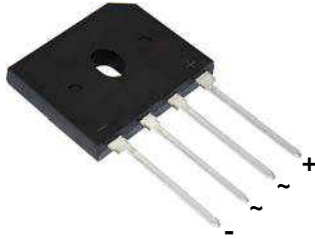
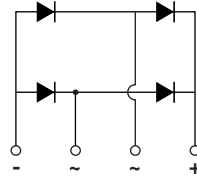




## Glass Passivated Single-Phase Bridge Rectifier



Case Style GBU



Case Style GBU



RoHS COMPLIANT HALOGEN FREE

### FEATURES

- UL recognition file number E54214
- Ideal for printed circuit boards
- High surge current capability
- High case dielectric strength of 1500 V<sub>RMS</sub>
- Solder dip 275 °C max. 10 s, per JESD 22-B106
- Material categorization: for definitions of compliance please see [www.vishay.com/doc?99912](http://www.vishay.com/doc?99912)

### TYPICAL APPLICATIONS

General purpose use in AC/DC bridge full wave rectification for monitor, TV, printer, switching mode power supply, adapter, audio equipment, and home appliances applications.

### MECHANICAL DATA

**Case:** GBU  
Molding compound meets UL 94 V-0 flammability rating Base P/N-M3 - halogen-free, RoHS-compliant, and commercial grade

**Terminals:** Matte tin plated leads, solderable per J-STD-002 and JESD 22-B102  
M3 suffix meets JESD 201 class 1A whisker test

**Polarity:** As marked on body

**Mounting Torque:** 10 cm-kg (8.8 inches-lbs) max.

**Recommended Torque:** 5.7 cm-kg (5 inches-lbs)

PRIMARY CHARACTERISTICS	
Package	GBU
I <sub>F(AV)</sub>	4.0 A
V <sub>RRM</sub>	50 V, 100 V, 200 V, 400 V, 600 V, 800 V, 1000 V
I <sub>FSM</sub>	150 A
I <sub>R</sub>	5 μA
V <sub>F</sub> at I <sub>F</sub> = 4.0 A	1.0 V
T <sub>J</sub> max.	150 °C
Diode variations	In-line

MAXIMUM RATINGS (T <sub>A</sub> = 25 °C unless otherwise noted)									
PARAMETER	SYMBOL	GBU4A	GBU4B	GBU4D	GBU4G	GBU4J	GBU4K	GBU4M	UNIT
Maximum repetitive peak reverse voltage	V <sub>RRM</sub>	50	100	200	400	600	800	1000	V
Maximum RMS voltage	V <sub>RMS</sub>	35	70	140	280	420	560	700	V
Maximum DC blocking voltage	V <sub>DC</sub>	50	100	200	400	600	800	1000	V
Maximum average forward rectified output current at	I <sub>F(AV)</sub>	4.0							A
		3.0							
Peak forward surge current single sine-wave superimposed on rated load	I <sub>FSM</sub>	150							A
Rating for fusing (t < 8.3 ms)	I <sup>2</sup> t	93							A <sup>2</sup> s
Operating junction and storage temperature range	T <sub>J</sub> , T <sub>STG</sub>	-55 to +150							°C

### Notes

- (1) Unit case mounted on 1.6" x 1.6" x 0.06" thick (4.0 cm x 4.0 cm x 0.15 cm) aluminum plate
- (2) Units mounted on PCB with 0.5" x 0.5" (12 mm x 12 mm) copper pads and 0.375" (9.5 mm) lead length



<b>ELECTRICAL CHARACTERISTICS</b> ( $T_A = 25\text{ }^\circ\text{C}$ unless otherwise noted)										
PARAMETER		SYMBOL	GBU4A	GBU4B	GBU4D	GBU4G	GBU4J	GBU4K	GBU4M	UNIT
Maximum instantaneous forward drop per diode	4.0 A	$V_F$				1.0				V
Maximum DC reverse current at rated DC blocking voltage per diode	$T_A = 25\text{ }^\circ\text{C}$	$I_R$				5.0				$\mu\text{A}$
	$T_A = 125\text{ }^\circ\text{C}$					500				
Typical junction capacitance per diode	4.0 A, 1 MHz	$C_J$				57				pF

<b>THERMAL CHARACTERISTICS</b> ( $T_A = 25\text{ }^\circ\text{C}$ unless otherwise noted)										
PARAMETER		SYMBOL	GBU4A	GBU4B	GBU4D	GBU4G	GBU4J	GBU4K	GBU4M	UNIT
Typical thermal resistance		$R_{\theta JA}^{(2)}$				22				$^\circ\text{C/W}$
		$R_{\theta JC}^{(1)}$				4.2				

**Notes**

- (1) Unit case mounted on aluminum plate heatsink
- (2) Units mounted on PCB with 0.5" x 0.5" (12 mm x 12 mm) copper pads and 0.375" (9.5 mm) lead length

<b>ORDERING INFORMATION</b> (Example)				
PREFERRED P/N	UNIT WEIGHT (g)	PREFERRED PACKAGE CODE	BASE QUANTITY	DELIVERY MODE
GBU4J-M3/45	3.565	45	20	Tube
GBU4J-M3/51	3.565	51	250	Paper tray

**RATINGS AND CHARACTERISTICS CURVES** ( $T_A = 25\text{ }^\circ\text{C}$  unless otherwise noted)

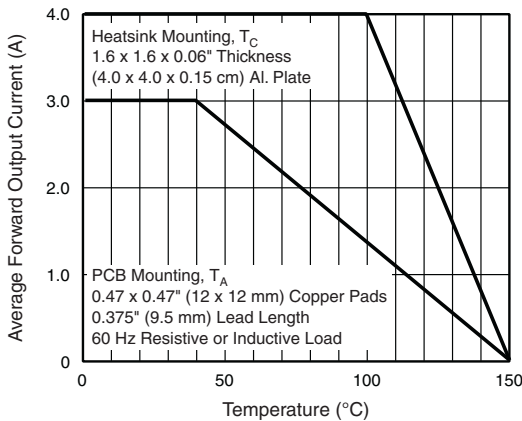


Fig. 1 - Derating Curve Output Rectified Current

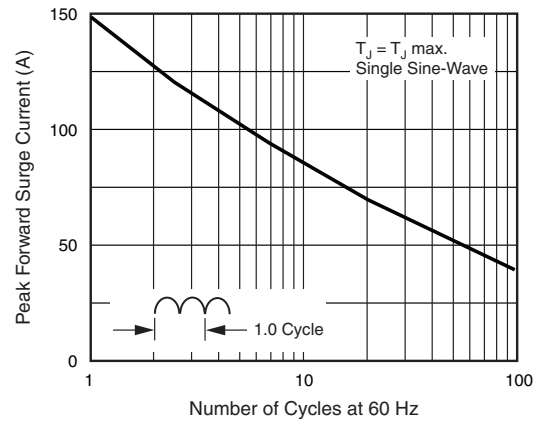


Fig. 2 - Maximum Non-Repetitive Peak Forward Surge Current Per Diode

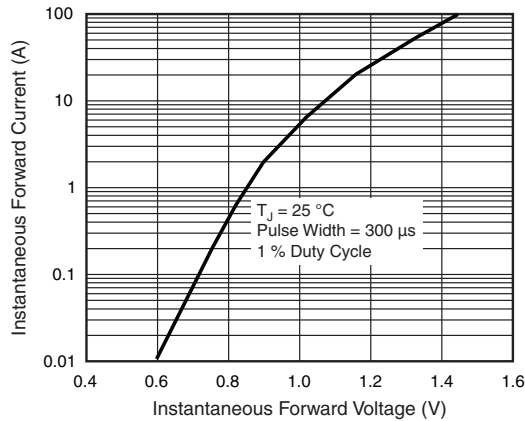


Fig. 3 - Typical Forward Characteristics Per Diode

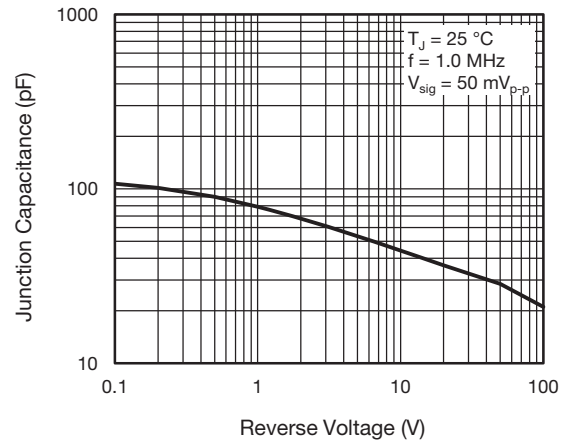


Fig. 5 - Typical Junction Capacitance Per Diode

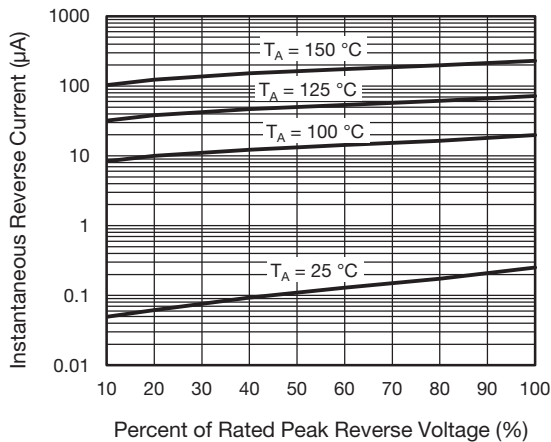


Fig. 4 - Typical Reverse Leakage Characteristics Per Diode

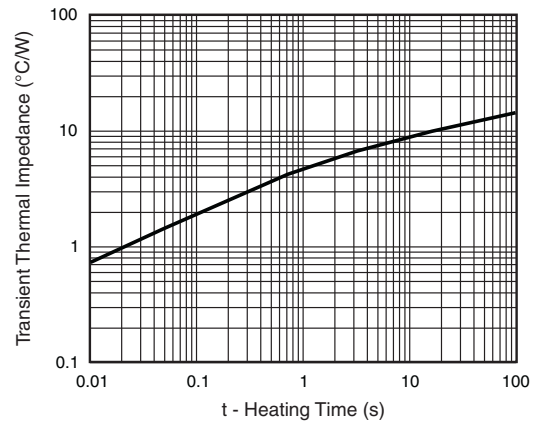
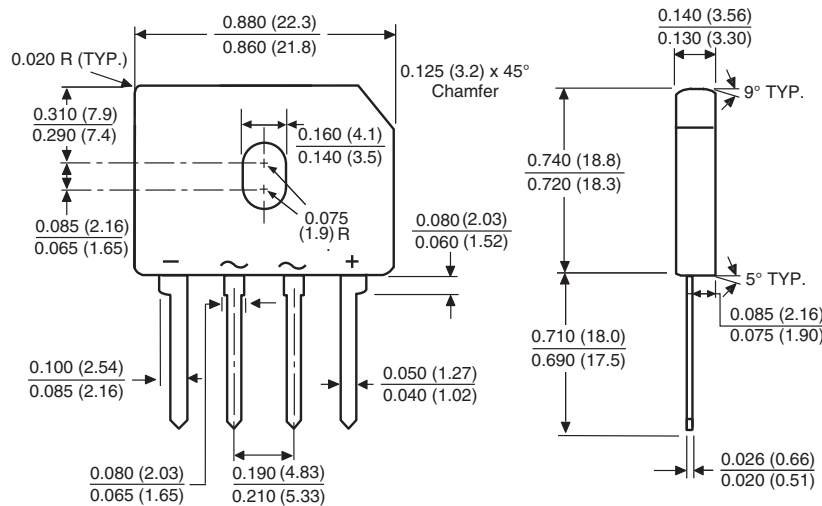


Fig. 6 - Typical Transient Thermal Impedance

**PACKAGE OUTLINE DIMENSIONS** in inches (millimeters)

**Case Type GBU**



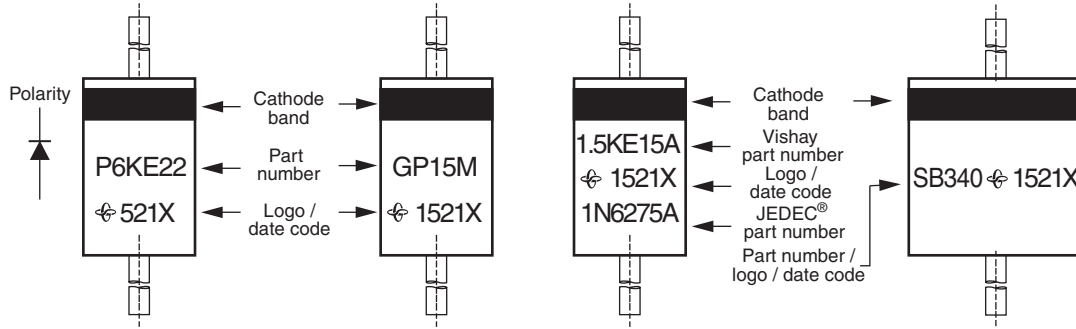
Polarity shown on front side of case, positive lead by beveled corner

## Vishay General Semiconductor

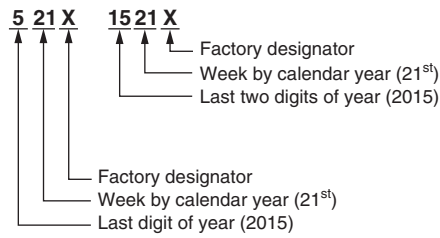
### AXIAL MARKING

Package: DO-41 (DO-204AL), DO-15 (DO-204AC), DO-201AD, GP20, 1.5KE, P600

Examples:



#### DATE CODE (for RoHS-compliant products)

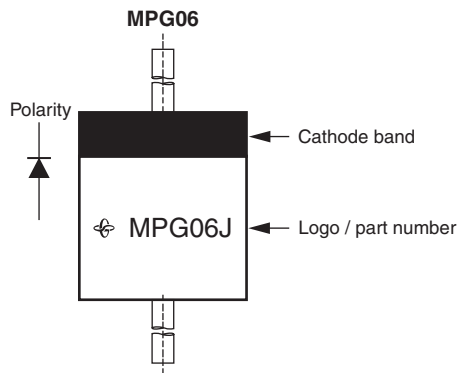


#### DATE CODE (for halogen-free products)



#### Notes

- (1) No cathode band marking for TVS bi-directional type
- (2) Date code per individual part number specification



PART NUMBER MARKING CODE		
TYPE	RoHS-COMPLIANT	HALOGEN-FREE
MPG06 series	MPG06x	M06x
RMPG06 series	RMPG06x	MR06x
UG06 series	UG06x	MUG06x
SB0x series	SB0x0	MSB0x0
TPMP06 series	T-x	MT-x

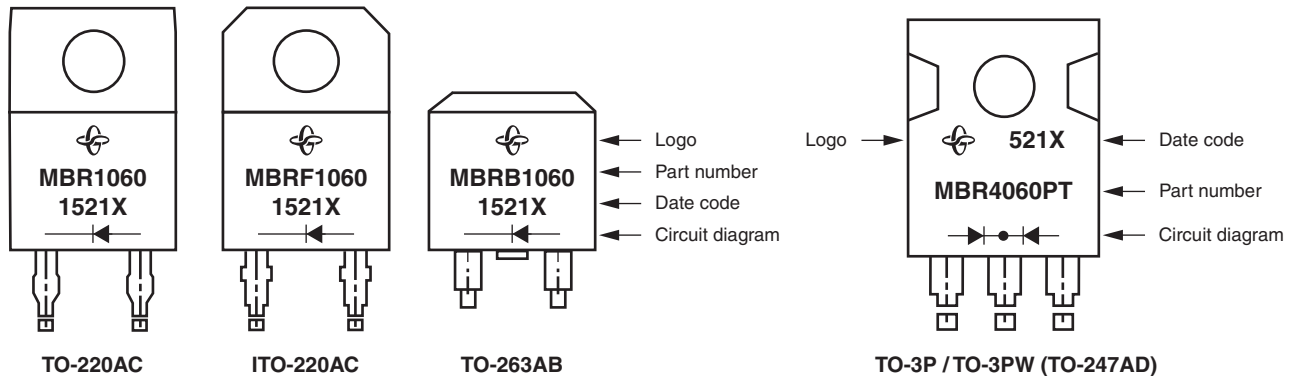
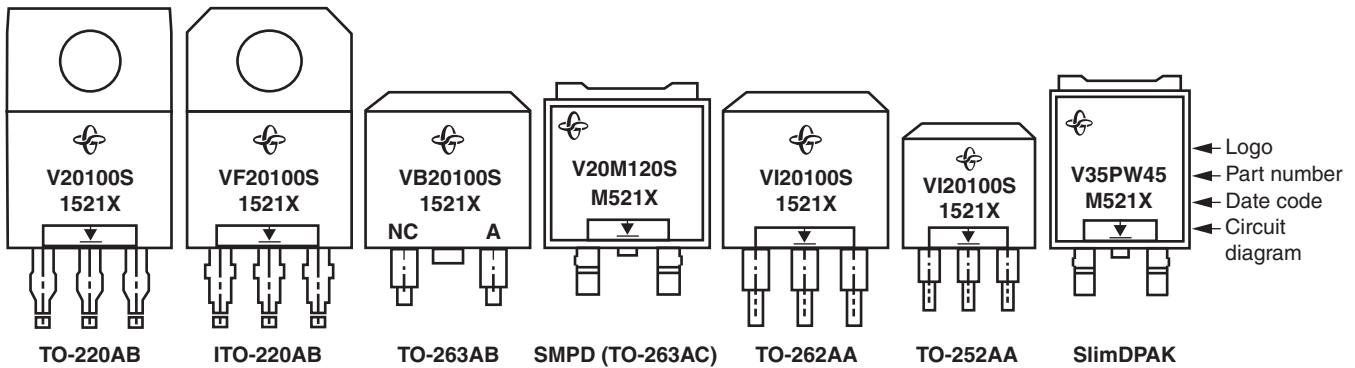
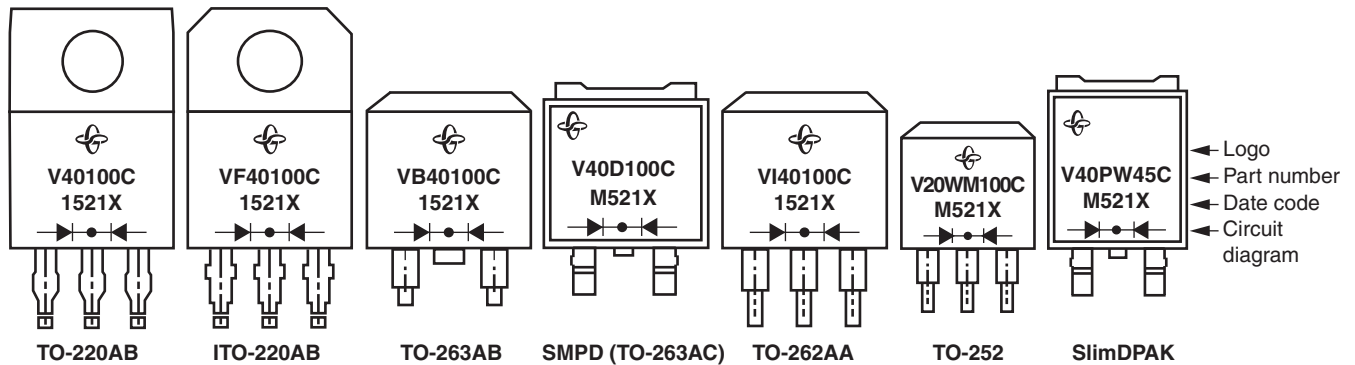
#### Note

- x - type code

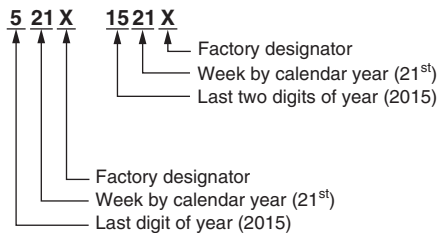


## POWER PACK MARKING

Examples:



### DATE CODE (for RoHS-compliant products)



### DATE CODE (for halogen-free products)



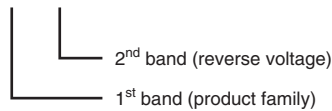
### Notes

(1) Date code per individual part number specification

## PLASTIC MELF AND MiniMELF MARKING

1. Package: GL41 (DO-213AB)

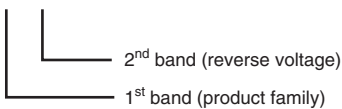
**MELF**  
2.5 mm x 4.9 mm



TYPE	1 <sup>st</sup> BAND	2 <sup>nd</sup> BAND	
BYM10 series	white	gray: 50 V	violet: 1000 V
GL41 series	white	red: 100 V	white: 1300 V
BYM11 series	red	orange: 200 V	brown: 1600 V
RGL41 series	red	yellow: 400 V	
BYM12 series	green	green: 600 V	
EGL41 series	green	blue: 800 V	
BYM13 series	orange	gray: 20 V orange: 40 V green: 60 V	
SGL41 series	orange	red: 30 V yellow: 50 V	
TGL41-xx	blue		
ZGL41-xx	red		

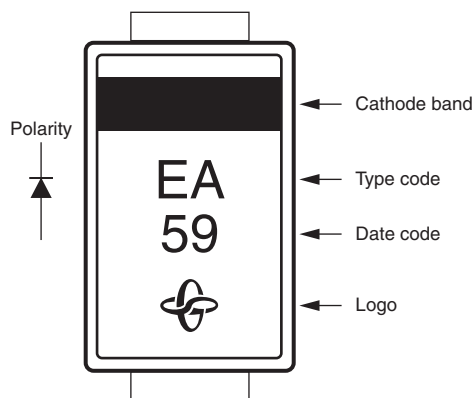
2. Package: GL34 (DO-213AA)

**MiniMELF**  
1.6 mm x 3.5 mm

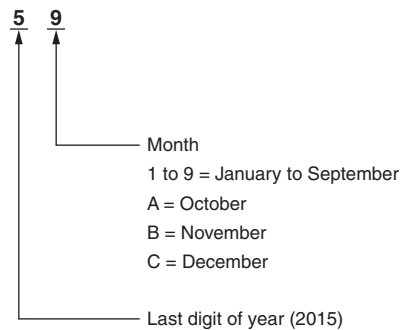


TYPE	1 <sup>st</sup> BAND	2 <sup>nd</sup> BAND	
BYM07 series	white	gray: 50 V	brown: 300 V
GL34 series	white	red: 100 V	yellow: 400 V
EGL34 series	green	pink: 150 V	green: 600 V
RGL34 series	red	orange: 200 V	blue: 800 V

## GF1 (DO-214BA) MARKING



### DATE CODE

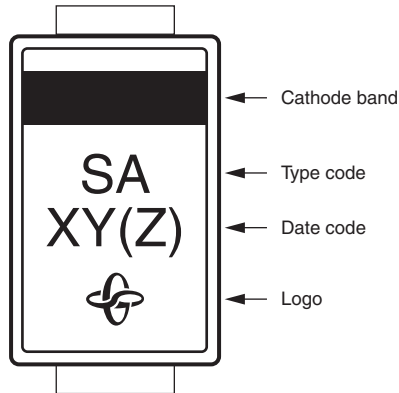


**Note**

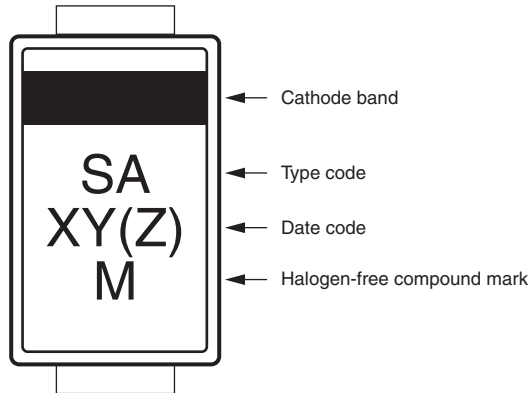
- Type code refers to individual datasheet

## SMA (DO-214AC), SMB (DO-214AA), SMC (DO-214AB), SlimSMA (DO-221AC), AND SMPA (DO-221BC) MARKING

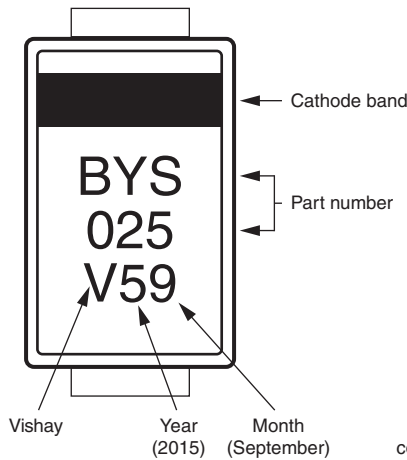
SMA, SMB, SMC



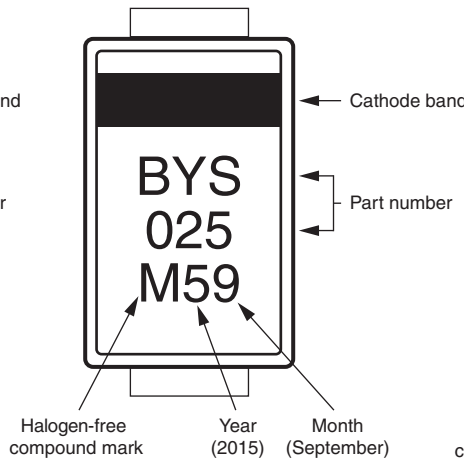
SMA, SMB, SMC, SlimSMA, SMPA



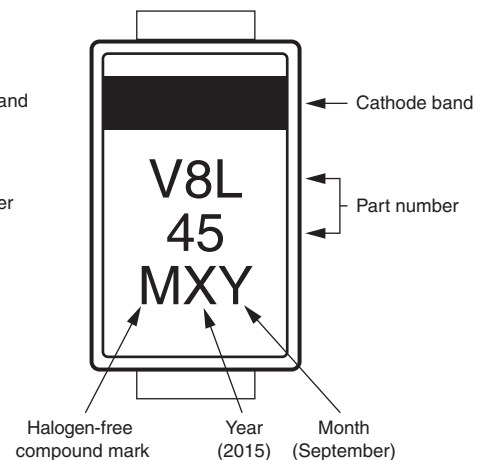
SMA with "BYS", "BYG" Prefix



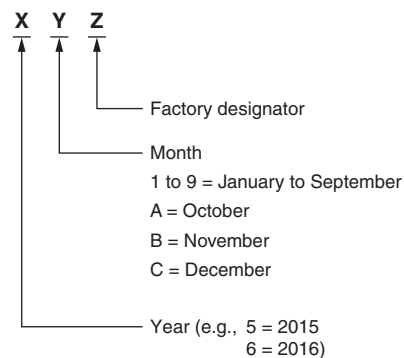
SMA with "BYS", "BYG" Prefix



SMA, SMB, SMC (for TMBS products with long core part number)



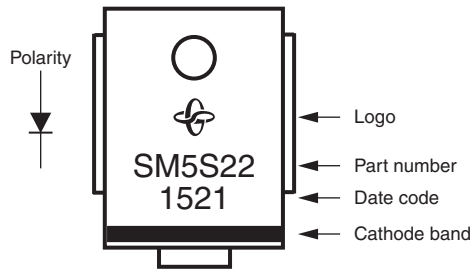
### DATE CODE



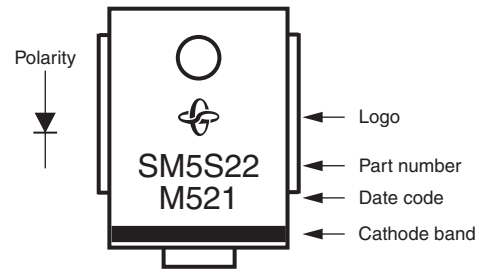
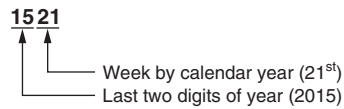
### Notes

- Type code refers to individual datasheet
- No cathode band marking for TVS bi-directional type
- "XY" 2 digits: For rectifiers and PAR TVS (TPSMA, TPSMB, TPSMB, TPSMC, and TA6F)
- "XYZ" 3 digits: For TRANSZORB® TVS and Power Voltage-Regulating Diodes
- Non "M" mark belongs to RoHS-compliant product

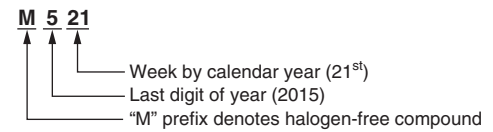
## DO-218AB MARKING



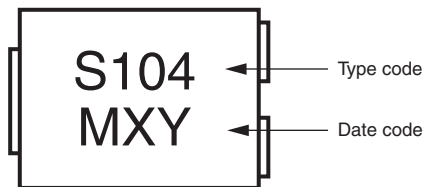
DATE CODE (for RoHS-compliant products)



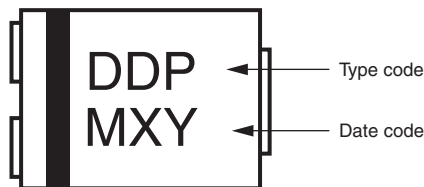
DATE CODE (for halogen-free products)



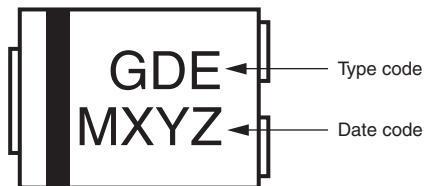
## SMPC (TO-277A) MARKING



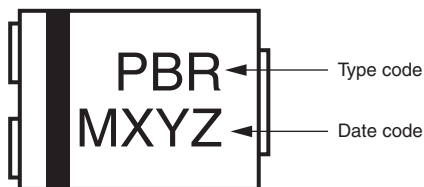
Polarity (for rectifiers)



Polarity (for PAR<sup>®</sup> TVS)

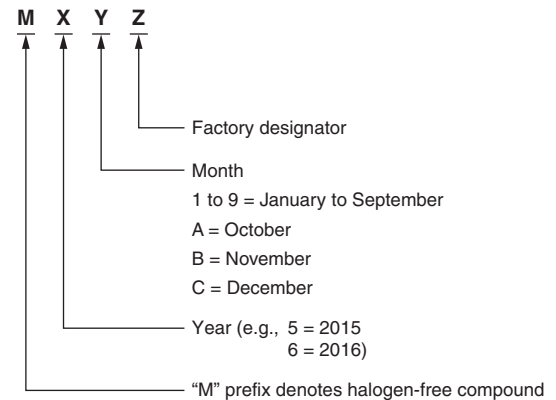


Polarity (for TRANSZORB<sup>®</sup> TVS of SMPCxxAN)



Polarity (for TRANSZORB<sup>®</sup> TVS of SMPCxxA)

### DATE CODE

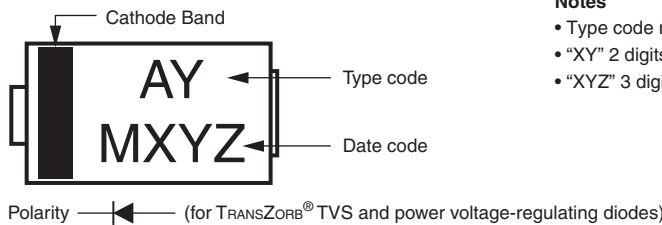
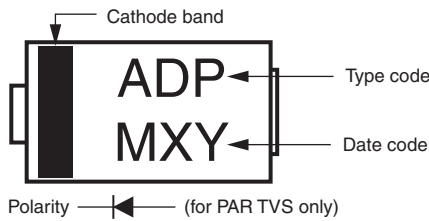
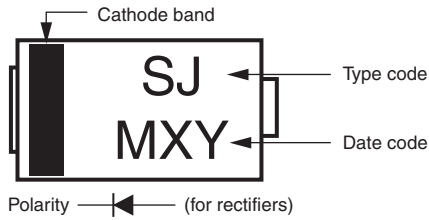


### Notes

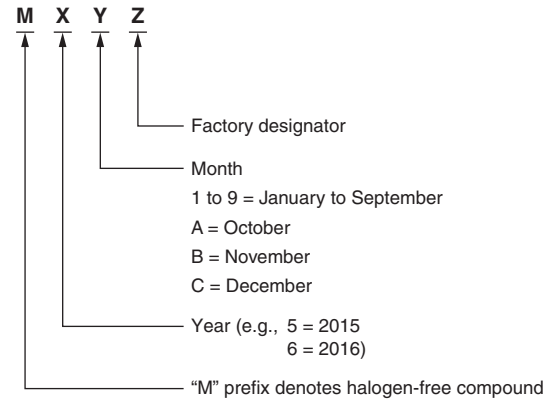
- Type code refers to individual datasheet
- "XY" 2 digits: for rectifiers and PAR<sup>®</sup> TVS
- "XYZ" 3 digits: for TRANSZORB<sup>®</sup> TVS
- TRANSZORB<sup>®</sup> TVS: cathode band depends on actual polarity
- No cathode band marking for bi-directional PAR TVS type



## SMP (DO-220AA) MARKING



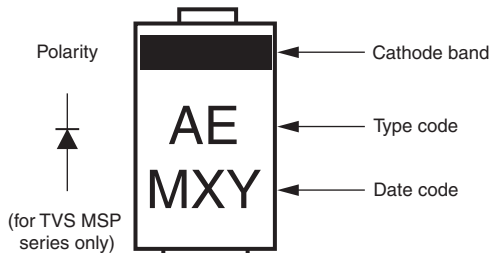
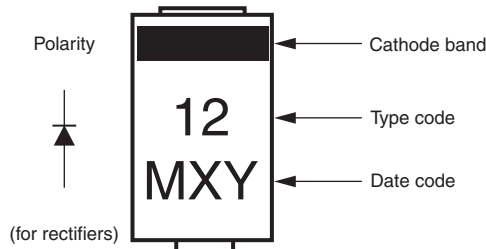
### DATE CODE



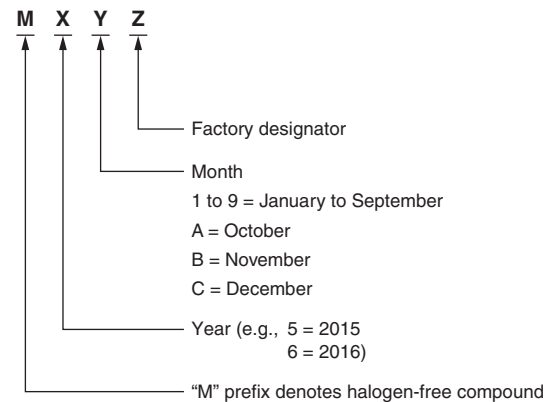
### Notes

- Type code refers to individual datasheet
- "XY" 2 digits: for rectifiers and PAR TVS
- "XYZ" 3 digits: for TRANSZORB® TVS and power voltage-regulating diodes

## MicroSMP (DO-219AD) MARKING



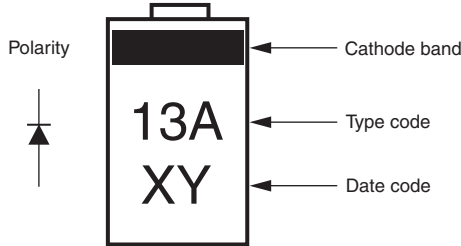
### DATE CODE



### Note

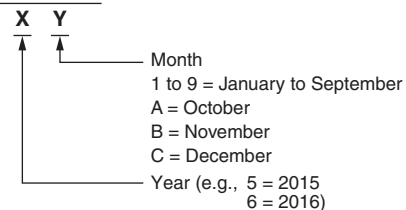
- Type code refers to individual datasheet

## MicroSMF (DO-219AC) MARKING

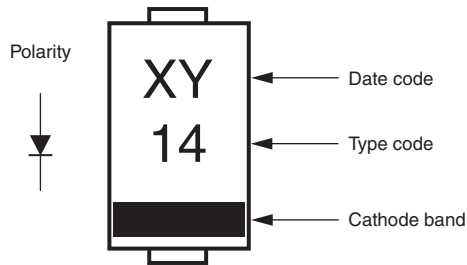


- Note**
- Type code refers to individual datasheet

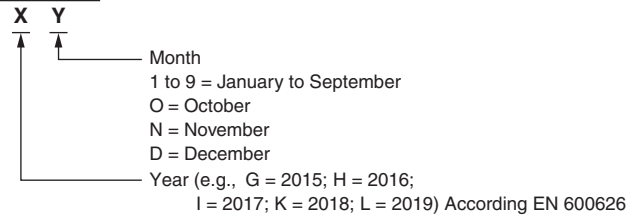
### DATE CODE



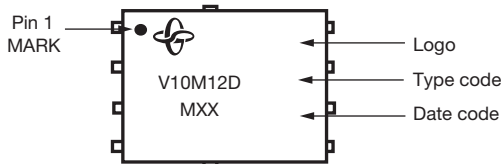
## SMF (DO-219AB) MARKING



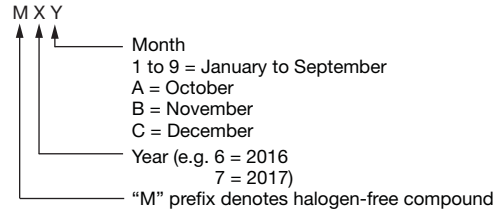
### DATE CODE



## FlatPAK 5 X 6 MARKING

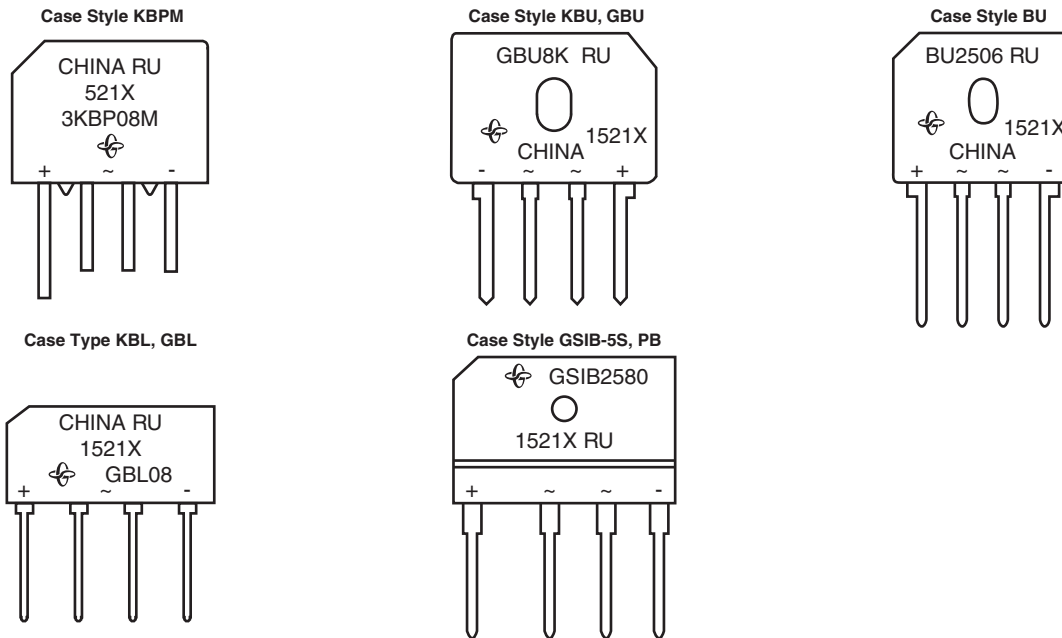


### DATE CODE



## BRIDGE MARKING

Single in-line bridge marking



Logo :

Part number: 3KBP08M, BU2506 (example)  
 UL approved: RU  
 Location: China  
 Date code (e.g., 521X, 1521X or M521X)  
 Polarity: + Positive output terminal  
 - Negative output terminal  
 ~ Alternate

### DATE CODE (for RoHS-compliant products)



### DATE CODE (for RoHS-compliant products)



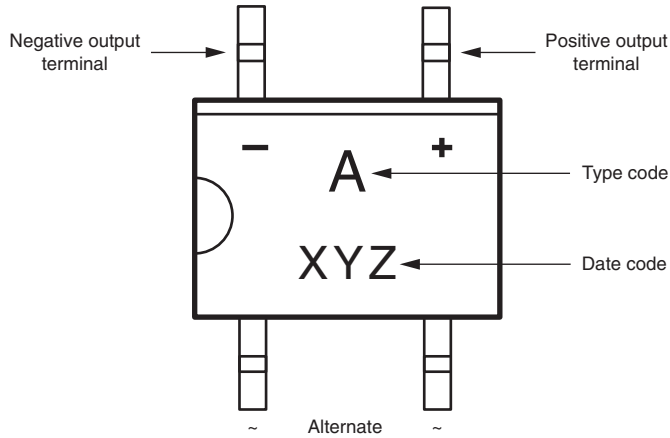
### DATE CODE (for halogen-free products)



**Note**  
 (1) Date code per individual part number specification

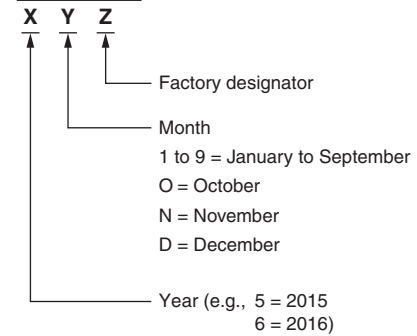
## DUAL IN-LINE BRIDGE MARKING

MBS (TO-269AA) and MBM Mini-Bridge



Polarity: + Positive output terminal  
- Negative output terminal

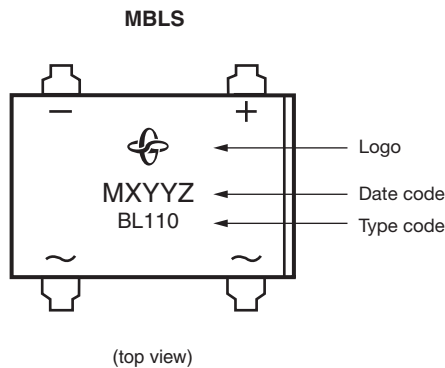
### DATE CODE



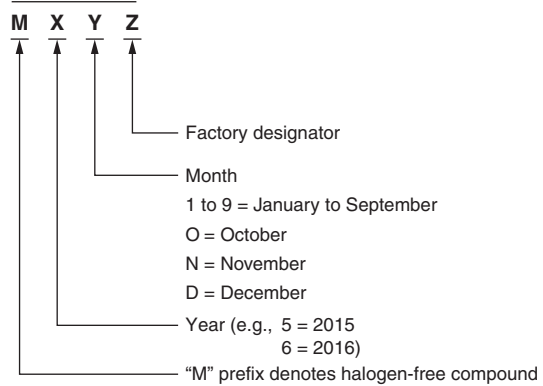
TYPE	TYPE CODE	TYPE	TYPE CODE
B2S, B2M	B2	MB4S, MB4M	4
B4S, B4M	B4	MB6S, MB6M	6
B6S, B6M	B6	RMB2S	2R
MB2S, MB2M	2	RMB4S	4R

### Note

- For halogen-free: add "Underline" below type code (e.g., 6)
- RMB2S and RMB4S only has type code without date code



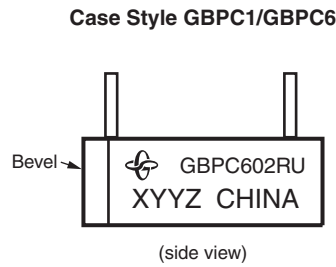
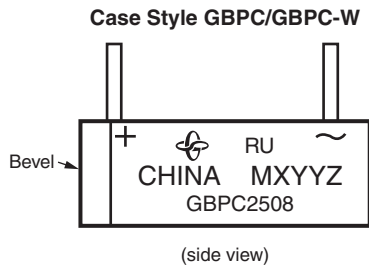
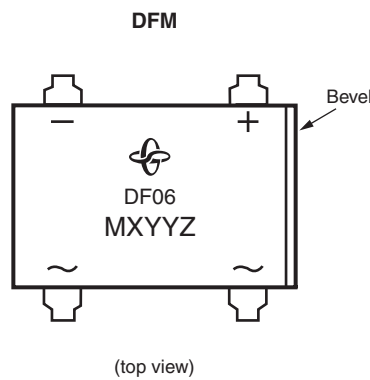
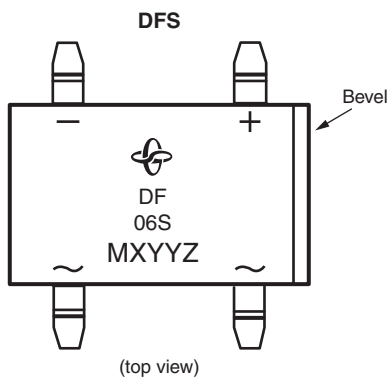
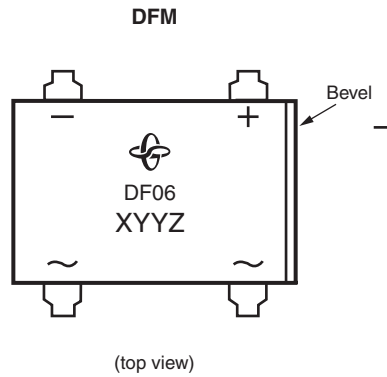
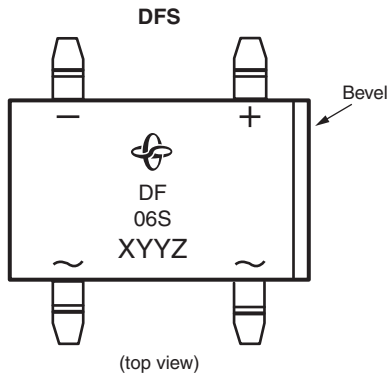
### DATE CODE



TYPE	TYPE CODE
MBL104S	BL104
MBL106S	BL106
MBL108S	BL108
MBL110S	BL110



DFS, DFM, and WOG



Logo:

Part number: GBPC2508 (example)  
 UL approved: RU  
 Location: China  
 Date code: (M)XYYZ  
 Polarity: + Positive output terminal  
 - Negative output terminal  
 ~ Alternate

### DATE CODE



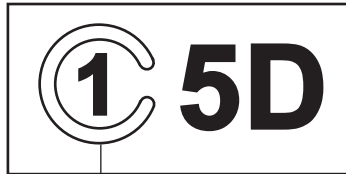
### Notes

- (1) Date code per individual part number specification
- (2) Non "M" mark belongs to RoHS-compliant product
- (3) "M" prefix denotes halogen-free compound

## Vishay Semiconductors (Small Signal Products)

### SMD MARKING

#### CLP0603 MARKING

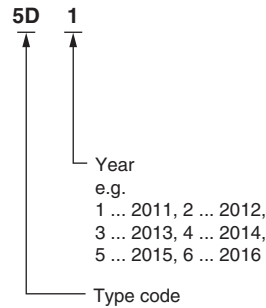


Cathode mark  
Opening of "C" indicates month,  
where wafer lot was started in fab,  
e.g. 3 o'clock means March

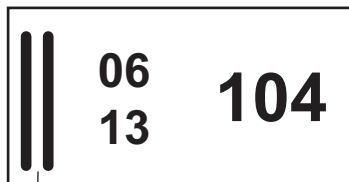
**Note**

- Type code refers to individual datasheet

#### DATE CODE



#### CLP1608 MARKING

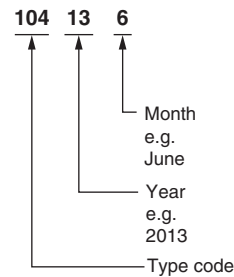


Cathode mark

**Note**

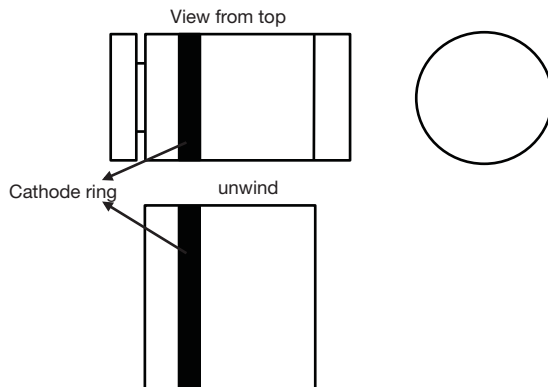
- Type code refers to individual datasheet

#### DATE CODE

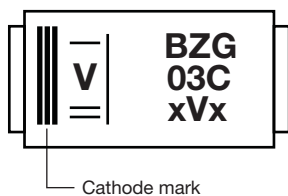


#### DO-213 MARKING

Marking: cathode

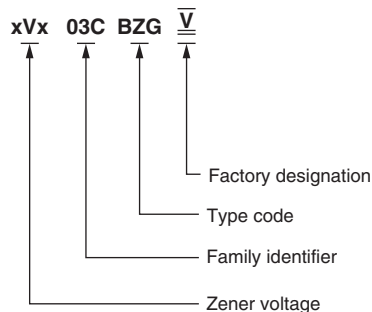


## SMA (DO-214AC) MARKING

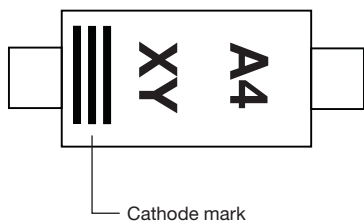


**Note**  
• Type code refers to individual datasheet

### DATE CODE

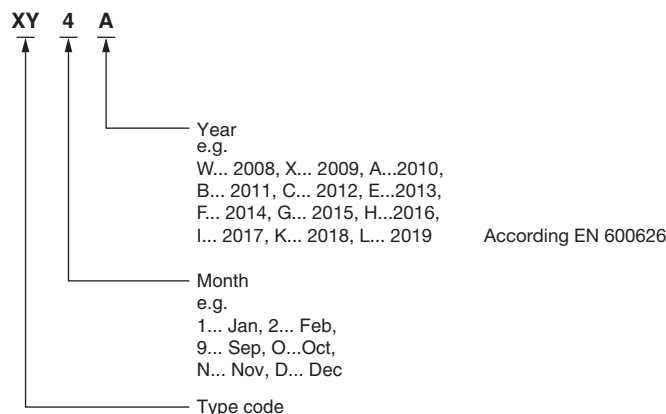


## SMF (DO-219AB) MARKING

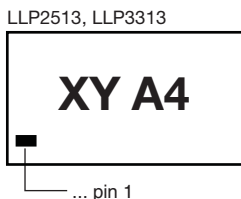
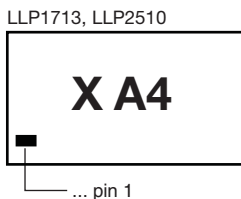


**Note**  
• Type code refers to individual datasheet

### DATE CODE

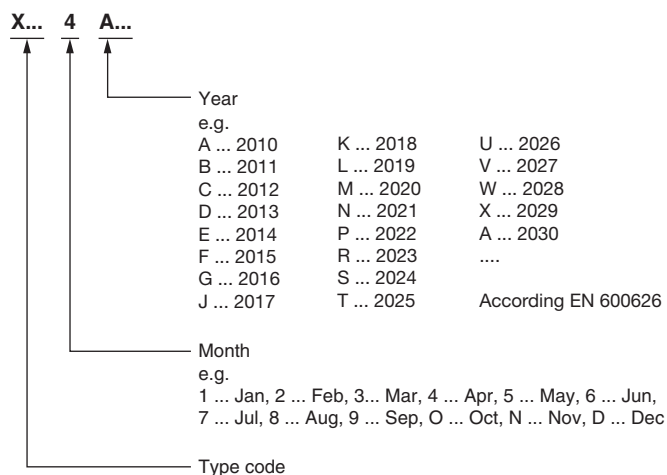


## LLP75, LLP1713, LLP2510, LLP2513, LLP3313 MARKING

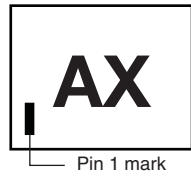


**Note**  
• Type code refers to individual datasheet

### DATE CODE



## LLP1006, LLP1010 MARKING



**Note**  
• Type code refers to individual datasheet

### DATE CODE

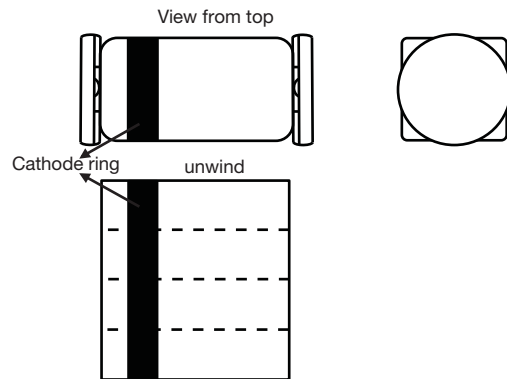
X... A...

Jan14-A, Feb14-B, Mar14-C, Apr14-D, May14-E, Jun14-F, Jul14-G, Aug14-H, Sep14-J, Oct14-K, Nov14-M, Dec14-N, Jan15-P, Feb15-Q, Mar15-R, Apr15-S, May15-T, Jun15-U, Jul15-V, Aug15-W, Sep15-X, Oct15-Y, Nov15-Z, Dec15- $\nu$ , Jan16- $\vartheta$ , Feb16- $\zeta$ , Mar16- $\zeta$ , Apr16- $\zeta$ , May16- $\zeta$ , Jun16- $\zeta$ , Jul16- $\rho$ , Aug16- $\chi$ , Sep16- $\omega$ , Oct16- $\delta$ , Nov16- $\delta$ , Dec16- $\delta$ , Jan17- $\lambda$ , Feb17- $\eta$ , Mar17- $\lambda$ , Apr17- $\mu$ , May17- $\lambda$ , Jun17-1, Jul17-2, Aug17-3, Sep17-4, Oct17-5, Nov17-6, Dec17-7, Jan18 = Jan14,....

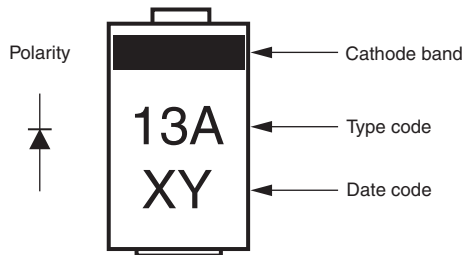
Type code

## MicroMELF MARKING

Marking: cathode



## MicroSMF (DO-219AC) MARKING



**Note**  
• Type code refers to individual datasheet

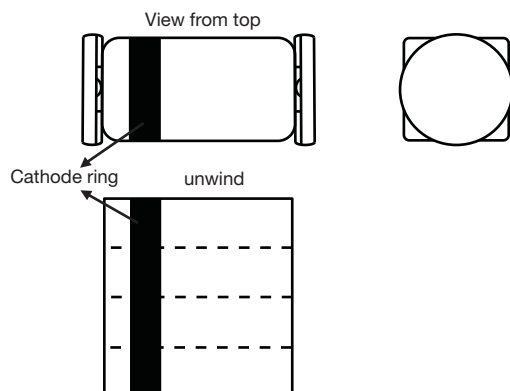
### DATE CODE

X Y

Month  
1 to 9 = January to September  
A = October  
B = November  
C = December  
Year (e.g., 5 = 2015  
6 = 2016)

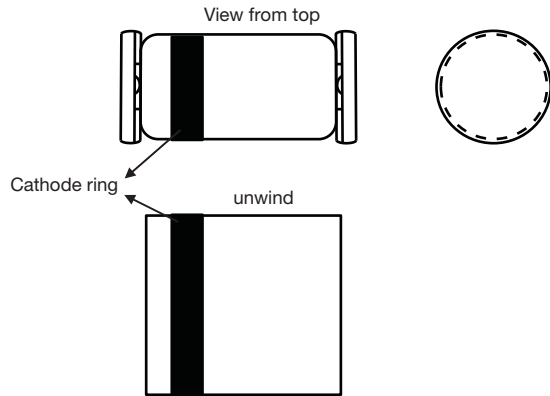
## QuadroMELF (SOD-80) MARKING

Marking: cathode



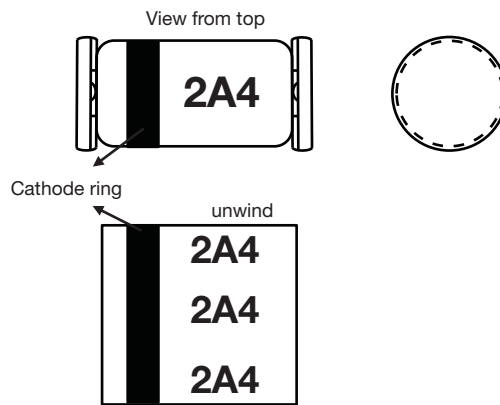
## MiniMELF (SOD-80) MARKING

Marking: cathode

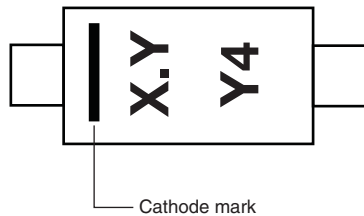


## MiniMELF (SOD-80) TLZ MARKING

Marking: type and cathode

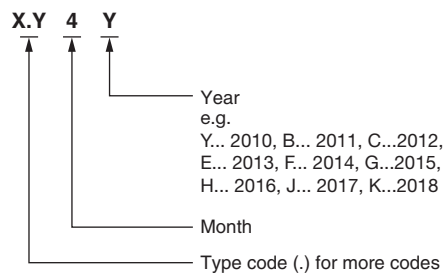


## SOD-123 MARKING



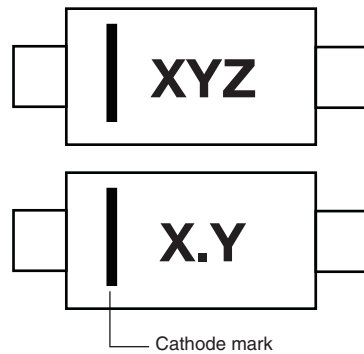
**Note**  
• Type code refers to individual datasheet

### DATE CODE

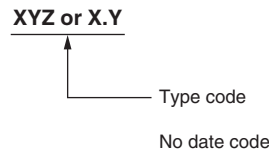


According to EN 600626

## SOD-323 MARKING

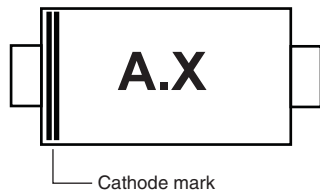


**Note**  
• Type code refers to individual datasheet



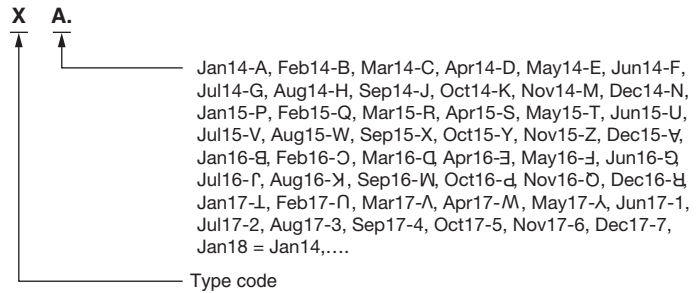


## SOD-523 MARKING

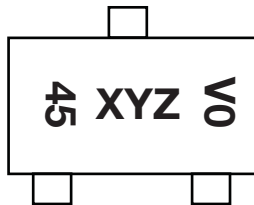


**Note**  
• Type code refers to individual datasheet

### DATE CODE

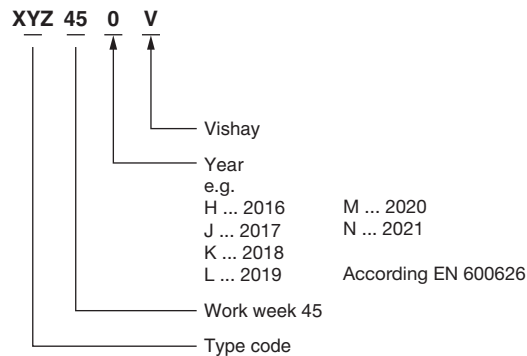


## SOT-23 MARKING

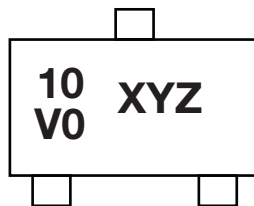


**Note**  
• Type code refers to individual datasheet

### DATE CODE

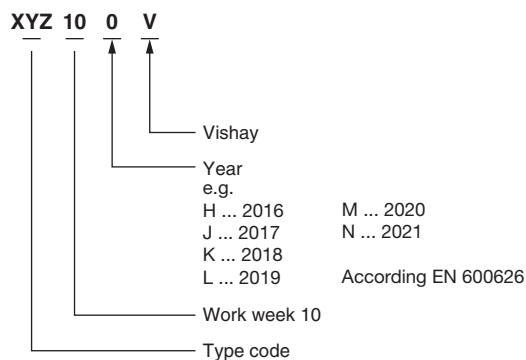


## SOT-3xx MARKING



**Note**  
• Type code refers to individual datasheet

### DATE CODE



## AXIAL MARKING

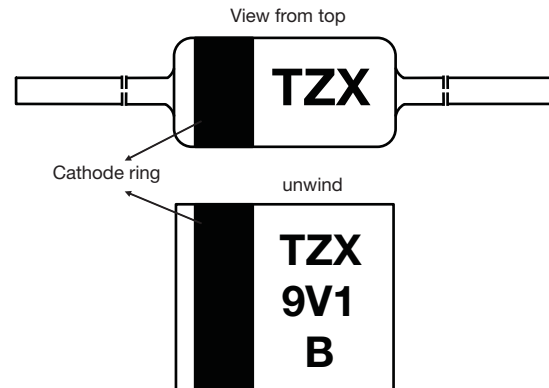
### DO-35 (DO-204AH) BAV, BAW, BAS MARKING

Marking: type and cathode



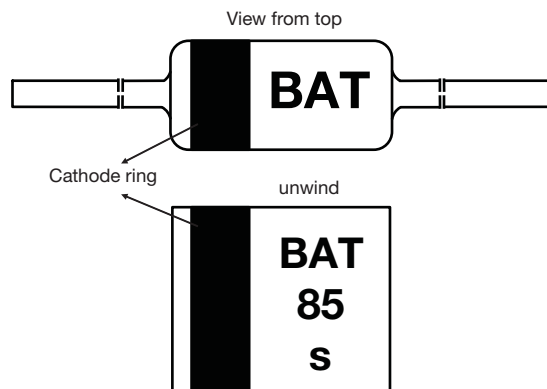
### DO-35 (DO-204AH) ZENER TZX MARKING

Marking: type and cathode



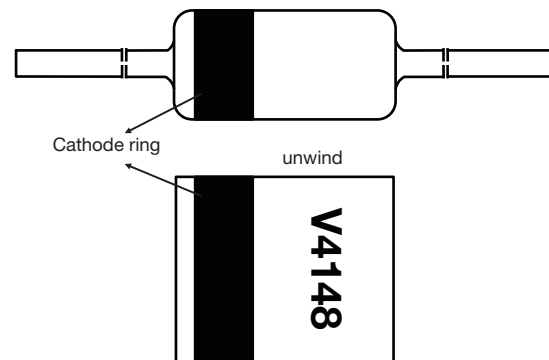
### DO-35 (DO-204AH) SCHOTTKY BAT, SD MARKING

Marking: type and cathode



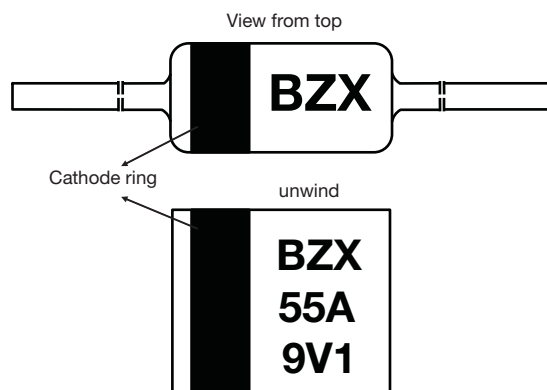
### DO-35 (DO-204AH) 1N4148 MARKING

Marking: type and cathode



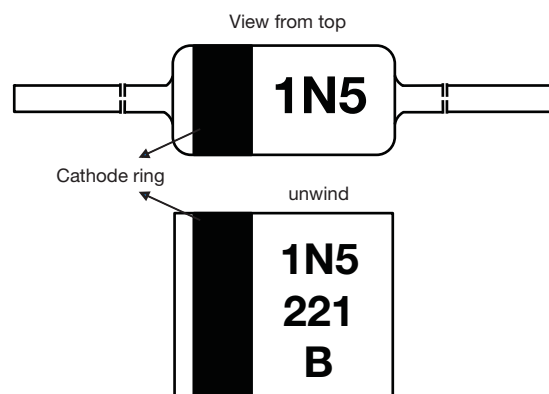
### DO-35 (DO-204AH) ZENER BZX55 MARKING

Marking: type and cathode



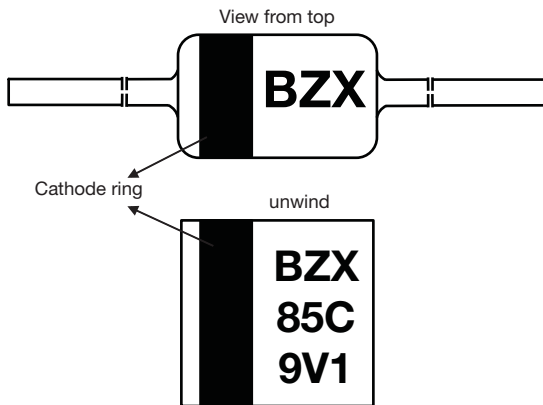
### DO-35 (DO-204AH) ZENER 1N52 MARKING

Marking: type and cathode



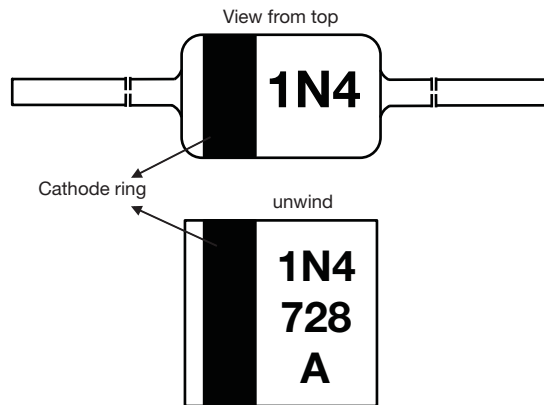
## DO-41 (DO-204AL) BZX85 MARKING

Marking: type and cathode



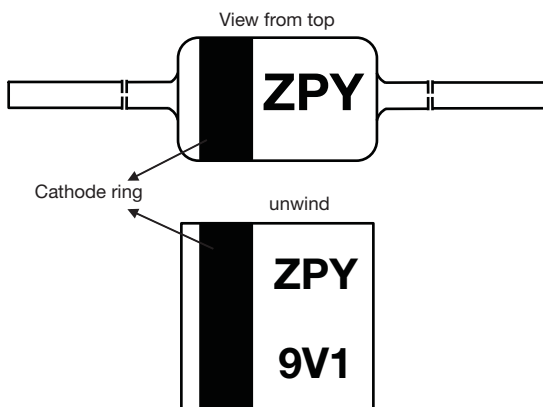
## DO-41 (DO-204AL) 1N47xx MARKING

Marking: type and cathode

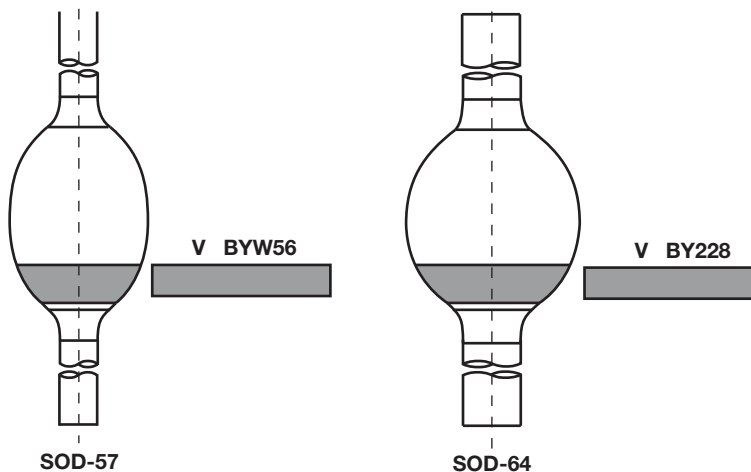


## DO-41 (DO-204AL) ZPY MARKING

Marking: type and cathode



## SOD-57, SOD-64 MARKING CODE



### SOD-57 and SOD-64 Avalanche diodes

The unique part number is followed by letter "V", means Vishay  
e.g. BYT62 V; SF1600 V or BYW83 V

### SOD-57 Zener diodes

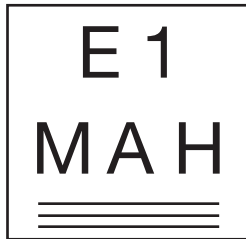
BZT03Cxx - where "xx" means the Zener voltage (no "V" after the part number)

### SOD-64 Zener diodes

BZW03Cxx - where "xx" means the Zener voltage (no "V" after the part number)

## Vishay Semiconductors (High Power Products)

### SMF (DO-219AB) MARKING



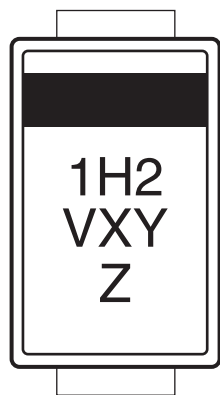
**1<sup>st</sup> row**

First digit: year (E = 2013; F = 2014; G = 2015; H = 2016; I = 2017; K = 2018; L = 2019.....) According to EN 600626  
Second digit: month (1 = Jan; 2 = Feb; ... O = Oct; N = Nov; D = Dec)

**2<sup>nd</sup> row**

First digit: environmental digit  
Second digit: current / voltage rating

### SMA (DO-214AC), SMB (DO-214AA), SMC (DO-214AB) (FRED Pt®) MARKING



← Cathode band  
← Type code  
← Date code  
← Environmental digit code

**Type Code**

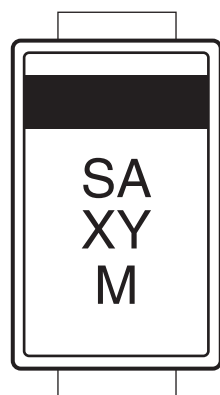
**1 H 2**  
Voltage  
FRED Pt®  
2 = 200 V  
..  
6 = 600 V  
  
Current  
1 = 1 A  
..  
5 = 5 A

**Date Code**

**X Y**  
Month:  
1 to 9 = January to September  
A = October  
B = November  
C = December  
  
Year  
(e.g. 1 = 2011, 2 = 2012)

Process type:  
X = hyperfast recovery time  
H = hyperfast recovery time  
U = ultrafast recovery time  
L = low  $V_f$  ultrafast recovery time

### SMA (DO-214AC), SMB (DO-214AA), SMC (DO-214AB) (Schottky) MARKING



← Cathode band  
← Type code  
← Date code  
← Halogen-free compound mark

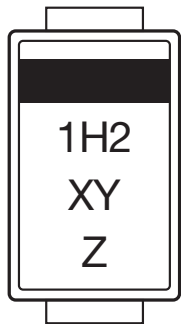
**Type Code**

**S A**  
Voltage  
Schottky standard:  
C = 15 V  
E = 30 V  
F = 40 V  
H = 60 V  
J = 100 V  
  
Schottky MBR series:  
2 = 20 V  
3 = 30 V  
4 = 40 V  
6 = 60 V  
9 = 90 V  
0 = 100 V  
  
Current  
1 = 1 A  
X = 1.5 A  
2 = 2 A  
3 = 3 A  
4 = 4 A  
..  
..

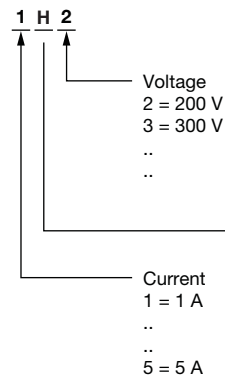
**Date Code**

**X Y**  
Month:  
1 to 9 = January to September  
A = October  
B = November  
C = December  
  
Year  
(e.g. 1 = 2011, 2 = 2012)

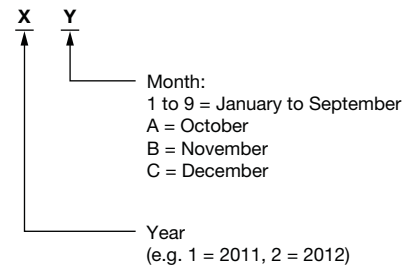
## SlimSMA (DO-221AC) MARKING



### Type Code



### Date Code

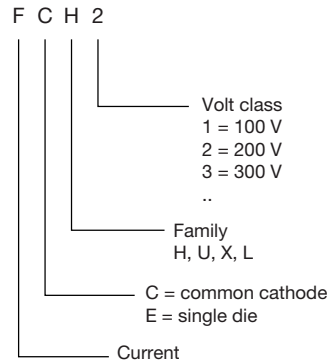


## SMPC MARKING

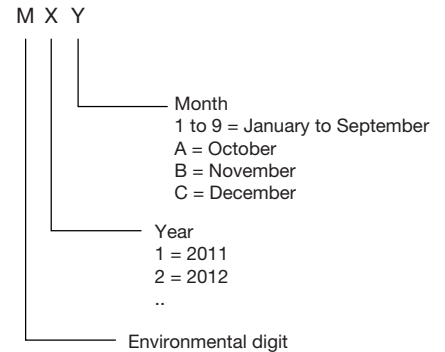


Polarity (For rectifiers)

### 1<sup>st</sup> row

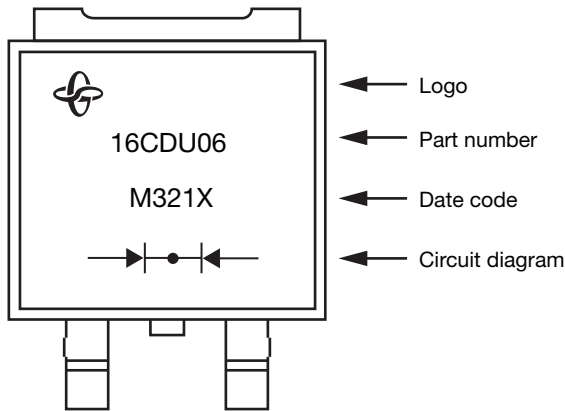


### 2<sup>nd</sup> row

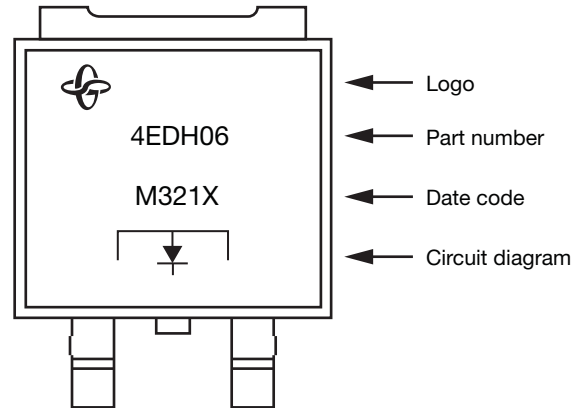


CURRENT	DIGIT	CURRENT	DIGIT
1	D	8	Q
2	F	7	R
3	G	10	S
4	J	11	T
5	K	12	V
6	N	13	Y
7	P	14	Z

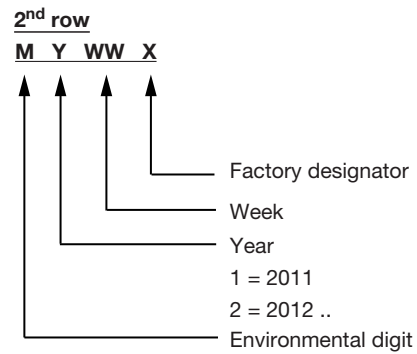
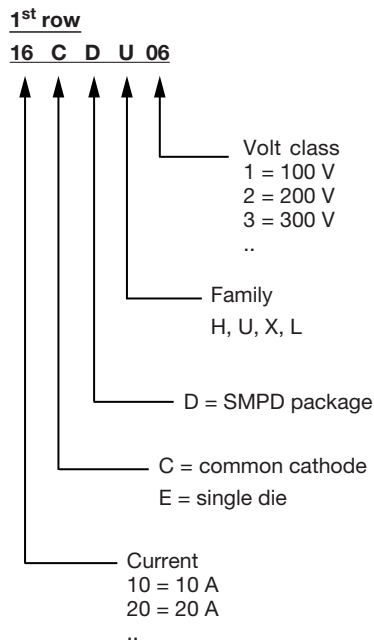
## SMPD MARKING



(For Dual Die Parts)



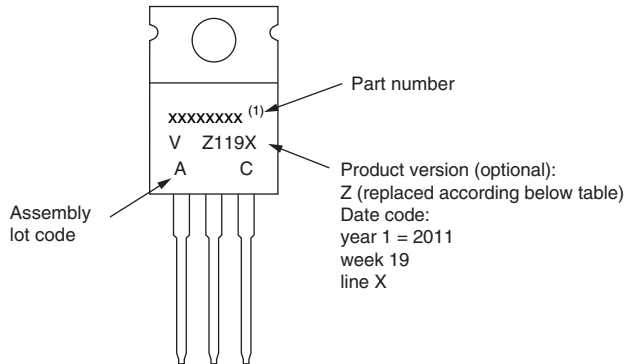
(For Single Die Parts)



## TO-220 MARKING

Examples: TO-220AB, TO-220FP, TO-220AC E, TO-220AC-N3

### TO-220AB E

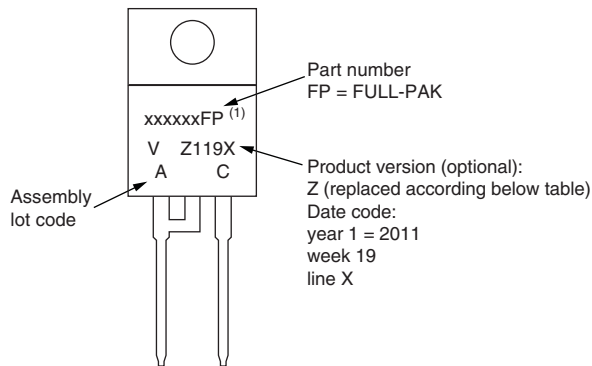


Example: This is a xxxxxxxx<sup>(1)</sup> with assembly lot code AC, assembled on WW 19, 2011 in the assembly line "X"

#### Note

<sup>(1)</sup> If part number contains "H" as last digit, product is AEC-Q101 qualified

### TO-220FP-N3

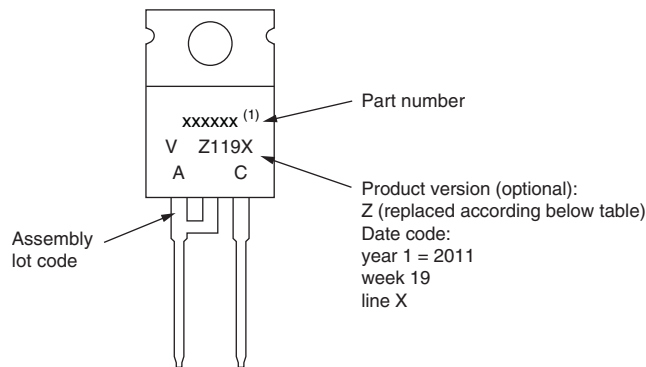


Example: This is a xxxxxxFP<sup>(1)</sup> with assembly lot code AC, assembled on WW 19, 2011 in the assembly line "X"

#### Note

<sup>(1)</sup> If part number contains "H" as last digit, product is AEC-Q101 qualified

### TO-220AC E, TO-220AC-N3

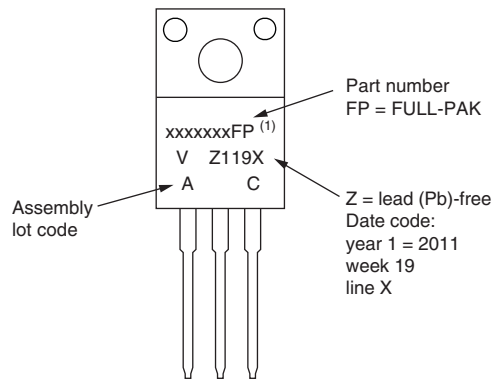


Example: This is a xxxxxx<sup>(1)</sup> with assembly lot code AC, assembled on WW 19, 2011 in the assembly line "X"

#### Note

<sup>(1)</sup> If part number contains "H" as last digit, product is AEC-Q101 qualified

## TO-220FP 2L

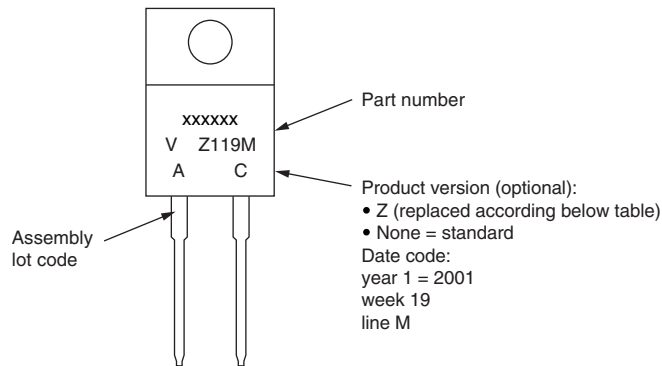


Example: This is a xxxxxxFP<sup>(1)</sup> with assembly lot code AC, assembled on WW 19, 2011 in the assembly line "X"

### Note

<sup>(1)</sup> If part number contains "H" as last digit, product is AEC-Q101 qualified

## TO-220AC 2L



Example: This is a xxxxxx with assembly lot code AC, assembled on WW 19, 2001 in the assembly line "M"

### Note

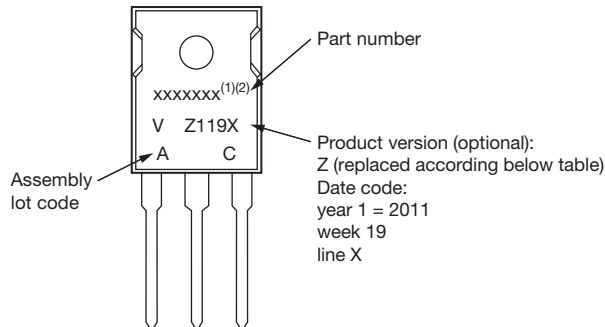
<sup>(1)</sup> If part number contains "H" as last digit, product is AEC-Q101 qualified



## TO-247 MARKING

Examples:

### TO-247, 3 pins long-lead

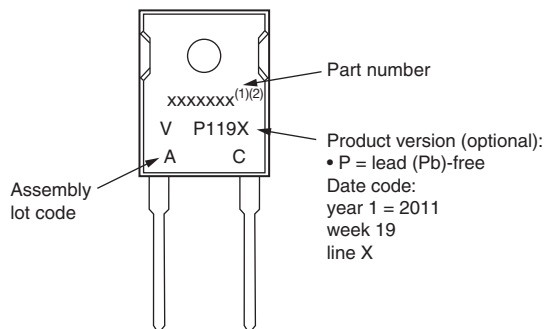


Example: This is a xxxxxxx<sup>(1)</sup> with assembly lot code AC, assembled on WW 19, 2011 in the assembly line "X"

### Notes

- (1) If part number contains "H" as last digit, product is AEC-Q101 qualified
- (2) If part number contains "L", product is long-lead

### TO-247, 2 pins long-lead

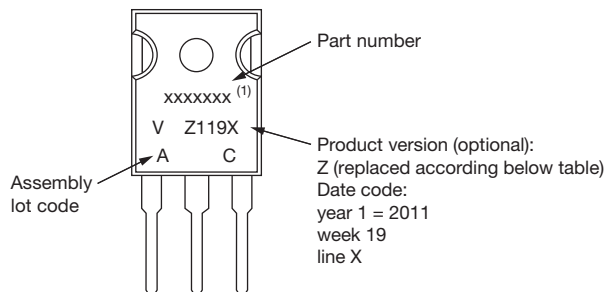


Example: This is a xxxxxxx with assembly lot code AC, assembled on WW 19, 2011 in the assembly line "X"

### Notes

- (1) If part number contains "H" as last digit, product is AEC-Q101 qualified
- (2) If part number contains "L", product is long-lead

### TO-247AC-N3

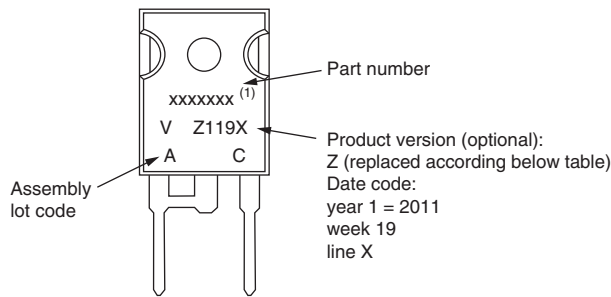


Example: This is a xxxxxxx<sup>(1)</sup> with assembly lot code AC, assembled on WW 19, 2011 in the assembly line "X"

### Note

- (1) If part number contains "H" as last digit, product is AEC-Q101 qualified

## TO-247AC-N3 modified

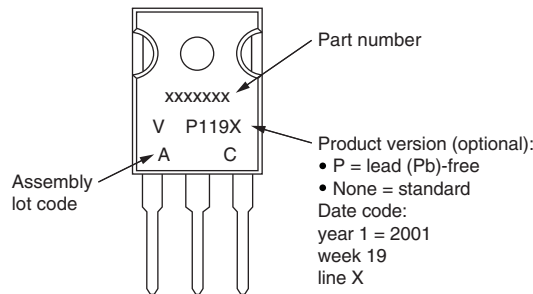


Example: This is a xxxxxx<sup>(1)</sup> with assembly lot code AC, assembled on WW 19, 2011 in the assembly line "X"

### Note

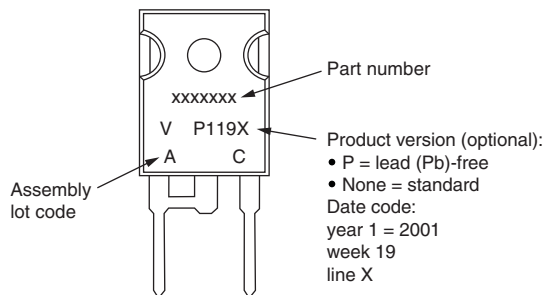
(1) If part number contains "H" as last digit, product is AEC-Q101 qualified

## TO-247 PbF



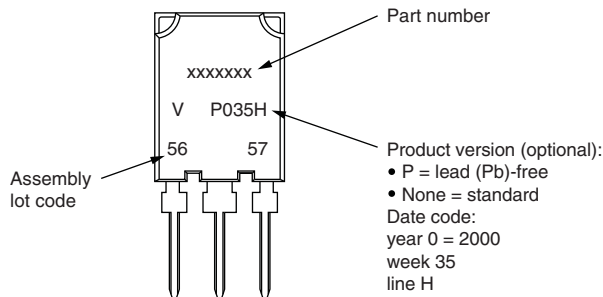
Example: This is a xxxxxx with assembly lot code AC, assembled on WW 19, 2001 in the assembly line "X"

## TO-247 PbF modified



Example: This is a xxxxxx with assembly lot code AC, assembled on WW 19, 2001 in the assembly line "X"

## Super TO-247

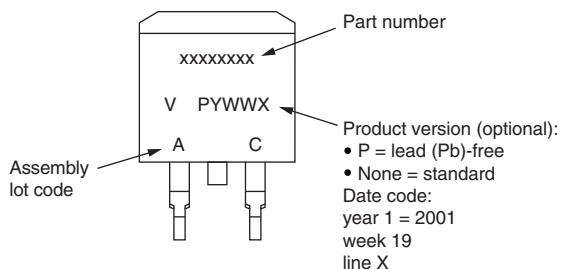


Example: This is a xxxxxx with assembly lot code 5657, assembled on WW 35, 2000 in assembly line "H"

## D<sup>2</sup>PAK (TO-263AA), TO-262 MARKING

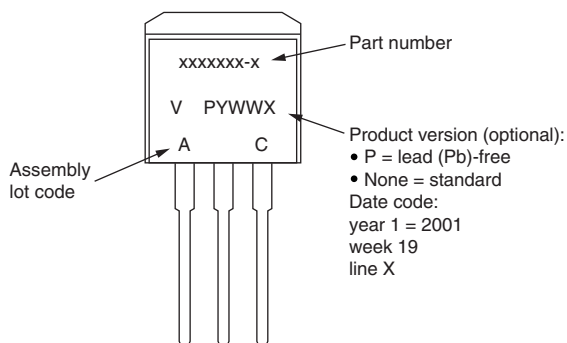
Examples:

### D<sup>2</sup>PAK E (TO-263AA)



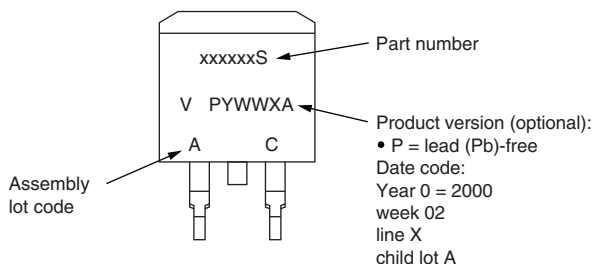
Example: This is a xxxxxxx with assembly lot code AC, assembled on WW 19, 2001 in the assembly line "X"

### TO-262AA



Example: This is a xxxxxx-x with assembly lot code AC, assembled on WW 19, 2001 in the assembly line "X"

### D<sup>2</sup>PAK (TO-263AA)

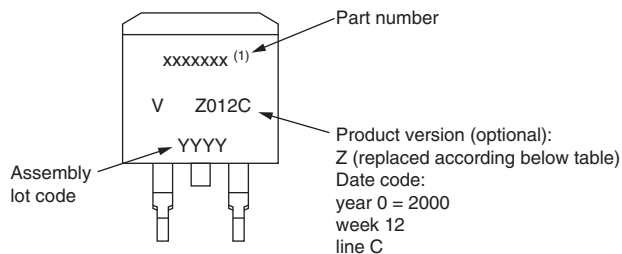


Example: This is a xxxxxxS with assembly lot code AC, assembled on WW 02, 2000

## DPAK (TO-252AA) MARKING

Examples:

### DPAK E

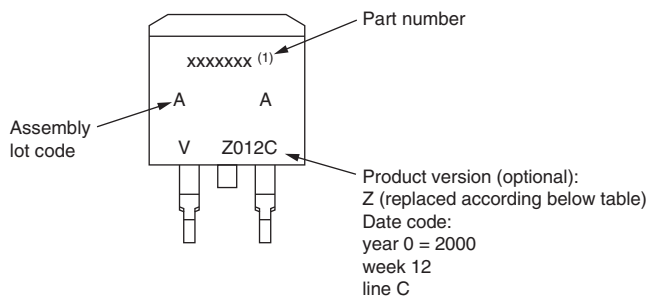


Example: This is a xxxxxxx with assembly lot code YYY, assembled on WW 12, 2000 in the assembly line "C"

### Note

(1) If part number contains "H" as last digit, product is AEC-Q101 qualified

### DPAK



Example: This is a xxxxxxx with assembly lot code YYY, assembled on WW 12, 2000 in the assembly line "C"

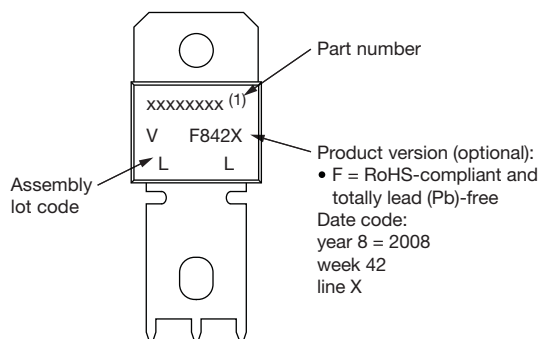
### Note

(1) If part number contains "H" as last digit, product is AEC-Q101 qualified

## PowerTab® MARKING

Examples:

### PowerTab®



Example: This is a xxxxxxx (1) with assembly lot code LL, assembled on WW 42, 2008 in the assembly line "X"

### Note

(1) If part number contains "H" as last digit, product is AEC-Q101 qualified



# eSMP® シリーズ

パワーダイオード製品の小型・薄型パッケージソリューション

IN A  
NUTSHELL

## eSMP® パッケージ

パワーデバイス向けに最適化  
した表面実装型パッケージ

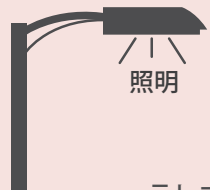


- 独自開発パッケージ
- 電力効率の向上
- 高い電流駆動能力

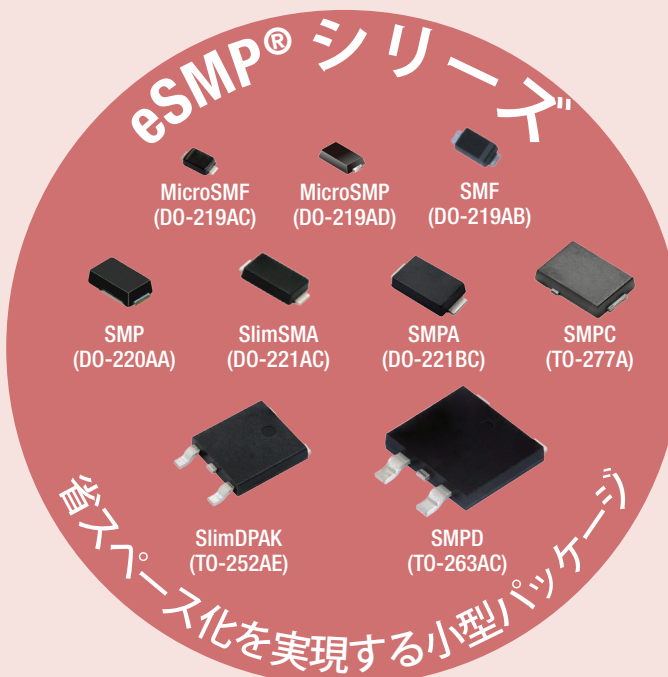


- 熱性能と信頼性の向上に貢献

## 用途



テレコミュニケーション



## 各種eSMP®パッケージで提供 される製品シリーズ

- ESD保護ダイオード
- PAR® TVSダイオード
- TRANSZORB® TVS ダイオード
- ツェナーダイオード
- アバランシェダイオード
- FRED Pt®ダイオード
- ショットキーダイオード
- 標準・高速リカバリーダイオード
- TMBS® ダイオード
- 超高速リカバリーダイオード

参照リンク:



eSMP® シリーズ製品概要

[www.vishay.com/doc?49383](http://www.vishay.com/doc?49383)

ダイオード (eSMP®シリーズパッケージ)

[www.vishay.com/landingpage/tradeshows/diodes/](http://www.vishay.com/landingpage/tradeshows/diodes/)

端子形状が**非対称・対称**なフラット  
リードタイプパッケージで提供

技術に関するお問い合わせ先: [DiodesAmericas@vishay.com](mailto:DiodesAmericas@vishay.com), [DiodesEurope@vishay.com](mailto:DiodesEurope@vishay.com), [DiodesAsia@vishay.com](mailto:DiodesAsia@vishay.com)



# eSMP® 系列

用于选定二极管和整流器的小尺寸和低型面高度封装解决方案

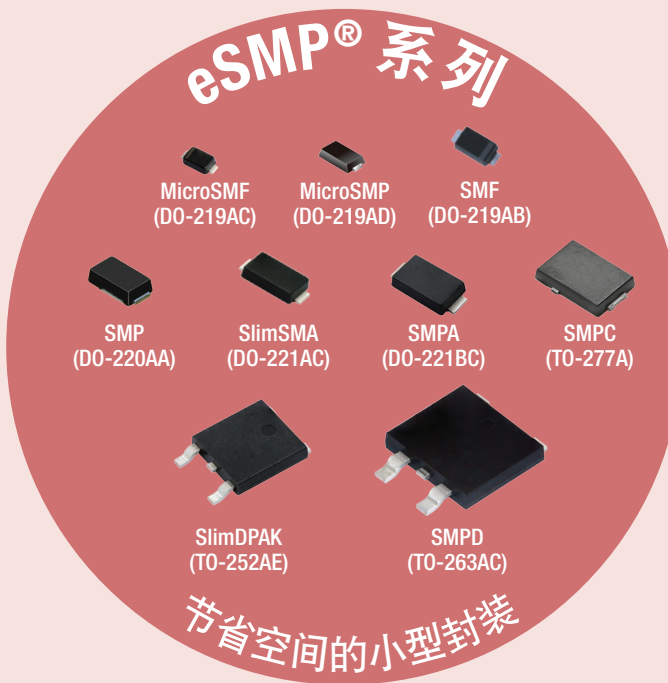
## 快速了解

### eSMP® 封装

#### 增强型表面贴装功率封装



利用可提供更出色**热性能**和**可靠性的独特设计**支持更高的**电流**和**功率效率**

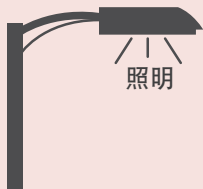
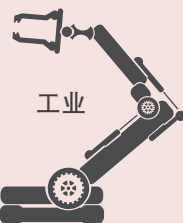


节省空间的小型封装

### eSMP®系列封装提供的产品技术:

- ESD 保护二极管
- PAR® TVS 二极管
- TRANSZORB® TVS 二极管
- 齐纳二极管
- 雪崩整流器
- FRED Pt® 整流器
- 肖特基整流器
- 标准和快速恢复整流器
- TMBS® 整流器
- 超快恢复整流器

### 应用



### 有用链接



### eSMP® 系列产品概述:

[www.vishay.com/doc?49383](http://www.vishay.com/doc?49383)

### 采用 eSMP® 系列封装的二极管/整流器:

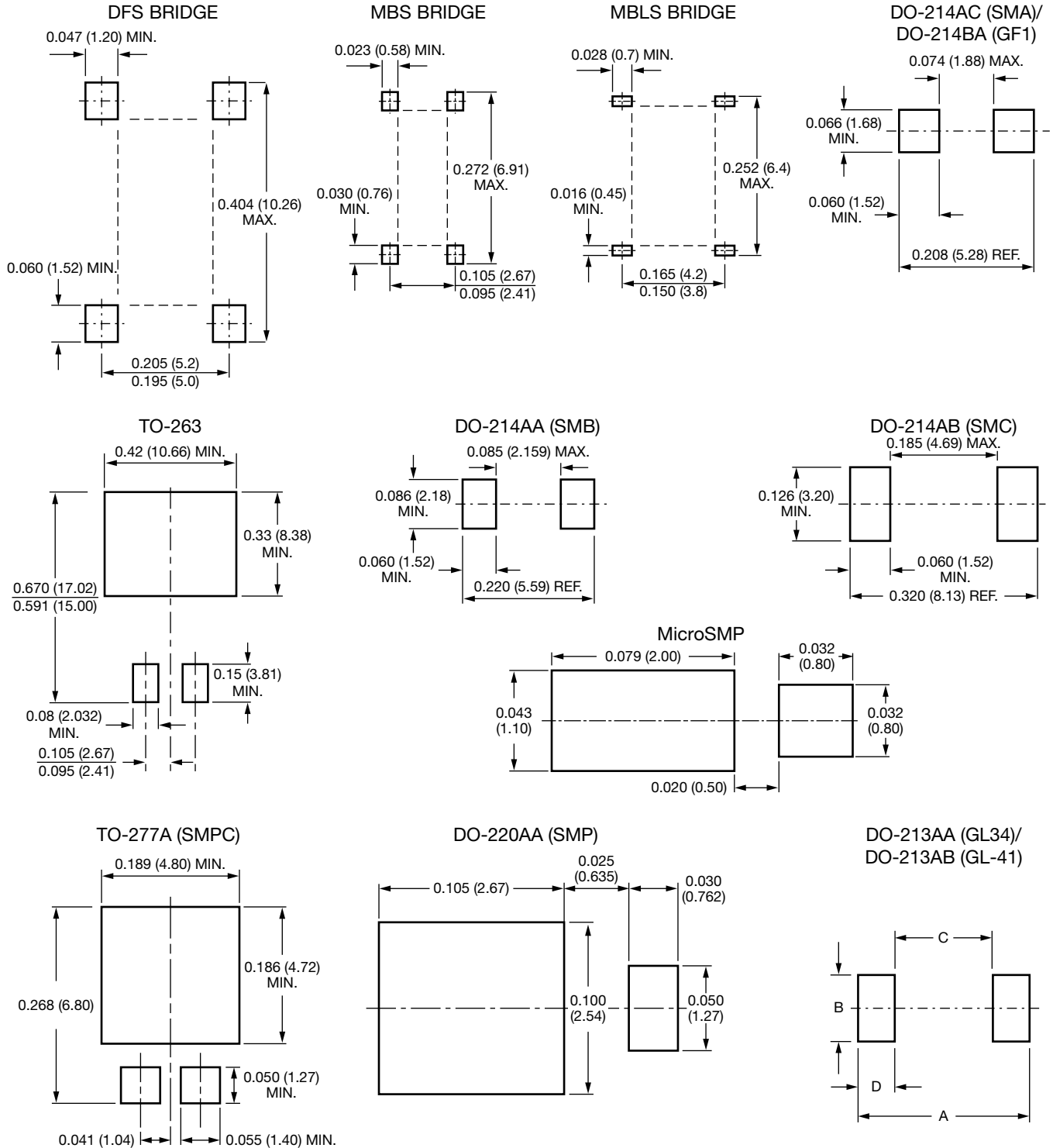
[www.vishay.com/landingpage/tradeshows/diodes/](http://www.vishay.com/landingpage/tradeshows/diodes/)

### 提供**不对称**和**对称**扁平式封装

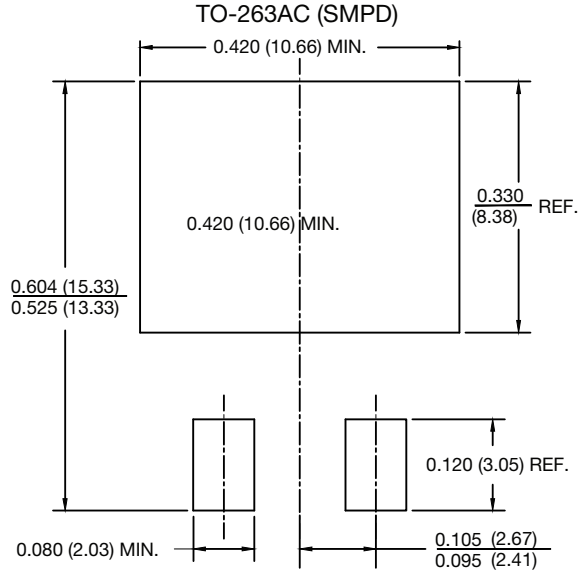
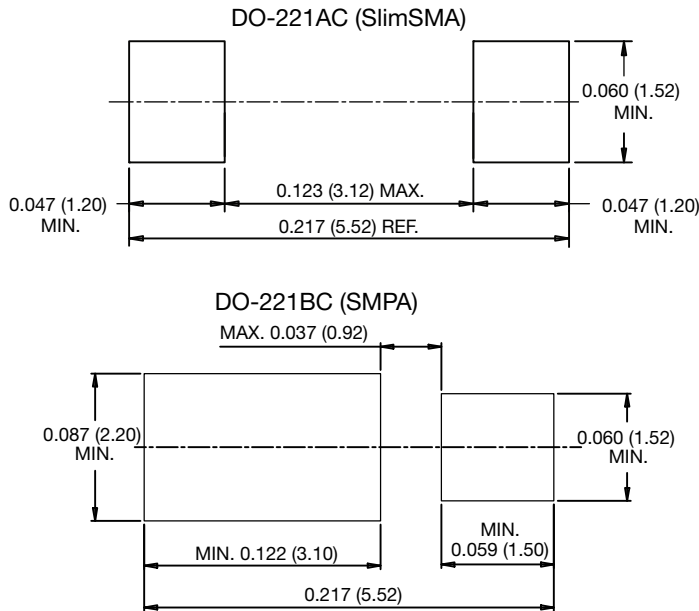
技术问题垂询: [DiodesAmericas@vishay.com](mailto:DiodesAmericas@vishay.com)、[DiodesEurope@vishay.com](mailto:DiodesEurope@vishay.com) 或 [DiodesAsia@vishay.com](mailto:DiodesAsia@vishay.com)

## Pad Layouts/Soldering Process

### VISHAY GENERAL SEMICONDUCTOR RECOMMENDED MINIMUM MOUNTING PAD LAYOUT SIZES FOR THE SURFACE MOUNT RECTIFIER



All dimensions in inches (millimeters)



DIMENSIONS in inches (millimeters)		
	DO-213AA (GL34)	DO-213AB (GL41)
A	0.177 (4.5) ref.	0.236 (6.0) ref.
B	0.079 (2.0) min.	0.118 (3.0) min.
C	0.079 (2.0) max.	0.138 (3.5) max.
D	0.050 (1.25) min.	0.050 (1.25) min.

## VISHAY GENERAL SEMICONDUCTOR RECOMMENDED SOLDERING PROCESS

Through hole device (THD) and surface mount device (SMD) imply different soldering technologies leading to different constraints.

In THD, the package body is exposed to relatively low temperatures (< 150 °C) because the lead extremities are only dipped in the soldering alloy, whereas in SMD the whole package body is exposed to a very high temperature (> 240 °C) during reflow soldering process.

In addition, molding compounds used for encapsulation absorb moisture from the ambient medium. During rapid heating in solder reflow process; this absorbed moisture can vaporize, generating pressure at lead frame pad/silicon to plastic interfaces in the package, with a risk of package cracking and potential degradation of device reliability.

Wave soldering with SMD packages is not recommended because the thermal shock associated with package body solder dipping may induce internal structural damage to the package (interface delamination) that may affect long term reliability.

SMD package characterizations performed as a standard by Vishay only induce Solder Reflow Resistance assessment.

JEDEC JESD A111 recommends that wave soldering of SMD packages should be evaluated by the USER, because the stress induced inside the package is very dependant of solder process parameters.

Due to the higher melting point of lead (Pb)-free alloys, the temperature of the solder pot will also increase to improve solderability and shorten contact times. For AgSnCu with melting point of 217 °C, the solder pot temperature will be between 250 °C to 270 °C or as high as 260 °C to 280 °C for SnCu.



### RECOMMENDED WAVE SOLDERING PROFILE FOR THROUGH HOLE COMPONENTS

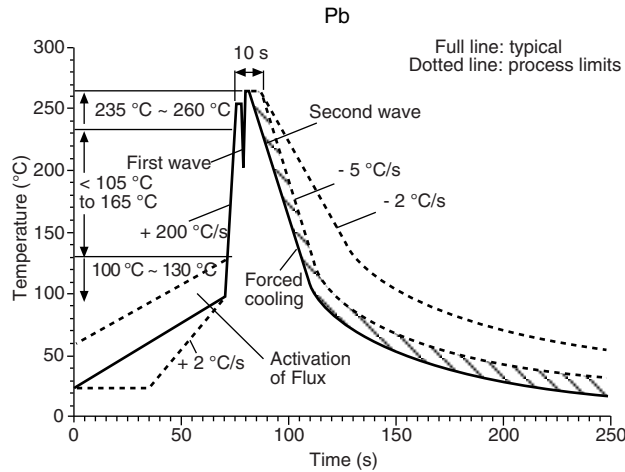
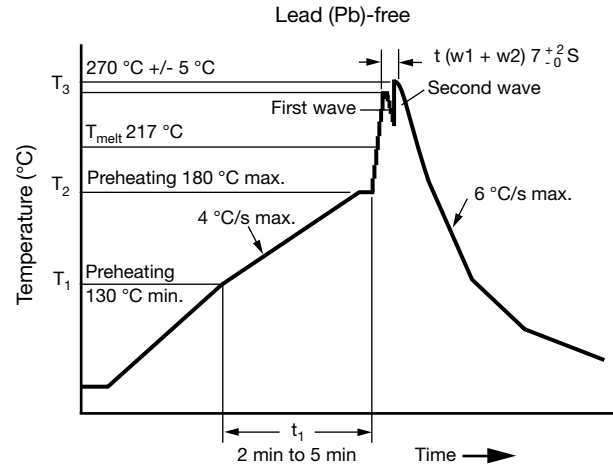


Fig. 1



**Notes**

- Temperature jump from  $T_2$  to  $T_3$  ( $w_1$ ): 150 °C max.
- Time from 25 °C to  $T_3$  (wave temp.): 8 min max.

Fig. 2

### REFLOW FOR SURFACE MOUNTED COMPONENTS

TABLE 1 - CLASSIFICATION REFLOW PROFILE		
PROFILE FEATURE	Sn-Pb EUTECTIC ASSEMBLY	LEAD (Pb)-FREE ASSEMBLY
Preheat and soak		
Temperature min. ( $T_{Smin.}$ )	100 °C	150 °C
Temperature max. ( $T_{Smax.}$ )	150 °C	200 °C
Time ( $T_{Smin.}$ to $T_{Smax.}$ ) ( $t_s$ )	60 s to 120 s	60 s to 120 s
Average ramp-up rate ( $T_{Smax.}$ to $T_p$ )	3 °C/s maximum	
Liquidous temperature ( $T_L$ )	183 °C	217 °C
Time to liquidous ( $t_L$ )	60 s to 150 s	60 s to 150 s
Peak package temperature ( $T_p$ ) <sup>(1)</sup>	See classification temperature in table 2	See classification temperature in table 3
Time ( $t_p$ ) <sup>(2)</sup> with 5 °C of the specified classification temperature ( $T_C$ )	20 s <sup>(2)</sup>	30 s <sup>(2)</sup>
Average ramp-down rate ( $T_p$ to $T_{Smax.}$ )	6 °C/s maximum	
Time 25 °C to peak temperature	6 min maximum	8 min maximum

**Notes**

- (1) Tolerance for peak profile temperature ( $T_p$ ) is defined as a supplier minimum and user maximum
- (2) Tolerance for time at peak profile temperature ( $T_p$ ) is defined as a supplier minimum and user maximum

## REFLOW PROFILE

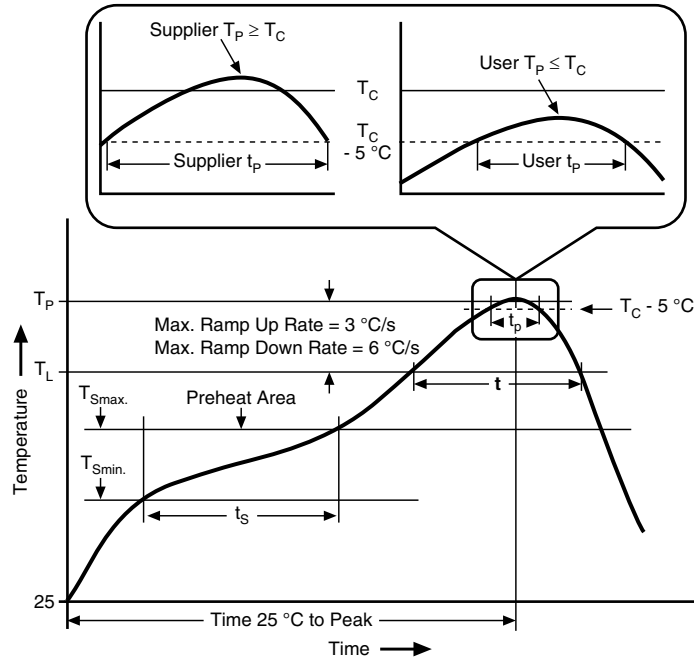


Fig. 3

TABLE 2 - Sn-Pb EUTECTIC PROCESS PACKAGE PEAK REFLOW TEMPERATURES		
PACKAGE THICKNESS	VOLUME mm <sup>3</sup> < 350	VOLUME mm <sup>3</sup> ≥ 350
< 2.5 mm	235 °C	220 °C
≥ 2.5 mm	220 °C	220 °C

TABLE 3 - LEAD (Pb) - FREE PROCESS PACKAGE CLASSIFICATION REFLOW TEMPERATURES			
PACKAGE THICKNESS	VOLUME mm <sup>3</sup> < 350	VOLUME mm <sup>3</sup> 350 TO 2000	VOLUME mm <sup>3</sup> > 2000
< 1.6 mm	260 °C	260 °C	260 °C
1.6 mm to 2.5 mm	260 °C	250 °C	245 °C
≥ 2.5 mm	250 °C	245 °C	245 °C

Tolerance: The device manufacturer/supplier shall assure process compatibility up to and including the stated classification temperature at the rated MSL level.

### Notes

- Package volume excludes external terminals (balls, bumps, lands, leads) and/or non-integral heatsinks.
- The maximum component temperature reached during reflow depends on package thickness and volume. The use of convection reflow processes reduces the thermal gradients between packages. However, thermal gradients due to differences in thermal mass of SMD packages may still exist.
- Recommended soldering process is accordance with J-STD-020D.



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