

SBML Model Report

Model identifier:
“VDCC_N_type_version_2_0_20100127”



July 2, 2015

1 General Overview

This is a document in SBML Level 2 Version 4 format. Table 1 shows an overview of the quantities of all components of this model.

Table 1: The SBML components in this model.
All components are described in more detail in the following sections.

Element	Quantity	Element	Quantity
compartment types	0	compartments	1
species types	0	species	2
events	0	constraints	0
reactions	0	function definitions	0
global parameters	23	unit definitions	13
rules	12	initial assignments	0

Model Notes

2 Unit Definitions

This is an overview of 13 unit definitions.

2.1 Unit pS

Name pS

Definition pS

2.2 Unit pA

Name pA

Definition pA

2.3 Unit mV

Name mV

Definition mV

2.4 Unit msec

Name msec

Definition ms

2.5 Unit mM

Name milliMolar

Definition $\text{mmol}\cdot\text{l}^{-1}$

2.6 Unit substance

Name substance

Definition mol

2.7 Unit volume

Name volume

Definition l

2.8 Unit area

Name area

Definition m^2

2.9 Unit length

Name length

Definition m

2.10 Unit time

Name time

Definition s

2.11 Unit J_perKelvin

Name J_perKelvin

Definition $J \cdot K^{-1}$

2.12 Unit per_mV_per_msec

Name per_mV_per_msec

Definition $mV^{-1} \cdot ms^{-1}$

2.13 Unit per_msec

Name per_msec

Definition ms^{-1}

3 Compartment

This model contains one compartment.

Table 2: Properties of all compartments.

Id	Name	SBO	Spatial Dimensions	Size	Unit	Constant	Outside
default			3	1	litre	<input checked="" type="checkbox"/>	

3.1 Compartment default

This is a three-dimensional compartment with a constant size of one litre.

4 Species

This model contains two species. The boundary condition of two of these species is set to `true` so that these species' amount cannot be changed by any reaction. Section ?? provides further details and the derived rates of change of each species.

Table 3: Properties of each species.

Id	Name	Compartment	Derived Unit	Constant	Boundary Condition
V	V	default	$\text{mol} \cdot \text{l}^{-1}$	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Cai	Cai	default	$\text{mol} \cdot \text{l}^{-1}$	<input type="checkbox"/>	<input checked="" type="checkbox"/>

5 Parameters

This model contains 23 global parameters.

Table 4: Properties of each parameter.

Id	Name	SBO	Value	Unit	Constant
alpham	alpham		0.000	dimensionless	<input type="checkbox"/>
alphah	alphah		0.000	dimensionless	<input type="checkbox"/>
betam	betam		0.000	dimensionless	<input type="checkbox"/>
betah	betah		0.000	dimensionless	<input type="checkbox"/>
m	m		0.002	dimensionless	<input type="checkbox"/>
a	a		0.190	mV ⁻¹ · ms ⁻¹	<input checked="" type="checkbox"/>
b	b		19.880	mV	<input checked="" type="checkbox"/>
c	c		0.046	ms ⁻¹	<input checked="" type="checkbox"/>
d	d		20.730	mV	<input checked="" type="checkbox"/>
e	e		1.6 · 10 ⁻⁴	ms ⁻¹	<input checked="" type="checkbox"/>
f	f		48.400	mV	<input checked="" type="checkbox"/>
g	g		39.000	mV	<input checked="" type="checkbox"/>
h	h		0.974	dimensionless	<input type="checkbox"/>
Icanm	nonModulatedCaCurrent		0.000	pA	<input type="checkbox"/>
Cao	extracellularCalcium		2.000	mmol · l ⁻¹	<input type="checkbox"/>
Temperature	Temperature		300.000	K	<input checked="" type="checkbox"/>
conduct	conductance		0.000	pS	<input type="checkbox"/>
conductMax	conductMax		14.000	pS	<input checked="" type="checkbox"/>
temp1	temp1		0.000	dimensionless	<input type="checkbox"/>
temp2	temp2		0.000	dimensionless	<input type="checkbox"/>
temp3	temp3		-0.004	dimensionless	<input type="checkbox"/>
dvf	dvf		0.000	dimensionless	<input type="checkbox"/>
nb_VDCCNtype	number of N type VDCC		1.000	dimensionless	<input checked="" type="checkbox"/>

6 Rules

This is an overview of twelve rules.

6.1 Rule 1

Rule is an assignment rule for parameter betam:

$$\text{betam} = c \cdot \exp\left(\frac{-[V]}{d}\right) \quad (1)$$

6.2 Rule 2

Rule is an assignment rule for parameter alphah:

$$\text{alphah} = e \cdot \exp\left(\frac{-[V]}{f}\right) \quad (2)$$

6.3 Rule 3

Rule is an assignment rule for parameter betah:

$$\text{betah} = \frac{1}{\exp\left(\frac{-[V]+g}{10}\right) + 1} \quad (3)$$

6.4 Rule 4

Rule is an assignment rule for parameter alpham:

$$\text{alpham} = \frac{a \cdot (-[V] + b)}{\exp\left(\frac{-[V]+b}{10}\right) - 1} \quad (4)$$

6.5 Rule 5

Rule is a rate rule for parameter m:

$$\frac{d}{dt}m = \text{alpham} \cdot (1 - m) - \text{betam} \cdot m \quad (5)$$

6.6 Rule 6

Rule is a rate rule for parameter h:

$$\frac{d}{dt}h = \text{alphah} \cdot (1 - h) - \text{betah} \cdot h \quad (6)$$

6.7 Rule 7

Rule is an assignment rule for parameter conduct:

$$\text{conduct} = m^2 \cdot h \cdot \text{conductMax} \quad (7)$$

6.8 Rule 8

Rule is an assignment rule for parameter Icanm:

$$\text{Icanm} = (-\text{conduct}) \cdot \text{dvf} \cdot \text{nb_VDCCNtype} \quad (8)$$

Derived unit pS

6.9 Rule 9

Rule is an assignment rule for parameter temp1:

$$\text{temp1} = \frac{0.0853 \cdot \text{Temperature}}{2} \quad (9)$$

6.10 Rule 10

Rule is an assignment rule for parameter temp2:

$$\text{temp2} = \frac{[V]}{\text{temp1}} \quad (10)$$

6.11 Rule 11

Rule is an assignment rule for parameter dvf:

$$\text{dvf} = \frac{0.001 \cdot \text{temp1} \cdot \text{temp3} \cdot \left(1 - \frac{[\text{Cai}] \cdot \exp(\text{temp2})}{\text{Cao}}\right)}{0.001 + [\text{Cai}]} \quad (11)$$

6.12 Rule 12

Rule is an assignment rule for parameter temp3:

$$\text{temp3} = \begin{cases} 1 - \frac{\text{temp2}}{2} & \text{if } |\text{temp2}| \leq 0.0001 \\ \frac{\text{temp2}}{\exp(\text{temp2}) - 1} & \text{otherwise} \end{cases} \quad (12)$$

References

Dräger, A., Planatscher, H., Wouamba, D. M., Schröder, A., Hucka, M., Endler, L., Golebiewski, M., Müller, W., and Zell, A. (2009). SBML2 \LaTeX : Conversion of SBML files into human-readable reports. *Bioinformatics*, **25**(11), 1455–1456. [10.1093/bioinformatics/btp170](https://doi.org/10.1093/bioinformatics/btp170).