

# VOLTAGE DETECTOR IC with counter timer

## BD45XXXG BD46XXXG

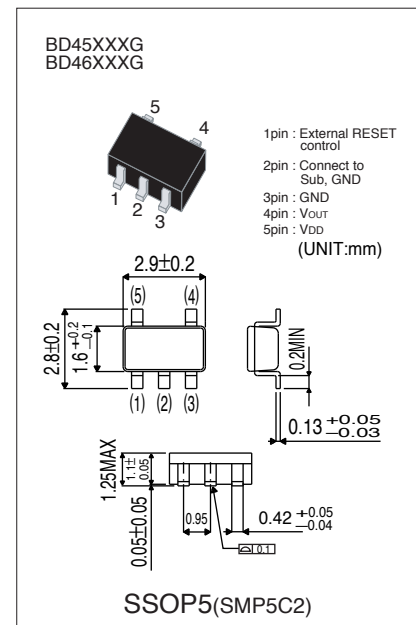
BD45XXXG and BD46XXXG are series of high-accuracy detection voltage and low current consumption VOLTAGE DETECTOR ICs adopting CMOS process. New lineup of 156 types with delay time circuit have developed. Delay time is fixed in the IC due to the built-in counter timer to require no external capacitor. Total 156 types of VOLTAGE DETECTOR ICs including BD45XXXG series (Nch open drain output) and BD46XXXG series (CMOS output), each of which has 26 kinds in every 0.1V step (2.3~4.8V) and three kinds of delay time (50msec, 100msec, 200msec) have developed.

### ●Applications

Every kind of appliances with microcontroller and logic circuit

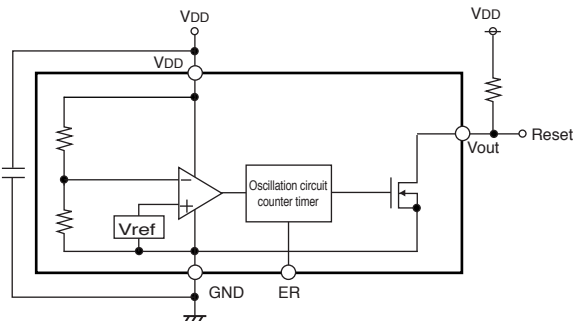
### ●Features

- 1) Built-in delay time circuit  
(Fixed delay time by the built-in  $\pm 10\%$  of high-accuracy counter timer)
- 2) No external capacitor for setting delay time required
- 3) 3 kinds of delay time: 50msec(Typ.)(BD45XX5G,BD46XX5G)  
100msec(Typ.)(BD45XX1G,BD46XX1G)  
200msec(Typ.)(BD45XX2G,BD46XX2G)
- 4) Detection voltage: 2.3V ~ 4.8V 0.1V step
- 5) High-accuracy detection voltage:  $\pm 1.0\%$
- 6) Ultra low current consumption:  $0.85\mu\text{A}$  typ.
- 7) Output circuit: Nch open drain(BD45XXXG)  
CMOS(BD46XXXG)
- 8) Package: SSOP5(SMP5C2)
- 9) Operating temperature range:  $-40^{\circ}\text{C} \sim +105^{\circ}\text{C}$

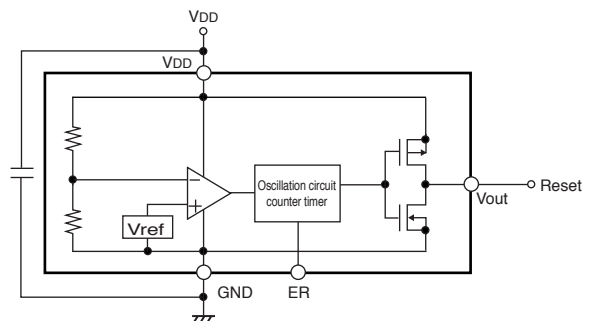


### ●Application Circuit

BD45XXXG



BD46XXXG



| Pin No. | 1  | 2   | 3   | 4    | 5   |
|---------|----|-----|-----|------|-----|
| SSOP5   | ER | Sub | GND | Vout | VDD |

## Voltage detectors

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

| Parameter                   | Symbol                | Limits                | Unit |
|-----------------------------|-----------------------|-----------------------|------|
| Power supply voltage        | VDD – GND             | – 0.3 ~ + 10          | V    |
| Output voltage              | Nch open drain output | GND – 0.3 ~ + 10      | V    |
|                             | CMOS output           |                       |      |
| ER pin input voltage        | VCT                   | GND – 0.3 ~ VDD + 0.3 | V    |
| Power dissipation:SSOP5 *1  | Pd                    | 540                   | mW   |
| Operating temperature range | Topr                  | – 40 ~ + 105          | °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.)

## ● Electrical characteristics (Unless otherwise noted; Ta=–25°C ~ +105°C)

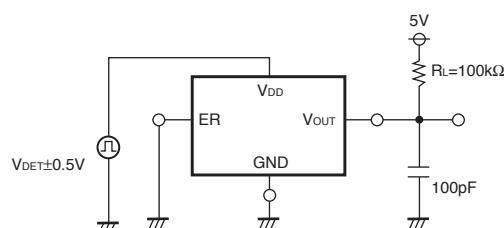
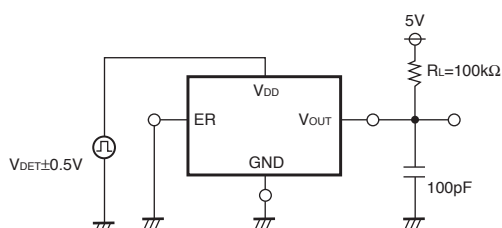
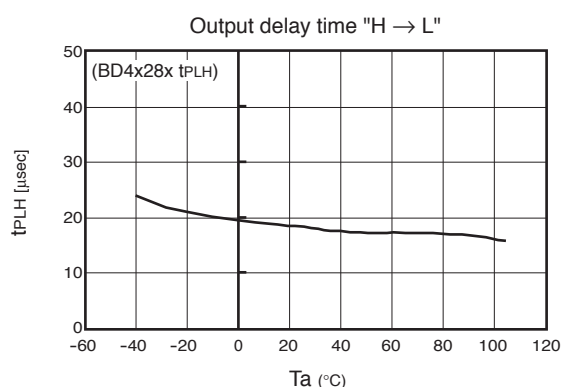
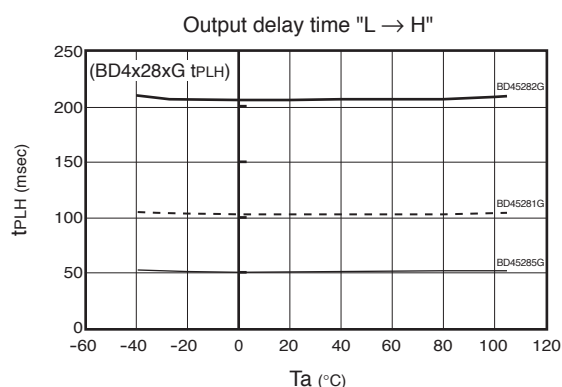
| Parameter                                    | Symbol          | Min.      | Typ.      | Max.      | Unit   | Conditions                                                                             |
|----------------------------------------------|-----------------|-----------|-----------|-----------|--------|----------------------------------------------------------------------------------------|
| Detection voltage temperature coefficient *1 | VDET/ΔT         | —         | ±100      | ±360      | ppm/°C | Ta=–40°C ~ +105°C                                                                      |
| Hysteresis voltage                           | ΔVDET           | VDET×0.03 | VDET×0.05 | VDET×0.08 | %      | RL=470kΩ, VDD=L→H→L                                                                    |
| Circuit current when ON                      | Icc1            | —         | 0.70      | 2.10      | μA     | VDD=VDET–0.2V<br>VDET=2.3~3.1V<br>VDET=3.2~4.2V<br>VDET=4.3~4.8V                       |
|                                              |                 | —         | 0.75      | 2.25      |        |                                                                                        |
|                                              |                 | —         | 0.80      | 2.40      |        |                                                                                        |
| Circuit current when OFF                     | Icc2            | —         | 0.75      | 2.25      | μA     | VDD=VDET+2V<br>VDET=2.3~3.1V<br>VDET=3.2~4.2V<br>VDET=4.3~4.8V                         |
|                                              |                 | —         | 0.80      | 2.40      |        |                                                                                        |
|                                              |                 | —         | 0.85      | 2.55      |        |                                                                                        |
| 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         | —         |        | VDS=0.5V, VDD=2.4V (VDET≥2.7V)                                                         |
| "H" output current                           | IOH             | 1.0       | 2.2       | —         | mA     | VDS=0.5V, VDD=4.8V VDET=2.3~4.2V                                                       |
|                                              |                 | 1.2       | 2.7       | —         |        | VDS=0.5V, VDD=6.0V VDET=4.3~4.8V                                                       |
| Output leak current                          | Ilaek           | —         | —         | 0.1       | μA     | VDD=VDS=10V                                                                            |
| "H" transmission delay time                  | tPLH            | 45        | 50        | 55        | V      | RL=100kΩ<br>CL=100pF<br>BD45XX5G, BD46XX5G<br>BD45XX1G, BD46XX1G<br>BD45XX2G, BD46XX2G |
|                                              |                 | 90        | 100       | 110       |        |                                                                                        |
|                                              |                 | 180       | 200       | 220       |        |                                                                                        |
| ER pin "H" voltage                           | VEH             | 2.0       | —         | —         | V      |                                                                                        |
| ER pin "L" voltage                           | VEL             | —         | —         | 0.8       | V      |                                                                                        |
| ER pin input current                         | I <sub>ER</sub> | —         | 1         | 10        | μA     | VER=2.0V                                                                               |

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

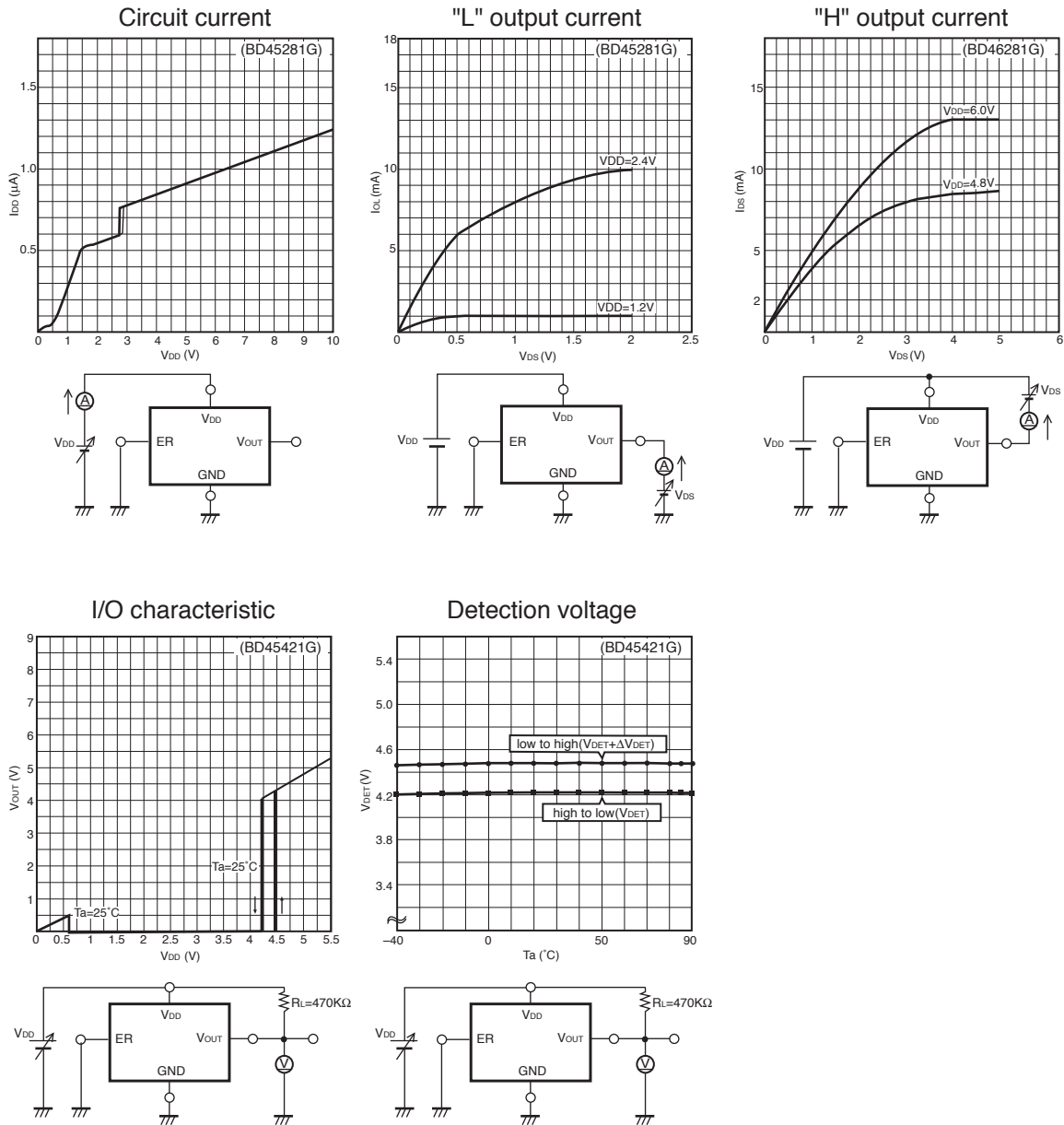
Note) RL is not necessary for CMOS output type.

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

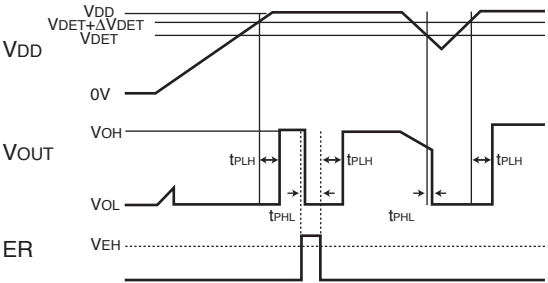
## ● Characteristic diagram and Measurement circuit



Voltage detectors



●Timing waveform

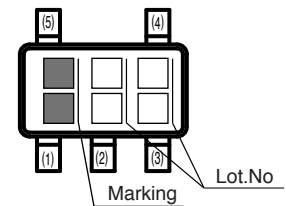


# Voltage detectors

## Part number and Marking of samples

| Voltage | Marking | Part No. | Marking | Part No. | Marking | Part No. | Marking | Part No. | Marking | Part No. | Marking | Part No. |
|---------|---------|----------|---------|----------|---------|----------|---------|----------|---------|----------|---------|----------|
| 4.8V    | T0      | BD45485  | TS      | BD45481  | UJ      | BD45482  | VA      | BD46485  | W2      | BD46481  | WU      | BD46482  |
| 4.7V    | T1      | BD45475  | TT      | BD45471  | UK      | BD45472  | VB      | BD46475  | W3      | BD46471  | WV      | BD46472  |
| 4.6V    | T2      | BD45465  | TU      | BD45461  | UL      | BD45462  | VC      | BD46465  | W4      | BD46461  | WW      | BD46462  |
| 4.5V    | T3      | BD45455  | TV      | BD45451  | UM      | BD45452  | VD      | BD46455  | W5      | BD46451  | WX      | BD46452  |
| 4.4V    | T4      | BD45445  | TW      | BD45441  | UN      | BD45442  | VE      | BD46445  | W6      | BD46441  | WY      | BD46442  |
| 4.3V    | T5      | BD45435  | TX      | BD45431  | UP      | BD45432  | VF      | BD46435  | W7      | BD46431  | WZ      | BD46432  |
| 4.2V    | T6      | BD45425  | TY      | BD45421  | UQ      | BD45422  | VG      | BD46425  | W8      | BD46421  | X0      | BD46422  |
| 4.1V    | T7      | BD45415  | TZ      | BD45411  | UR      | BD45412  | VH      | BD46415  | W9      | BD46411  | X1      | BD46412  |
| 4.0V    | T8      | BD45405  | U0      | BD45401  | US      | BD45402  | VJ      | BD46405  | WA      | BD46401  | X2      | BD46402  |
| 3.9V    | T9      | BD45395  | U1      | BD45391  | UT      | BD45392  | VK      | BD46395  | WB      | BD46391  | X3      | BD46392  |
| 3.8V    | TA      | BD45385  | U2      | BD45381  | UU      | BD45382  | VL      | BD46385  | WC      | BD46381  | X4      | BD46382  |
| 3.7V    | TB      | BD45375  | U3      | BD45371  | UV      | BD45372  | VM      | BD46375  | WD      | BD46371  | X5      | BD46372  |
| 3.6V    | TC      | BD45365  | U4      | BD45361  | UV      | BD45362  | VN      | BD46365  | WE      | BD46361  | X6      | BD46362  |
| 3.5V    | TD      | BD45355  | U5      | BD45351  | UX      | BD45352  | VP      | BD46355  | WF      | BD46351  | X7      | BD46352  |
| 3.4V    | TE      | BD45345  | U6      | BD45341  | UY      | BD45342  | VQ      | BD46345  | WG      | BD46341  | X8      | BD46342  |
| 3.3V    | TF      | BD45335  | U7      | BD45331  | UZ      | BD45332  | VR      | BD46335  | WH      | BD46331  | X9      | BD46332  |
| 3.2V    | TG      | BD45325  | U8      | BD45321  | V0      | BD45322  | VS      | BD46325  | WJ      | BD46321  | XA      | BD46322  |
| 3.1V    | TH      | BD45315  | U9      | BD45311  | V1      | BD45312  | VT      | BD46315  | WK      | BD46311  | XB      | BD46312  |
| 3.0V    | TJ      | BD45305  | UA      | BD45301  | V2      | BD45302  | VU      | BD46305  | WL      | BD46301  | XC      | BD46302  |
| 2.9V    | TK      | BD45295  | UB      | BD45291  | V3      | BD45292  | VV      | BD46295  | WM      | BD46291  | XD      | BD46292  |
| 2.8V    | TL      | BD45285  | UC      | BD45281  | V4      | BD45282  | VW      | BD46285  | WN      | BD46281  | XE      | BD46282  |
| 2.7V    | TM      | BD45275  | UD      | BD45271  | V5      | BD45272  | VX      | BD46275  | WP      | BD46271  | XF      | BD46272  |
| 2.6V    | TN      | BD45265  | UE      | BD45261  | V6      | BD45262  | VY      | BD46265  | WQ      | BD46261  | XG      | BD46262  |
| 2.5V    | TP      | BD45255  | UF      | BD45251  | V7      | BD45252  | VZ      | BD46255  | WR      | BD46251  | XH      | BD46252  |
| 2.4V    | TQ      | BD45245  | UG      | BD45241  | V8      | BD45242  | W0      | BD46245  | WS      | BD46241  | XJ      | BD46242  |
| 2.3V    | TR      | BD45235  | UH      | BD45231  | V9      | BD45232  | W1      | BD46235  | WT      | BD46231  | XK      | BD46232  |

BD45XXXG/BD46XXXG : SSOP5(SMP5C2)



## Line-up

| Detection<br>voltage<br>V <sub>DET</sub> | 50msec delay             |             | 100msec delay            |             | 200msec delay            |             | Detection voltage<br>V <sub>DET</sub> (V) Ta=25 C |       |       | Hysteresis<br>voltage<br>( V, Typ. ) | Package           |
|------------------------------------------|--------------------------|-------------|--------------------------|-------------|--------------------------|-------------|---------------------------------------------------|-------|-------|--------------------------------------|-------------------|
|                                          | Nch<br>open drain output | CMOS output | Nch<br>open drain output | CMOS output | Nch<br>open drain output | CMOS output | Min.                                              | Typ.  | Max.  |                                      |                   |
|                                          |                          |             |                          |             |                          |             |                                                   |       |       |                                      |                   |
| 4.8V                                     | BD45485G                 | BD46485G    | BD45481G                 | BD46481G    | BD45482G                 | BD46482G    | 4.752                                             | 4.800 | 4.848 | V <sub>DET</sub> X 0.05              | SSOP5<br>(SMP5C2) |
| 4.7V                                     | BD45475G                 | BD46475G    | BD45471G                 | BD46471G    | BD45472G                 | BD46472G    | 4.653                                             | 4.700 | 4.747 |                                      |                   |
| 4.6V                                     | BD45465G                 | BD46465G    | BD45461G                 | BD46461G    | BD45462G                 | BD46462G    | 4.554                                             | 4.600 | 4.646 |                                      |                   |
| 4.5V                                     | BD45455G                 | BD46455G    | BD45451G                 | BD46451G    | BD45452G                 | BD46452G    | 4.455                                             | 4.500 | 4.545 |                                      |                   |
| 4.4V                                     | BD45445G                 | BD46445G    | BD45441G                 | BD46441G    | BD45442G                 | BD46442G    | 4.356                                             | 4.400 | 4.444 |                                      |                   |
| 4.3V                                     | BD45435G                 | BD46435G    | BD45431G                 | BD46431G    | BD45432G                 | BD46432G    | 4.257                                             | 4.300 | 4.343 |                                      |                   |
| 4.2V                                     | BD45425G                 | BD46425G    | BD45421G                 | BD46421G    | BD45422G                 | BD46422G    | 4.158                                             | 4.200 | 4.242 |                                      |                   |
| 4.1V                                     | BD45415G                 | BD46415G    | BD45411G                 | BD46411G    | BD45412G                 | BD46412G    | 4.059                                             | 4.100 | 4.141 |                                      |                   |
| 4.0V                                     | BD45405G                 | BD46405G    | BD45401G                 | BD46401G    | BD45402G                 | BD46402G    | 3.960                                             | 4.000 | 4.040 |                                      |                   |
| 3.9V                                     | BD45395G                 | BD46395G    | BD45391G                 | BD46391G    | BD45392G                 | BD46392G    | 3.861                                             | 3.900 | 3.939 |                                      |                   |
| 3.8V                                     | BD45385G                 | BD46385G    | BD45381G                 | BD46381G    | BD45382G                 | BD46382G    | 3.762                                             | 3.800 | 3.838 |                                      |                   |
| 3.7V                                     | BD45375G                 | BD46375G    | BD45371G                 | BD46371G    | BD45372G                 | BD46372G    | 3.663                                             | 3.700 | 3.737 |                                      |                   |
| 3.6V                                     | BD45365G                 | BD46365G    | BD45361G                 | BD46361G    | BD45362G                 | BD46362G    | 3.564                                             | 3.600 | 3.636 |                                      |                   |
| 3.5V                                     | BD45355G                 | BD46355G    | BD45351G                 | BD46351G    | BD45352G                 | BD46352G    | 3.465                                             | 3.500 | 3.535 |                                      |                   |
| 3.4V                                     | BD45345G                 | BD46345G    | BD45341G                 | BD46341G    | BD45342G                 | BD46342G    | 3.366                                             | 3.400 | 3.434 |                                      |                   |
| 3.3V                                     | BD45335G                 | BD46335G    | BD45331G                 | BD46331G    | BD45332G                 | BD46332G    | 3.267                                             | 3.300 | 3.333 |                                      |                   |
| 3.2V                                     | BD45325G                 | BD46325G    | BD45321G                 | BD46321G    | BD45322G                 | BD46322G    | 3.168                                             | 3.200 | 3.232 |                                      |                   |
| 3.1V                                     | BD45315G                 | BD46315G    | BD45311G                 | BD46311G    | BD45312G                 | BD46312G    | 3.069                                             | 3.100 | 3.131 |                                      |                   |
| 3.0V                                     | BD45305G                 | BD46305G    | BD45301G                 | BD46301G    | BD45302G                 | BD46302G    | 2.970                                             | 3.000 | 3.030 |                                      |                   |
| 2.9V                                     | BD45295G                 | BD46295G    | BD45291G                 | BD46291G    | BD45292G                 | BD46292G    | 2.871                                             | 2.900 | 2.929 |                                      |                   |
| 2.8V                                     | BD45285G                 | BD46285G    | BD45281G                 | BD46281G    | BD45282G                 | BD46282G    | 2.772                                             | 2.800 | 2.828 |                                      |                   |
| 2.7V                                     | BD45275G                 | BD46275G    | BD45271G                 | BD46271G    | BD45272G                 | BD46272G    | 2.673                                             | 2.700 | 2.727 |                                      |                   |
| 2.6V                                     | BD45265G                 | BD46265G    | BD45261G                 | BD46261G    | BD45262G                 | BD46262G    | 2.574                                             | 2.600 | 2.626 |                                      |                   |
| 2.5V                                     | BD45255G                 | BD46255G    | BD45251G                 | BD46251G    | BD45252G                 | BD46252G    | 2.475                                             | 2.500 | 2.525 |                                      |                   |
| 2.4V                                     | BD45245G                 | BD46245G    | BD45241G                 | BD46241G    | BD45242G                 | BD46242G    | 2.376                                             | 2.400 | 2.424 |                                      |                   |
| 2.3V                                     | BD45235G                 | BD46235G    | BD45231G                 | BD46231G    | BD45232G                 | BD46232G    | 2.277                                             | 2.300 | 2.323 |                                      |                   |