

High-accuracy detection voltage  
Low current consumption  
**VOLTAGE DETECTOR IC**  
with adjustable delay time  
**BD52XXG/FVE series**  
**BD53XXG/FVE series**

●Description

BD52XXG/FVE, BD53XXG/FVE are series of high-accuracy detection voltage and low current consumption VOLTAGE DETECTOR ICs adopting CMOS process.  
New lineup of 152 types with delay time circuit have developed in addition to well-reputed 152 types of VOLTAGE DETECTOR ICs. Any delay time can be established by using small capacitor due to high-resistance process technology.  
Total 152 types of VOLTAGE DETECTOR ICs including BD52XXG/FVE series (Nch open drain output) and BD53XXG/FVE series (CMOS output), each of which has 38 kinds in every 0.1V step (2.3~6.0V) have developed.

●Features

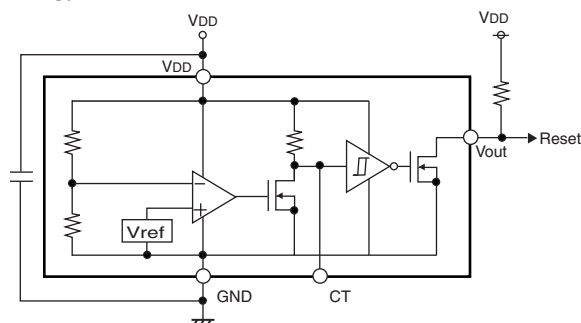
- 1) Detection voltage: 0.1V step line-up 2.3~6.0V (Typ.)
- 2) High-accuracy detection voltage:  $\pm 1.5\%$  (Max.)
- 3) Ultra low current consumption:  $0.95\mu\text{A}$  (Typ.)
- 4) Nch open drain output (BD52XXG/FVE series),  
CMOS output (BD53XXG/FVE series)
- 5) Small VSO5(EMP5), SSOP5(SMP5C2) package

●Applications

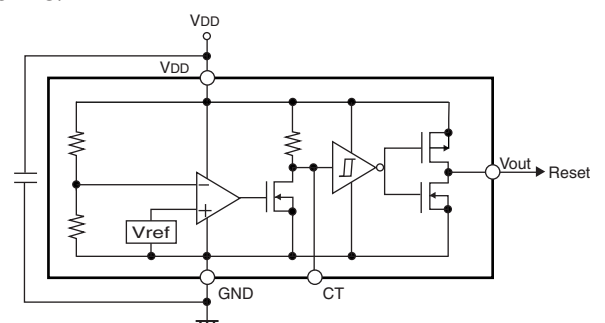
Every kind of appliances with microcontroller and logic circuit

●Application Circuit

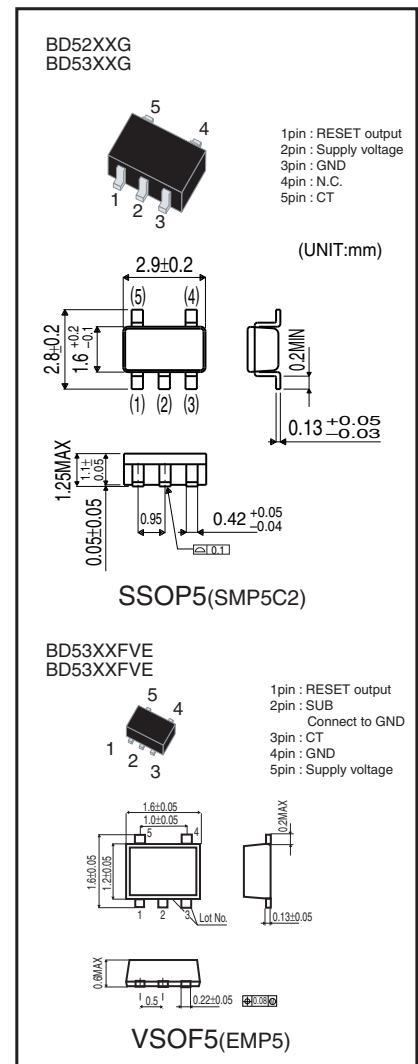
BD52XXG/FVE



BD53XXG/FVE



| Pin No.       | 1    | 2   | 3   | 4   | 5   |
|---------------|------|-----|-----|-----|-----|
| SSOP5(SMP5C2) | Vout | VDD | GND | NC. | CT  |
| VSO5(EMP5)    | Vout | SUB | CT  | GND | VDD |



## ● Absolute Maximum Ratings (Ta=25°C)

| Parameter                            | Symbol    | Limits                | Unit |
|--------------------------------------|-----------|-----------------------|------|
| Power supply voltage                 | VDD – GND | – 0.3 ~ + 10          | V    |
| Output voltage                       | VOUT      | GND – 0.3 ~ + 10      | V    |
| Nch open drain output<br>CMOS output |           | GND – 0.3 ~ VDD + 0.3 |      |
| Input voltage of CT                  | VCT       | GND – 0.3 ~ VDD + 0.3 | V    |
| Power dissipation:SSOP5(SMP5C2) *1   | Pd        | 540                   | mW   |
| Power dissipation:VSOF5(EMP5) *2     | Pd        | 210                   | mW   |
| Operating temperature range          | Topr      | – 40 ~ + 85           | °C   |
| Storage temperature range            | Tstg      | – 55 ~ + 125          | °C   |

\*1 Derating: 5.4mW/°C for operation above Ta=25°C.(Mounted on a 70.0mmX70.0mmX16mm glass epoxy PCB.)

\*2 Derating: 2.1mW/°C for operation above Ta=25°C.(Mounted on a 70.0mmX70.0mmX16mm glass epoxy PCB.)

## ● Electrical characteristics (Unless otherwise noted; Ta=–25~85°C)

| Parameter                                    | Symbol  | Min.     | Typ.     | Max.    | Unit   | Conditions                       |
|----------------------------------------------|---------|----------|----------|---------|--------|----------------------------------|
| Detection voltage temperature coefficient *1 | VDET/ΔT | —        | ±100     | ±360    | ppm/°C |                                  |
| Hysteresis voltage                           | ΔVDET   | VsX0.03  | VsX0.05  | VsX0.08 | %      | RL=470kΩ, VDD=L→H→L              |
| Circuit current when ON                      | Icc1    | —        | 0.80     | 2.40    | μA     | VDD=VDET–0.2V                    |
|                                              |         | —        | 0.85     | 2.55    |        |                                  |
|                                              |         | —        | 0.90     | 2.70    |        |                                  |
|                                              |         | —        | 0.95     | 2.85    |        |                                  |
| Circuit current when OFF                     | Icc2    | —        | 0.75     | 2.25    | μA     | VDD=VDET+2V                      |
|                                              |         | —        | 0.80     | 2.40    |        |                                  |
|                                              |         | —        | 0.85     | 2.55    |        |                                  |
|                                              |         | —        | 0.90     | 2.70    |        |                                  |
| Min. operating voltage                       | VOPL    | 0.95     | —        | —       | V      | RL=470kΩ, VOL ≥ 0.4V             |
| "L" output current                           | IOL     | 0.4      | 1.2      | —       | mA     | VDS=0.5V, VDD=1.2V               |
|                                              |         | 2.0      | 5.0      | —       |        | VDS=0.5V, VDD=2.4V (VDET ≥ 2.7V) |
| "H" output current                           | IOH     | 0.7      | 1.4      | —       | mA     | VDS=0.5V, VDD=4.8V               |
|                                              |         | 0.9      | 1.8      | —       |        | VDS=0.5V, VDD=6.0V               |
|                                              |         | 1.1      | 2.2      | —       |        | VDS=0.5V, VDD=8.0V               |
| Output leak current *1                       | Ileak   | —        | —        | 0.1     | μA     | VDD=VDS=10V                      |
| CT pin Threshold voltage                     | VCTH    | VDDX0.3  | VDDX0.4  | VDDX0.6 | V      | VDD=VDET X 1.1                   |
|                                              |         | VDDX0.3  | VDDX0.45 | VDDX0.6 |        |                                  |
|                                              |         | VDDX0.35 | VDDX0.5  | VDDX0.6 |        |                                  |
|                                              |         | VDDX0.4  | VDDX0.5  | VDDX0.6 |        |                                  |
| Output delay resistance *1                   | RCT     | 5.5      | 9        | 12.5    | MΩ     | VDD=VDET X 1.1                   |
| CT pin output current *1                     | ICT     | 15       | 40       | —       | μA     | VCT=0.1V, VDD=0.95V              |
|                                              |         | 150      | 240      | —       |        | VCT=0.5V, VDD=1.5V               |

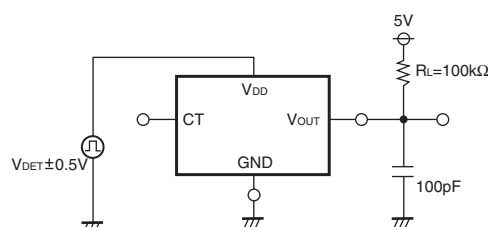
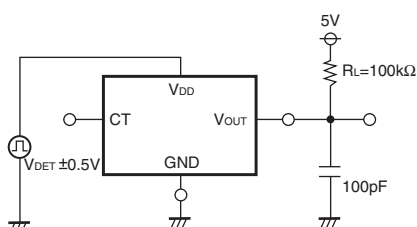
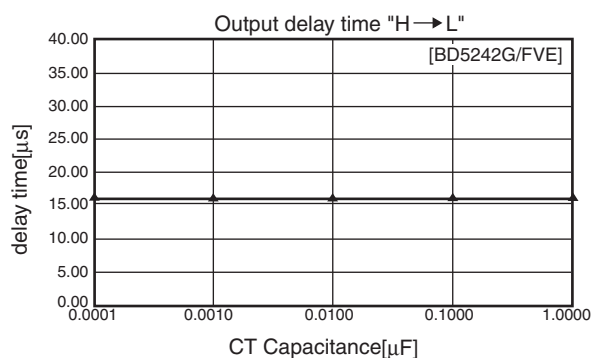
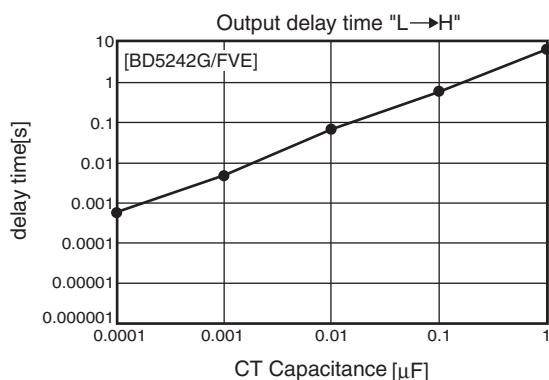
\*1 This value is guaranteed at Ta=25°C.

\*2 TPLH : VDD=(VDET typ.–0.5V) → (VDET typ.+0.5V).

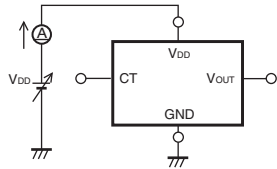
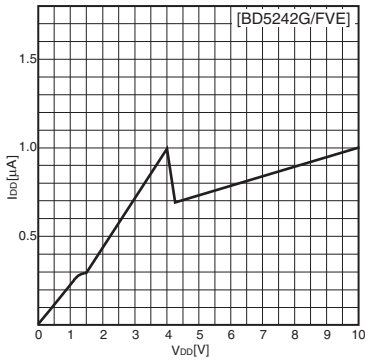
Note) RL is not necessary for CMOS output type.

Note) Please refer to the detection voltage of Line-up table.

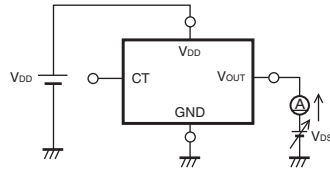
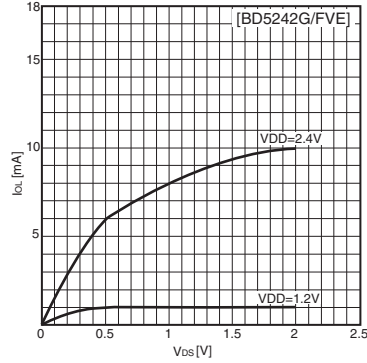
## ● Characteristic diagram and Measurement circuit



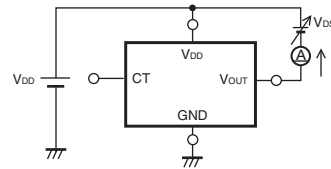
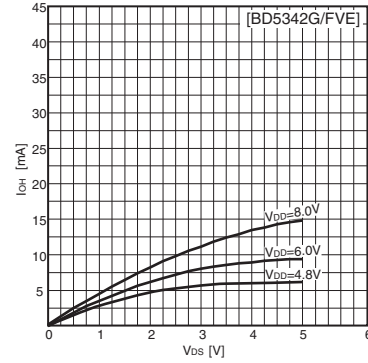
Circuit current



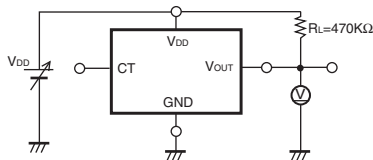
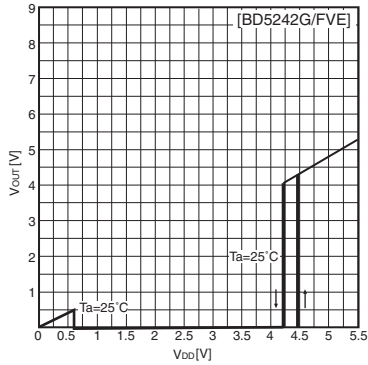
"L" output current



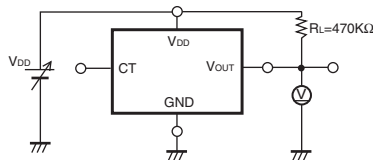
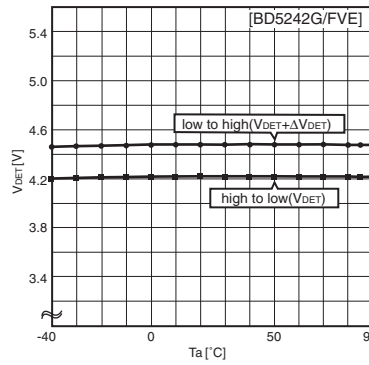
"H" output current



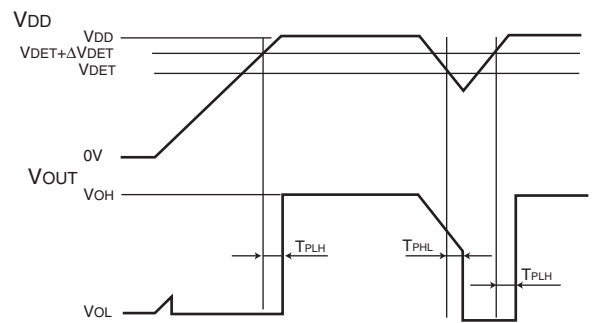
I/O characteristic



Detection voltage



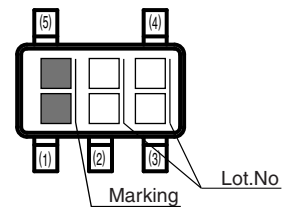
Timing waveform



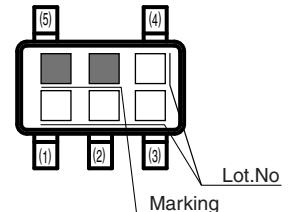
Part number and Marking of samples

| Marking | Voltage | Part No. | Marking | Voltage | Part No. | Marking | Voltage | Part No. | Marking | Voltage | Part No. |
|---------|---------|----------|---------|---------|----------|---------|---------|----------|---------|---------|----------|
| PW      | 6.0V    | BD5260   | PB      | 4.1V    | BD5241   | RW      | 6.0V    | BD5360   | RB      | 4.1V    | BD5341   |
| PV      | 5.9V    | BD5259   | PA      | 4.0V    | BD5240   | RV      | 5.9V    | BD5359   | RA      | 4.0V    | BD5340   |
| PU      | 5.8V    | BD5258   | MV      | 3.9V    | BD5239   | RU      | 5.8V    | BD5358   | QV      | 3.9V    | BD5339   |
| PT      | 5.7V    | BD5257   | MU      | 3.8V    | BD5238   | RT      | 5.7V    | BD5357   | QU      | 3.8V    | BD5338   |
| PS      | 5.6V    | BD5256   | MT      | 3.7V    | BD5237   | RS      | 5.6V    | BD5356   | QT      | 3.7V    | BD5337   |
| PR      | 5.5V    | BD5255   | MS      | 3.6V    | BD5236   | RR      | 5.5V    | BD5355   | QS      | 3.6V    | BD5336   |
| PQ      | 5.4V    | BD5254   | MR      | 3.5V    | BD5235   | RQ      | 5.4V    | BD5354   | QR      | 3.5V    | BD5335   |
| PP      | 5.3V    | BD5253   | MQ      | 3.4V    | BD5234   | RP      | 5.3V    | BD5353   | QQ      | 3.4V    | BD5334   |
| PN      | 5.2V    | BD5252   | MP      | 3.3V    | BD5233   | RN      | 5.2V    | BD5352   | QP      | 3.3V    | BD5333   |
| PM      | 5.1V    | BD5251   | MN      | 3.2V    | BD5232   | RM      | 5.1V    | BD5351   | QN      | 3.2V    | BD5332   |
| PL      | 5.0V    | BD5250   | MM      | 3.1V    | BD5231   | RL      | 5.0V    | BD5350   | QM      | 3.1V    | BD5331   |
| PK      | 4.9V    | BD5249   | ML      | 3.0V    | BD5230   | RK      | 4.9V    | BD5349   | QL      | 3.0V    | BD5330   |
| PJ      | 4.8V    | BD5248   | MK      | 2.9V    | BD5229   | RJ      | 4.8V    | BD5348   | QK      | 2.9V    | BD5329   |
| PH      | 4.7V    | BD5247   | MJ      | 2.8V    | BD5228   | RH      | 4.7V    | BD5347   | QJ      | 2.8V    | BD5328   |
| PG      | 4.6V    | BD5246   | MH      | 2.7V    | BD5227   | RG      | 4.6V    | BD5346   | QH      | 2.7V    | BD5327   |
| PF      | 4.5V    | BD5245   | MG      | 2.6V    | BD5226   | RF      | 4.5V    | BD5345   | QG      | 2.6V    | BD5326   |
| PE      | 4.4V    | BD5244   | MF      | 2.5V    | BD5225   | RE      | 4.4V    | BD5344   | QF      | 2.5V    | BD5325   |
| PD      | 4.3V    | BD5243   | ME      | 2.4V    | BD5224   | RD      | 4.3V    | BD5343   | QE      | 2.4V    | BD5324   |
| PC      | 4.2V    | BD5242   | MD      | 2.3V    | BD5223   | RC      | 4.2V    | BD5342   | QD      | 2.3V    | BD5323   |

BD52XXG/BD53XXG : SSOP5 (SMP5C2)



BD52XXFVE/BD53XXFVE : VSOF5 (EMP5)



●Line-up

| Detection voltage<br>V <sub>DET</sub> | Nch open drain output<br>( BD52XXG/FVE ) | CMOS output<br>( BD53XXG/FVE ) | Detection voltage V <sub>DET</sub> ( V )Ta=25°C |       |       | Hysteresis voltage<br>( V, Typ. ) | Package                   |
|---------------------------------------|------------------------------------------|--------------------------------|-------------------------------------------------|-------|-------|-----------------------------------|---------------------------|
|                                       |                                          |                                | Min.                                            | Typ.  | Max.  |                                   |                           |
| 6.0V                                  | BD5260G/FVE                              | BD5360G/FVE                    | 5.910                                           | 6.000 | 6.090 | V <sub>DET</sub> X 0.05           | SSOP5(SMP5C2)/VSOF5(EMP5) |
| 5.9V                                  | BD5259G/FVE                              | BD5359G/FVE                    | 5.812                                           | 5.900 | 5.989 |                                   | SSOP5(SMP5C2)/VSOF5(EMP5) |
| 5.8V                                  | BD5258G/FVE                              | BD5358G/FVE                    | 5.713                                           | 5.800 | 5.887 |                                   | SSOP5(SMP5C2)/VSOF5(EMP5) |
| 5.7V                                  | BD5257G/FVE                              | BD5357G/FVE                    | 5.615                                           | 5.700 | 5.786 |                                   | SSOP5(SMP5C2)/VSOF5(EMP5) |
| 5.6V                                  | BD5256G/FVE                              | BD5356G/FVE                    | 5.516                                           | 5.600 | 5.684 |                                   | SSOP5(SMP5C2)/VSOF5(EMP5) |
| 5.5V                                  | BD5255G/FVE                              | BD5355G/FVE                    | 5.418                                           | 5.500 | 5.583 |                                   | SSOP5(SMP5C2)/VSOF5(EMP5) |
| 5.4V                                  | BD5254G/FVE                              | BD5354G/FVE                    | 5.319                                           | 5.400 | 5.481 |                                   | SSOP5(SMP5C2)/VSOF5(EMP5) |
| 5.3V                                  | BD5253G/FVE                              | BD5353G/FVE                    | 5.221                                           | 5.300 | 5.380 |                                   | SSOP5(SMP5C2)/VSOF5(EMP5) |
| 5.2V                                  | BD5252G/FVE                              | BD5352G/FVE                    | 5.122                                           | 5.200 | 5.278 |                                   | SSOP5(SMP5C2)/VSOF5(EMP5) |
| 5.1V                                  | BD5251G/FVE                              | BD5351G/FVE                    | 5.024                                           | 5.100 | 5.177 |                                   | SSOP5(SMP5C2)/VSOF5(EMP5) |
| 5.0V                                  | BD5250G/FVE                              | BD5350G/FVE                    | 4.925                                           | 5.000 | 5.075 |                                   | SSOP5(SMP5C2)/VSOF5(EMP5) |
| 4.9V                                  | BD5249G/FVE                              | BD5349G/FVE                    | 4.827                                           | 4.900 | 4.974 |                                   | SSOP5(SMP5C2)/VSOF5(EMP5) |
| 4.8V                                  | BD5248G/FVE                              | BD5348G/FVE                    | 4.728                                           | 4.800 | 4.872 |                                   | SSOP5(SMP5C2)/VSOF5(EMP5) |
| 4.7V                                  | BD5247G/FVE                              | BD5347G/FVE                    | 4.630                                           | 4.700 | 4.771 |                                   | SSOP5(SMP5C2)/VSOF5(EMP5) |
| 4.6V                                  | BD5246G/FVE                              | BD5346G/FVE                    | 4.531                                           | 4.600 | 4.669 |                                   | SSOP5(SMP5C2)/VSOF5(EMP5) |
| 4.5V                                  | BD5245G/FVE                              | BD5345G/FVE                    | 4.433                                           | 4.500 | 4.568 |                                   | SSOP5(SMP5C2)/VSOF5(EMP5) |
| 4.4V                                  | BD5244G/FVE                              | BD5344G/FVE                    | 4.334                                           | 4.400 | 4.466 |                                   | SSOP5(SMP5C2)/VSOF5(EMP5) |
| 4.3V                                  | BD5243G/FVE                              | BD5343G/FVE                    | 4.236                                           | 4.300 | 4.365 |                                   | SSOP5(SMP5C2)/VSOF5(EMP5) |
| 4.2V                                  | BD5242G/FVE                              | BD5342G/FVE                    | 4.137                                           | 4.200 | 4.263 |                                   | SSOP5(SMP5C2)/VSOF5(EMP5) |
| 4.1V                                  | BD5241G/FVE                              | BD5341G/FVE                    | 4.039                                           | 4.100 | 4.162 |                                   | SSOP5(SMP5C2)/VSOF5(EMP5) |
| 4.0V                                  | BD5240G/FVE                              | BD5340G/FVE                    | 3.940                                           | 4.000 | 4.060 |                                   | SSOP5(SMP5C2)/VSOF5(EMP5) |
| 3.9V                                  | BD5239G/FVE                              | BD5339G/FVE                    | 3.842                                           | 3.900 | 3.959 |                                   | SSOP5(SMP5C2)/VSOF5(EMP5) |
| 3.8V                                  | BD5238G/FVE                              | BD5338G/FVE                    | 3.743                                           | 3.800 | 3.857 |                                   | SSOP5(SMP5C2)/VSOF5(EMP5) |
| 3.7V                                  | BD5237G/FVE                              | BD5337G/FVE                    | 3.645                                           | 3.700 | 3.756 |                                   | SSOP5(SMP5C2)/VSOF5(EMP5) |
| 3.6V                                  | BD5236G/FVE                              | BD5336G/FVE                    | 3.546                                           | 3.600 | 3.654 |                                   | SSOP5(SMP5C2)/VSOF5(EMP5) |
| 3.5V                                  | BD5235G/FVE                              | BD5335G/FVE                    | 3.448                                           | 3.500 | 3.553 |                                   | SSOP5(SMP5C2)/VSOF5(EMP5) |
| 3.4V                                  | BD5234G/FVE                              | BD5334G/FVE                    | 3.349                                           | 3.400 | 3.451 |                                   | SSOP5(SMP5C2)/VSOF5(EMP5) |
| 3.3V                                  | BD5233G/FVE                              | BD5333G/FVE                    | 3.251                                           | 3.300 | 3.350 |                                   | SSOP5(SMP5C2)/VSOF5(EMP5) |
| 3.2V                                  | BD5232G/FVE                              | BD5332G/FVE                    | 3.152                                           | 3.200 | 3.248 |                                   | SSOP5(SMP5C2)/VSOF5(EMP5) |
| 3.1V                                  | BD5231G/FVE                              | BD5331G/FVE                    | 3.054                                           | 3.100 | 3.147 |                                   | SSOP5(SMP5C2)/VSOF5(EMP5) |
| 3.0V                                  | BD5230G/FVE                              | BD5330G/FVE                    | 2.955                                           | 3.000 | 3.045 |                                   | SSOP5(SMP5C2)/VSOF5(EMP5) |
| 2.9V                                  | BD5229G/FVE                              | BD5329G/FVE                    | 2.857                                           | 2.900 | 2.944 |                                   | SSOP5(SMP5C2)/VSOF5(EMP5) |
| 2.8V                                  | BD5228G/FVE                              | BD5328G/FVE                    | 2.758                                           | 2.800 | 2.842 |                                   | SSOP5(SMP5C2)/VSOF5(EMP5) |
| 2.7V                                  | BD5227G/FVE                              | BD5327G/FVE                    | 2.660                                           | 2.700 | 2.741 |                                   | SSOP5(SMP5C2)/VSOF5(EMP5) |
| 2.6V                                  | BD5226G/FVE                              | BD5326G/FVE                    | 2.561                                           | 2.600 | 2.639 |                                   | SSOP5(SMP5C2)/VSOF5(EMP5) |
| 2.5V                                  | BD5225G/FVE                              | BD5325G/FVE                    | 2.463                                           | 2.500 | 2.538 |                                   | SSOP5(SMP5C2)/VSOF5(EMP5) |
| 2.4V                                  | BD5224G/FVE                              | BD5324G/FVE                    | 2.364                                           | 2.400 | 2.436 |                                   | SSOP5(SMP5C2)/VSOF5(EMP5) |
| 2.3V                                  | BD5223G/FVE                              | BD5323G/FVE                    | 2.266                                           | 2.300 | 2.335 |                                   | SSOP5(SMP5C2)/VSOF5(EMP5) |