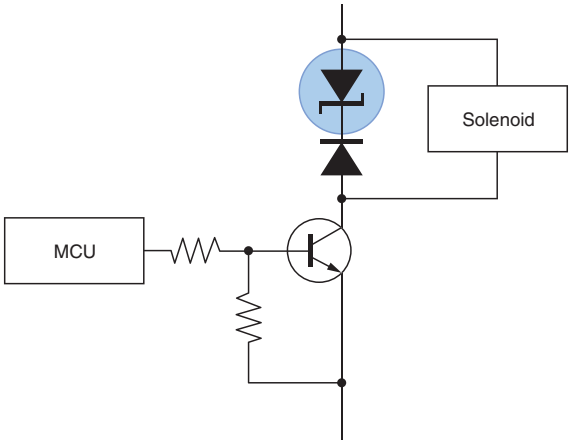
Basic Circuit Example



Microcontroller Unit (MCU) Protection



MOSFET Gate Protection



Solenoid Protection
(Surge Absorber)

Product Selection Guide

See pages 12-13 for electrical specifications.

Power Dissipation	0.7 W	1.0 W	2.0 W
Zener Voltage Vz(V) typ. \ Package	S-FLAT™	M-FLAT™	
6.2	CRY62		
6.8	CRY68		
8.2	CRY82		
10	CRZ10		
12	CRZ12	CMZB12	CMZ12
13	CRZ13	CMZB13	CMZ13
15	CRZ15	CMZB15	CMZ15
16	CRZ16		
18	CRZ18	CMZB18	CMZ18
20	CRZ20	CMZB20	CMZ20
24	CRZ24	CMZB24	CMZ24
27	CRZ27	CMZB27	CMZ27
30	CRZ30	CMZB30	CMZ30
33	CRZ33	CMZB33	CMZ33
36	CRZ36	CMZB36	CMZ36
39	CRZ39	CMZB39	CMZ39
43		CMZB43	CMZ43
47		CMZB47	CMZ47
51		CMZB51	CMZ51
68		CMZB68	
75		CMZB75	
82		CMZB82	

The Zener voltage values listed above are the values measured at the specified Zener current (Iz). For Zener voltage measurement, a pulse measurement method is used to minimize the increase in diode temperature. Therefore, Zener voltage could be different, depending on the actual usage conditions and Zener current. Temperature changes and variations should also be considered. When Zener voltage starts to rise (i.e., while Zener current is still low), a Zener diode has a large dynamic resistance (rd), causing significant variations in Zener voltage. For voltage regulation purposes, it is desirable to use a Zener diode in a low dynamic resistance region where sufficient Zener current flows.

Part Naming Conventions

CM Z 12

① ② ③

① Package style	
CR	S-FLAT
CM	M-FLAT

② Zener diode type	
Y	Diodes with a Vz of less than 10 V (Diodes with Zener voltage with one decimal place)
Z	Diodes with a Vz equal to or greater than 10 V (Diodes with an integer Zener voltage)
ZB	

③ Zener voltage, Vz
Integer that indicates Zener voltage if equal to or greater than 10 V Integer that indicates 10 times the Zener voltage if less than 10 V

Schottky Barrier Diodes (SBDs)

(Ta = 25˚C)

Package	Part Number	Absolute Maximum Ratings					Electrical Characteristics (Max)				
		V_{RRM} (V)	$I_{F(AV)}$ (A)	I_{FSM} (A)	T_j (˚C)	T_{stg} (˚C)	I_{RRM} (mA)	V_{FM} (V)	@I_{FM} (A)	C_j (pF) typ.	Conditions
 US-FLAT™	**CUS05**	20	1.0	20	125	−40 to 150	1.0	0.37	0.7	40	V_R = 10 V, f = 1 MHz
	CUS06	20	1.0	20	150	−40 to 150	0.03	0.45	0.7	40	
	CUS01	30	1.0	20	125	−40 to 150	1.5	0.37	0.7	40	
	CUS02	30	1.0	20	150	−40 to 150	0.1	0.45	0.7	40	
	CUS10I30A	30	1.0	20	150	−55 to 150	0.06	0.39	0.7	50	
	CUS15I30A	30	1.5	20	150	−55 to 150	0.06	0.46	1.5	50	
	CUS03	40	0.7	20	150	−40 to 150	0.1	0.52	0.7	45	
	CUS10I40A	40	1.0	20	150	−55 to 150	0.06	0.49	0.7	35	
	CUS04	60	0.7	20	150	−40 to 150	0.1	0.58	0.7	38	
 S-FLAT™	**CRS06**	20	1.0	20	125	−40 to 150	1	0.36	1.0	60	V_R = 10 V, f = 1 MHz
	CRS01	30	1.0	20	125	−40 to 150	1.5	0.37	0.7	40	
	CRS03	30	1.0	20	150	−40 to 150	0.1	0.45	0.7	40	
	CRS05	30	1.0	20	150	−40 to 150	▽	0.45	1.0	60	
	CRS11	30	1.0	20	125	−40 to 150	1.5	0.36	1.0	60	
	CRS10I30A	30	1.0	20	150	−55 to 150	0.06	0.39	0.7	50	
	CRS10I30B	30	1.0	20	150	−55 to 150	0.06	0.42	1.0	50	
	CRS10I30C	30	1.0	30	150	−55 to 150	0.1	0.36	1.0	82	
	CRS08	30	1.5	30	125	−40 to 150	1	0.36	1.5	90	
	CRS09	30	1.5	30	150	−40 to 150	0.05	0.46	1.5	90	
	CRS15I30A	30	1.5	20	150	−55 to 150	0.06	0.46	1.5	50	
	CRS15I30B	30	1.5	30	150	−55 to 150	0.1	0.40	1.5	82	
	CRS14	30	2.0	30	150	−40 to 150	0.05	0.49	2.0	90	
	CRS20I30A	30	2.0	20	150	−55 to 150	0.06	0.49	2.0	50	
	CRS20I30B	30	2.0	30	150	−55 to 150	0.1	0.45	2.0	82	
	CRS15◇	30	3.0	30	150	−40 to 150	0.05	0.52	3.0	90	
	CRS30I30A	30	3.0	30	150	−55 to 150	0.1	0.49	3.0	82	
	CRS04	40	1.0	20	150	−40 to 150	0.1	0.49	0.7	47	
	CRS10I40A	40	1.0	20	150	−55 to 150	0.06	0.49	0.7	35	
	CRS10I40B	40	1.0	25	150	−55 to 150	0.1	0.45	1.0	62	
	CRS15I40A	40	1.5	20	150	−55 to 150	0.06	0.55	1.5	35	
	CRS20I40A	40	2.0	20	150	−55 to 150	0.06	0.60	2.0	35	
	CRS20I40B	40	2.0	25	150	−55 to 150	0.1	0.52	2.0	62	
	CRS12	60	1.0	20	150	−55 to 150	0.1	0.58	1.0	40	
	CRS13	60	1.0	20	150	−55 to 150	0.05	0.55	1.0	40	
 M-FLAT™	**CMS08**	30	1.0	25	125	−40 to 150	1.5	0.37	1.0	70	V_R = 10 V, f = 1 MHz
	CMS09	30	1.0	25	150	−40 to 150	0.5	0.45	1.0	70	
	CMS10I30A	30	1.0	30	150	−55 to 150	0.1	0.36	1.0	82	
	CMS06	30	2.0	40	125	−40 to 150	3.0	0.37	2.0	130	
	CMS07	30	2.0	40	150	−40 to 150	0.5	0.45	2.0	130	
	CMS17	30	2.0	30	150	−40 to 150	0.1	0.48	2.0	90	
	CMS20I30A	30	2.0	30	150	−55 to 150	0.1	0.45	2.0	82	
	CMS01	30	3.0	40	125	−40 to 150	5.0	0.37	3.0	190	
	CMS03	30	3.0	40	150	−40 to 150	0.5	0.45	3.0	190	
	CMS30I30A	30	3.0	30	150	−55 to 150	0.1	0.49	3.0	82	
	CMS04	30	5.0	70	125	−40 to 150	8.0	0.37	5.0	330	
	CMS05	30	5.0	70	150	−40 to 150	0.8	0.45	5.0	330	
	CMS10	40	1.0	25	150	−40 to 150	0.5	0.55	1.0	50	
	CMS10I40A	40	1.0	25	150	−55 to 150	0.1	0.45	1.0	62	
	CMS15I40A	40	1.5	25	150	−55 to 150	0.1	0.49	1.5	62	
	CMS11	40	2.0	30	150	−40 to 150	0.5	0.55	2.0	95	
	CMS20I40A	40	2.0	25	150	−55 to 150	0.1	0.52	2.0	62	
	CMS16	40	3.0	30	150	−40 to 150	0.2	0.55	3.0	95	
	CMS30I40A	40	3.0	25	150	−55 to 150	0.1	0.55	3.0	62	
	CMS14	60	2.0	40	150	−40 to 150	0.2	0.58	2.0	77	
	CMS15	60	3.0	60	150	−40 to 150	0.3	0.58	3.0	102	

▽: I_{RRM} = 5 μA Max (V_R = 5 V) ◇: $I_{F(DC)}$ = 3 A

Rectification Diodes

General-Purpose Rectifiers (for reverse-current protection)

(Ta = 25˚C)

	Package	Part Number	Absolute Maximum Ratings					Electrical Characteristics (Max)		
			V_{RRM} (V)	$I_{F(AV)}$ (A)	I_{FSM} (A)	T_j (˚C)	T_{stg} (˚C)	I_{RRM} (μA)	V_{FM} (V)	@I_{FM} (A)
Single	 S-FLAT™	**CRG07**	400	0.7	15	175	−40 to 175	10	1.1	0.7
		CRG03	400	1.0	15	150	−40 to 150	10	1.1	0.7
		CRG09 (1)	400	1.0	15	150	−40 to 150	10	1.1	0.7
		CRG04	600	1.0	15	150	−40 to 150	10	1.1	1.0
		CRG05	800	1.0	15	150	−40 to 150	10	1.2	1.0
	 M-FLAT™	**CMC02** (2)	400	1.0	30	150	−40 to 150	10	1.0	1.0
		CMG05	400	1.0	15	150	−40 to 150	10	1.1	1.0
		CMG07	400	1.0	30	150	−40 to 150	10	1.1	1.0
		CMG02	400	2.0	80	150	−40 to 150	10	1.1	2.0
		CMG06	600	1.0	15	150	−40 to 150	10	1.1	1.0
		CMG08	600	1.0	30	150	−40 to 150	10	1.1	1.0
		CMG03	600	2.0	80	150	−40 to 150	10	1.1	2.0
Dual	 HM-FLAT	**HMG02** (3)	400	0.7	10	175	−40 to 175	10	1.0	0.5

(1) High ESD protection
(2) Designed for strobe discharge applications
(3) $I_{F(AV)}$, I_{FSM}, I_{RRM} and V_{FM} are specified per diode.

Super-Fast-Recovery Diodes (S-FRDs)

(Ta = 25˚C)

Package	Part Number	Absolute Maximum Ratings					Electrical Characteristics (Max)				
		V_{RRM} (V)	$I_{F(AV)}$ (A)	I_{FSM} (A)	T_j (˚C)	T_{stg} (˚C)	I_{RRM} (μA)	V_{FM} (V)	@I_{FM} (A)	t_{rr} (ns)	Conditions
 S-FLAT™	**CRF02**	800	0.5	10	150	−40 to 150	50	3.0	0.5	100	I_F = 1 A, di/dt = −30 A/μs
	CRF03	600	0.7	10	150	−40 to 150	50	2.0	0.7	100	
 M-FLAT™	**CMF01**	600	2.0	30	150	−40 to 150	50	2.0	2.0	100	I_F = 1 A, di/dt = −30 A/μs
	CMF02	600	1.0	10	150	−40 to 150	50	2.0	1.0	100	
	CMF04	800	0.5	10	150	−40 to 150	50	2.5	0.5	100	
	CMF03	900	0.5	10	125	−40 to 150	50	2.5	0.5	100	
	CMF05	1000	0.5	10	125	−40 to 150	50	2.7	0.5	100	

High-Efficiency Diodes (HEDs)

(Ta = 25˚C)

Package	Part Number	Absolute Maximum Ratings					Electrical Characteristics (Max)				
		V_{RRM} (V)	$I_{F(AV)}$ (A)	I_{FSM} (A)	T_j (˚C)	T_{stg} (˚C)	I_{RRM} (μA)	V_{FM} (V)	@I_{FM} (A)	t_{rr} (ns)	Conditions
 S-FLAT™	**CRH02**	200	0.5	10	150	−40 to 150	10	0.95	0.5	35	I_F = 1 A, di/dt = −30 A/μs
	CRH01	200	1.0	15	150	−40 to 150	10	0.98	1.0	35	
 M-FLAT™	**CMH04**	200	1.0	20	150	−40 to 150	10	0.98	1.0	35	I_F = 1 A, di/dt = −30 A/μs
	CMH07	200	2.0	40	150	−40 to 150	10	0.98	2.0	35	
	CMH01	200	3.0	40	150	−40 to 150	10	0.98	3.0	35	

Zener Diodes

CRY/CRZ Series (S-FLAT™)

Power Dissipation: 0.7 W

(Ta = 25˚C)

Part Number	Power Dissipation (W)	Zener Characteristics					Temperature Coefficient of Zener Voltage α_T (mV/˚C)		Forward Voltage V_F (V)	Measurement Current I_F (A)	Reverse Current I_R (μA)	Measurement Voltage V_R (V)
		Zener Voltage Vz (V)			Dynamic Resistance rd (Ω)	Measurement Current Iz (mA)						
		Min	Typ.	Max	Max		Typ.	Max	Max		Max	
CRY62	0.7	5.6	6.2	6.8	60	10	2	3	1.0	0.2	10	3.0
CRY68	0.7	6.2	6.8	7.4	60	10	3	4	1.0	0.2	10	3.0
CRY82	0.7	7.4	8.2	9.0	30	10	4	6	1.0	0.2	10	4.9
CRZ10	0.7	9.0	10.0	11.0	30	10	6	9	1.0	0.2	10	6.0
CRZ12	0.7	10.8	12.0	13.2	30	10	8	13	1.0	0.2	10	8.0
CRZ13	0.7	11.7	13.0	14.3	30	10	9	14	1.0	0.2	10	9.0
CRZ15	0.7	13.5	15.0	16.5	30	10	11	17	1.0	0.2	10	10.0
CRZ16	0.7	14.4	16.0	17.6	30	10	12	19	1.0	0.2	10	11.0
CRZ18	0.7	16.2	18.0	19.8	30	10	14	23	1.0	0.2	10	13.0
CRZ20	0.7	18.0	20.0	22.0	30	10	16	26	1.0	0.2	10	14.0
CRZ24	0.7	21.6	24.0	26.4	30	10	20	32	1.0	0.2	10	17.0
CRZ27	0.7	24.3	27.0	29.7	30	10	23	36	1.0	0.2	10	19.0
CRZ30	0.7	27.0	30.0	33.0	30	10	25	40	1.0	0.2	10	21.0
CRZ33	0.7	29.7	33.0	36.3	30	10	26	41	1.0	0.2	10	26.4
CRZ36	0.7	32.4	36.0	39.6	30	9	28	45	1.0	0.2	10	28.8
CRZ39	0.7	35.1	39.0	42.9	35	8	30	48	1.0	0.2	10	31.2

CMZB Series (M-FLAT™)

Power Dissipation: 1 W

(Ta = 25˚C)

Part Number	Power Dissipation (W)	Zener Characteristics					Temperature Coefficient of Zener Voltage α_T (mV/˚C)		Forward Voltage V_F (V)	Measurement Current I_F (A)	Reverse Current I_R (μA)	Measurement Voltage V_R (V)
		Zener Voltage Vz (V)			Dynamic Resistance rd (Ω)	Measurement Current Iz (mA)						
		Min	Typ.	Max	Max		Typ.	Max	Max		Max	
CMZB12	1.0	10.8	12	13.2	30	10	8	13	1.2	0.2	10	8
CMZB13	1.0	11.7	13	14.3	30	10	9	14	1.2	0.2	10	9
CMZB15	1.0	13.5	15	16.5	30	10	11	17	1.2	0.2	10	10
CMZB18	1.0	16.2	18	19.8	30	10	14	23	1.2	0.2	10	13
CMZB20	1.0	18.0	20	22.0	30	10	16	26	1.2	0.2	10	14
CMZB24	1.0	21.6	24	26.4	30	10	20	32	1.2	0.2	10	17
CMZB27	1.0	24.3	27	29.7	30	10	23	36	1.2	0.2	10	19
CMZB30	1.0	27.0	30	33.0	30	10	25	40	1.2	0.2	10	21
CMZB33	1.0	29.7	33	36.3	30	10	26	41	1.2	0.2	10	26.4
CMZB36	1.0	32.4	36	39.6	30	9	28	45	1.2	0.2	10	28.8
CMZB39	1.0	35.1	39	42.9	35	8	30	48	1.2	0.2	10	31.2
CMZB43	1.0	38.7	43	47.3	40	7	33	53	1.2	0.2	10	34.4
CMZB47	1.0	42.3	47	51.7	65	6	38	60	1.2	0.2	10	37.6
CMZB51	1.0	45.9	51	56.1	65	6	43	68	1.2	0.2	10	40.8
CMZB68	1.0	61.2	68	74.8	120	4	57	90	1.2	0.2	10	54.4
CMZB75	1.0	67.5	75	82.5	150	4	66	104	1.2	0.2	10	60
CMZB82	1.0	73.8	82	90.2	170	3	71	113	1.2	0.2	10	65.6

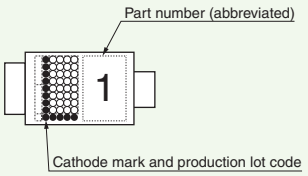
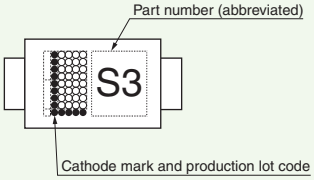
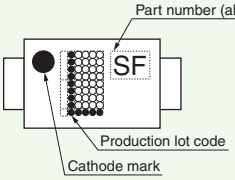
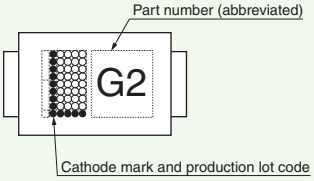
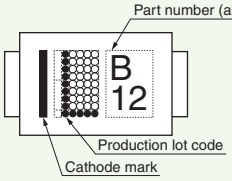
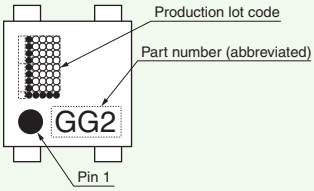
▶ CMZ Series (M-FLAT™)

Power Dissipation: 2 W

(Ta = 25˚C)

Part Number	Power Dissipation (W)	Zener Characteristics					Temperature Coefficient of Zener Voltage αT (mV/˚C)		Forward Voltage VF (V)	Measurement Current IF (A)	Reverse Current IR (μA)	Measurement Voltage VR (V)
		Zener Voltage Vz (V)			Dynamic Resistance rd (Ω)	Measurement Current Iz (mA)						
		Min	Typ.	Max	Max		Typ.	Max	Max		Max	
CMZ12	2.0	10.8	12	13.2	30	10	8	13	1.2	0.2	10	8
CMZ13	2.0	11.7	13	14.3	30	10	9	14	1.2	0.2	10	9
CMZ15	2.0	13.5	15	16.5	30	10	11	17	1.2	0.2	10	10
CMZ18	2.0	16.2	18	19.8	30	10	14	23	1.2	0.2	10	13
CMZ20	2.0	18.0	20	22.0	30	10	16	26	1.2	0.2	10	14
CMZ24	2.0	21.6	24	26.4	30	10	20	32	1.2	0.2	10	17
CMZ27	2.0	24.3	27	29.7	30	10	23	36	1.2	0.2	10	19
CMZ30	2.0	27.0	30	33.0	30	10	25	40	1.2	0.2	10	21
CMZ33	2.0	29.7	33	36.3	30	10	26	41	1.2	0.2	10	26.4
CMZ36	2.0	32.4	36	39.6	30	9	28	45	1.2	0.2	10	28.8
CMZ39	2.0	35.1	39	42.9	35	8	30	48	1.2	0.2	10	31.2
CMZ43	2.0	38.7	43	47.3	40	7	33	53	1.2	0.2	10	34.4
CMZ47	2.0	42.3	47	51.7	65	6	38	60	1.2	0.2	10	37.6
CMZ51	2.0	45.9	51	56.1	65	6	43	68	1.2	0.2	10	40.8

Marking

Package	Device Marking (Examples)
US-FLAT™	 Part number (abbreviated) Examples Abbreviation Part number 1: **CUS01** 7: **CUS10I30A**
S-FLAT™	 Part number (abbreviated) Examples Abbreviation Part number S3: **CRS03** G9: **CRG09** H1: **CRH01**  Part number (abbreviated) Examples Abbreviation Part number SF: **CRS10I30A** SV: **CRS30I40A**
M-FLAT™	 Part number (abbreviated) Examples Abbreviation Part number G2: **CMG02** F3: **CMF03** H7: **CMH07**  Part number (abbreviated) Examples Abbreviation Part number B12: **CMZB12**
HM-FLAT	 Part number (abbreviated) Examples Abbreviation Part number GG2: **HMG02**

Note

Note

SUBSIDIARIES AND AFFILIATES

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Toshiba America Electronic Components, Inc.
- Irvine, Headquarters
  Tel: (949)462-7700 Fax: (949)462-2200
- Buffalo Grove (Chicago)
  Tel: (847)484-2400 Fax: (847)541-7287
- Duluth/Atlanta
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- Wixom (Detroit)
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Toshiba Electronics do Brasil Ltda.
Tel: (011)2936-6681 Fax: (011)2936-6675

Toshiba India Private Ltd.
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  Tel: (0124)499-6600 Fax: (0124)499-6611
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Toshiba Electronics Europe GmbH
- Düsseldorf Head Office
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Toshiba Electronics Asia, Ltd.
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Toshiba Electronics Korea Corporation
Tel: (02)3484-4334 Fax: (02)3484-4302

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