

# **LED\_BBB\_Driver**

## **Design Description**

**peer23peer**

## LED\_BBB\_Driver: Design Description

peer23peer

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# Model Version

**Version:** 1.24

**Last modified:** Tue Aug 25 23:11:06 2015

**Checksum:** 2483240512 3720892819 3316352029 2866340800



Parameter	Value
ClassName	dc_voltage
SchemaVersion	1
Constant voltage	5
v0_unit	V

## "BS270N" (SimscapeBlock)

**Table 2. "BS270N" Parameters**

Parameter	Value
ComponentPath	elec.semiconductors.n_mosfet
ComponentVariants	elec.semiconductors.n_mosfet, elec.semiconductors.n_mosfet_thermal
ComponentVariantNames	No thermal port, Show thermal port
ClassName	Simscape variant
SchemaVersion	1
Parameterization	1
parameterization_unit	1
Parameterization	2
prmDatasheet_unit	1
Parameterization	1
prmEquCoeff_unit	1
Gain, K	5
Beta_unit	A/V <sup>2</sup>
Drain-source on resistance, R_DS(on)	3.5
Rds_unit	Ohm
Drain current, Ids, for R_DS(on)	600
Id_unit	mA
Gate-source voltage, Vgs, for R_DS(on)	4.5
Vgs_unit	V
Gate-source threshold voltage, Vth	2.5
Vth_unit	V
Channel modulation, L	0
lam_unit	1/V
Measurement temperature	25



Parameter	Value
Tmeas_unit	C
Source ohmic resistance	1e-4
RS_unit	Ohm
Drain ohmic resistance	0.01
RD_unit	Ohm
Parameterization	1
C_param_unit	1
Gate-source junction capacitance	270
C_GS_unit	pF
Gate-drain junction capacitance	80
C_GD_unit	pF
Input capacitance, Ciss	50
C_iss_unit	pF
Reverse transfer capacitance, Crss	5
C_rss_unit	pF
Output capacitance, Coss	25
C_oss_unit	pF
Gate-source junction capacitance	[ 270 300 290 280 295 255 ]
C_GS_vec_unit	pF
Gate-drain junction capacitance	[ 450 400 300 190 95 55 ]
C_GD_vec_unit	pF
Input capacitance, Ciss	[ 720 700 590 470 390 310 ]
C_iss_vec_unit	pF
Reverse transfer capacitance, Crss	[ 450 400 300 190 95 55 ]
C_rss_vec_unit	pF
Output capacitance, Coss	[ 900 810 690 420 270 170 ]
C_oss_vec_unit	pF
Corresponding drain-source voltages	[ 0.1 0.3 1 3 10 30 ]
C_Vds_vec_unit	V
Charge-voltage linearity	1
charge_linearity_param_unit	1

Parameter	Value
Gate-drain oxide capacitance	200
C_OX_unit	pF
Drain-gate voltage at which oxide capacitance becomes active	-0.5
V_C_OX_unit	V
Gate threshold voltage temperature coefficient, $dV_{th}/dT$	-6
$dV_{th}_dT\_unit$	mV/K
Drain-source on resistance, $R_{DS(on)}$ , at second measurement temperature	3.5
Rds_T2_unit	Ohm
Second measurement temperature	125
Tmeas2_unit	C
Mobility temperature exponent, BEX	-1.5
BEXDatasheet_unit	1
Mobility temperature exponent, BEX	-1.5
BEXEquCoeff_unit	1
Device simulation temperature	25
TdeviceDatasheet_unit	C
Device simulation temperature	25
TdeviceEquCoeff_unit	C
Junction-case and case-ambient (or case-heatsink) thermal resistances, $[R_{JC} R_{CA}]$	[ 0 10 ]
Rth_unit	K/W
Thermal mass parameterization	1
thermal_mass_parameterization_unit	1
Junction and case thermal masses, $[M_J M_C]$	[ 0 1 ]
thermal_mass_unit	J/K

Parameter	Value
Junction and case thermal time constants, [t <sub>J</sub> t <sub>C</sub> ]	[ 0 10 ]
thermal_time_constant_unit	s
Junction and case initial temperatures, [T <sub>J</sub> T <sub>C</sub> ]	[ 25 25 ]
thermal_mass_initial_temperatures_unit	C

## "Current Sensor" (SimscapeBlock)

**Table 3. "Current Sensor" Parameters**

Parameter	Value
ComponentPath	foundation.electrical.sensors.current
ComponentVariants	foundation.electrical.sensors.current
ComponentVariantNames	current
ClassName	current
SchemaVersion	1

## "Current Sensor1" (SimscapeBlock)

**Table 4. "Current Sensor1" Parameters**

Parameter	Value
ComponentPath	foundation.electrical.sensors.current
ComponentVariants	foundation.electrical.sensors.current
ComponentVariantNames	current
ClassName	current
SchemaVersion	1

## "Electrical Reference" (SimscapeBlock)

**Table 5. "Electrical Reference" Parameters**

Parameter	Value
ComponentPath	foundation.electrical.elements.reference

Parameter	Value
ComponentVariants	foundation.electrical.elements.reference
ComponentVariantNames	reference
ClassName	reference
SchemaVersion	1

## "LED1" (SimscapeBlock)

**Table 6. "LED1" Parameters**

Parameter	Value
ComponentPath	foundation.electrical.elements.pwl_diode
ComponentVariants	foundation.electrical.elements.pwl_diode
ComponentVariantNames	pwl_diode
ClassName	pwl_diode
SchemaVersion	1
Forward voltage	3.4
Vf_unit	V
On resistance	0.3
Ron_unit	Ohm
Off conductance	1e-8
Goff_unit	1/Ohm
i	on
i	High
i	600
i_unit	mA
v	off
v	High
v	0
v_unit	V

## "LED2" (SimscapeBlock)

**Table 7. "LED2" Parameters**

Parameter	Value
ComponentPath	foundation.electrical.elements.pwl_diode
ComponentVariants	foundation.electrical.elements.pwl_diode

Parameter	Value
ComponentVariantNames	pwl_diode
ClassName	pwl_diode
SchemaVersion	1
Forward voltage	3.4
Vf_unit	V
On resistance	0.3
Ron_unit	Ohm
Off conductance	1e-8
Goff_unit	1/Ohm
i	on
i	High
i	600
i_unit	mA
v	off
v	High
v	0
v_unit	V

## "LED3" (SimscapeBlock)

**Table 8. "LED3" Parameters**

Parameter	Value
ComponentPath	foundation.electrical.elements.pwl_diode
ComponentVariants	foundation.electrical.elements.pwl_diode
ComponentVariantNames	pwl_diode
ClassName	pwl_diode
SchemaVersion	1
Forward voltage	3.4
Vf_unit	V
On resistance	0.3
Ron_unit	Ohm
Off conductance	1e-8
Goff_unit	1/Ohm
i	on
i	High
i	600

Parameter	Value
i_unit	mA
v	off
v	High
v	0
v_unit	V

## "Product" (Product)

**Table 9. "Product" Parameters**

Parameter	Value
Number of inputs	2
Multiplication	Element-wise(.*)
Multiply over	All dimensions
Dimension	1
Require all inputs to have the same data type	off
Output minimum	[]
Output maximum	[]
Output data type	Inherit: Inherit via internal rule
Lock output data type setting against changes by the fixed-point tools	off
Integer rounding mode	Floor
Saturate on integer overflow	off
Sample time (-1 for inherited)	-1

## "Product1" (Product)

**Table 10. "Product1" Parameters**

Parameter	Value
Number of inputs	2
Multiplication	Element-wise(.*)
Multiply over	All dimensions
Dimension	1
Require all inputs to have the same data type	off

Parameter	Value
Output minimum	[]
Output maximum	[]
Output data type	Inherit: Inherit via internal rule
Lock output data type setting against changes by the fixed-point tools	off
Integer rounding mode	Floor
Saturate on integer overflow	off
Sample time (-1 for inherited)	-1

## "r" (SimscapeBlock)

**Table 11. "r" Parameters**

Parameter	Value
ComponentPath	foundation.electrical.sensors.voltage
ComponentVariants	foundation.electrical.sensors.voltage
ComponentVariantNames	voltage
ClassName	voltage
SchemaVersion	1

## "R1" (SimscapeBlock)

**Table 12. "R1" Parameters**

Parameter	Value
ComponentPath	foundation.electrical.elements.resistor
ComponentVariants	foundation.electrical.elements.resistor
ComponentVariantNames	resistor
ClassName	resistor
SchemaVersion	1
Resistance	100
R_unit	Ohm
i	off
i	High
i	0

Parameter	Value
i_unit	A
v	off
v	High
v	0
v_unit	V

## "R2" (SimscapeBlock)

**Table 13. "R2" Parameters**

Parameter	Value
ComponentPath	foundation.electrical.elements.resistor
ComponentVariants	foundation.electrical.elements.resistor
ComponentVariantNames	resistor
ClassName	resistor
SchemaVersion	1
Resistance	1
R_unit	MOhm
i	off
i	High
i	0
i_unit	A
v	off
v	High
v	0
v_unit	V

## "r2" (SimscapeBlock)

**Table 14. "r2" Parameters**

Parameter	Value
ComponentPath	foundation.electrical.sensors.voltage
ComponentVariants	foundation.electrical.sensors.voltage
ComponentVariantNames	voltage
ClassName	voltage
SchemaVersion	1



## "R3" (SimscapeBlock)

**Table 15. "R3" Parameters**

Parameter	Value
ComponentPath	foundation.electrical.elements.resistor
ComponentVariants	foundation.electrical.elements.resistor
ComponentVariantNames	resistor
ClassName	resistor
SchemaVersion	1
Resistance	7
R_unit	Ohm
i	off
i	High
i	0
i_unit	A
v	off
v	High
v	0
v_unit	V

## "R4" (SimscapeBlock)

**Table 16. "R4" Parameters**

Parameter	Value
ComponentPath	foundation.electrical.elements.resistor
ComponentVariants	foundation.electrical.elements.resistor
ComponentVariantNames	resistor
ClassName	resistor
SchemaVersion	1
Resistance	7
R_unit	Ohm
i	off
i	High
i	0
i_unit	A

Parameter	Value
v	off
v	High
v	0
v_unit	V

## "R5" (SimscapeBlock)

**Table 17. "R5" Parameters**

Parameter	Value
ComponentPath	foundation.electrical.elements.resistor
ComponentVariants	foundation.electrical.elements.resistor
ComponentVariantNames	resistor
ClassName	resistor
SchemaVersion	1
Resistance	7
R_unit	Ohm
i	off
i	High
i	0
i_unit	A
v	off
v	High
v	0
v_unit	V

## Block Execution Order

1. Constant [16] (Constant)
2. INPUT\_1\_1\_1 (SimscapeInputBlock)
3. Step [18] (Step)
4. INPUT\_3\_1\_1 (SimscapeInputBlock)
5. Pulse Generator [17] (DiscretePulseGenerator)
6. INPUT\_4\_1\_1 (SimscapeInputBlock)
7. Random Number [18] (RandomNumber)
8. INPUT\_2\_1\_1 (SimscapeInputBlock)
9. STATE\_1 (SimscapeExecutionBlock)
10. OUTPUT\_1\_0 (SimscapeExecutionBlock)
11. Product [9] (Product)
12. External [7] (Scope)

13. input (PMIOPort)
14. input (PMIOPort)
15. Product1 [9] (Product)
16. GPIO [7] (Scope)
17. input (PMIOPort)
18. input (PMIOPort)
19. output (PMIOPort)
20. output (PMIOPort)
21. output (PMIOPort)
22. output (PMIOPort)
23. Controlled Voltage Source [16] (SimscapeBlock)
24. Electrical Reference [17] (SimscapeBlock)
25. Resistor3 [18] (SimscapeBlock)
26. Switch [19] (SimscapeBlock)
27. Switch1 [19] (SimscapeBlock)
28. Variable Resistor [20] (SimscapeBlock)
29. + [15] (PMIOPort)
30. GPIO [17] (PMIOPort)
31. - [16] (PMIOPort)
32. SINK\_1 (SimscapeExecutionBlock)
33. a (PMIOPort)
34. 5V [2] (SimscapeBlock)
35. BS270N [3] (SimscapeBlock)
36. Current Sensor [6] (SimscapeBlock)
37. Current Sensor1 [6] (SimscapeBlock)
38. Electrical Reference [6] (SimscapeBlock)
39. LED1 [7] (SimscapeBlock)
40. LED2 [7] (SimscapeBlock)
41. LED3 [8] (SimscapeBlock)
42. R1 [10] (SimscapeBlock)
43. R2 [11] (SimscapeBlock)
44. R3 [12] (SimscapeBlock)
45. R4 [12] (SimscapeBlock)
46. R5 [13] (SimscapeBlock)
47. r [10] (SimscapeBlock)
48. r2 [11] (SimscapeBlock)

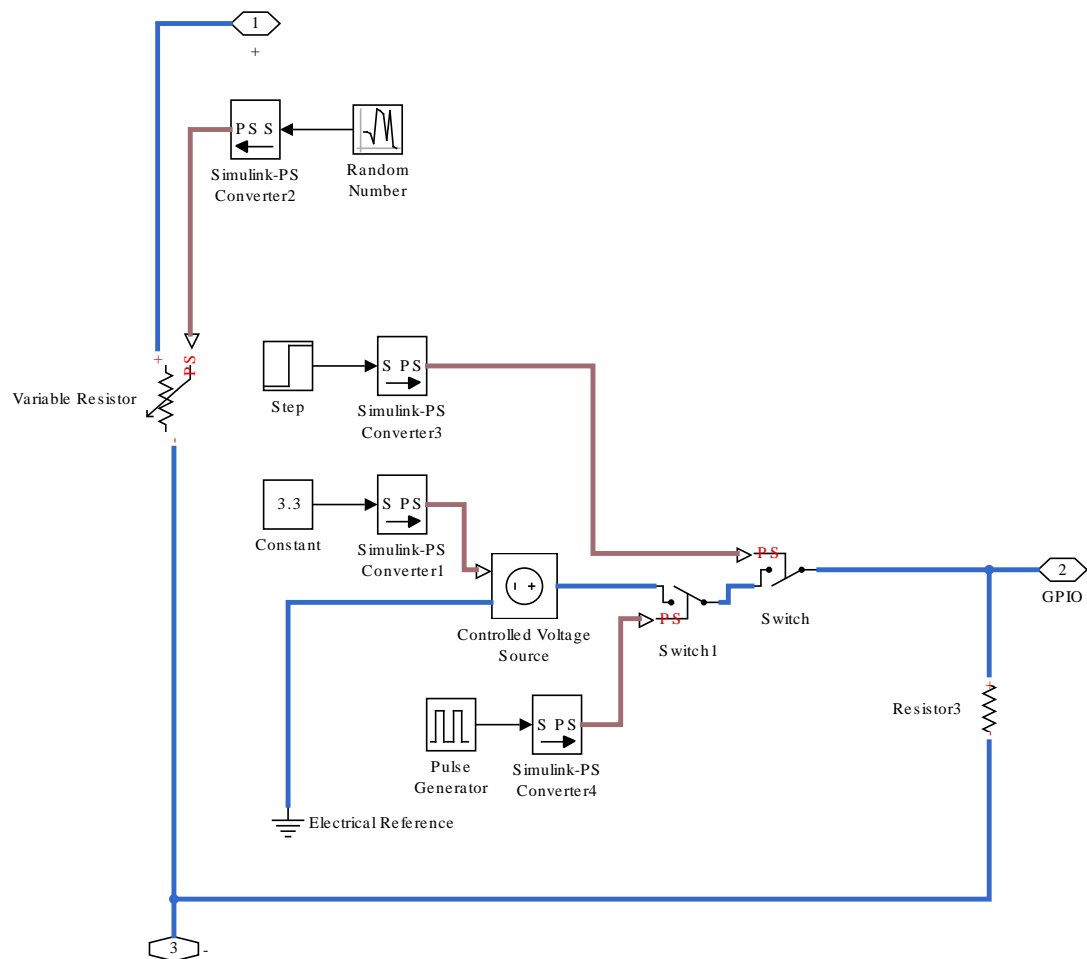
# Subsystems

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## BBB

Figure 2. LED\_BBB\_Driver/BBB



## Blocks

## Parameters

**"+" (PMIOPort)****Table 18. "+" Parameters**

Parameter	Value
Port number	1
Port location on parent subsystem	Right

**"-" (PMIOPort)****Table 19. "-" Parameters**

Parameter	Value
Port number	3
Port location on parent subsystem	Left

**"Constant" (Constant)****Table 20. "Constant" Parameters**

Parameter	Value
Constant value	3.3
Interpret vector parameters as 1-D	on
Output minimum	[]
Output maximum	[]
Output data type	Inherit: Inherit from 'Constant value'
Lock output data type setting against changes by the fixed-point tools	off
Sample time	inf
Frame period	inf

**"Controlled Voltage Source" (SimscapeBlock)****Table 21. "Controlled Voltage Source" Parameters**

Parameter	Value
ComponentPath	foundation.electrical.sources.controlled_voltage

Parameter	Value
ComponentVariants	foundation.electrical.sources.controlled_voltage
ComponentVariantNames	controlled_voltage
ClassName	controlled_voltage
SchemaVersion	1

## "Electrical Reference" (SimscapeBlock)

**Table 22. "Electrical Reference" Parameters**

Parameter	Value
ComponentPath	foundation.electrical.elements.reference
ComponentVariants	foundation.electrical.elements.reference
ComponentVariantNames	reference
ClassName	reference
SchemaVersion	1

## "GPIO" (PMIOPort)

**Table 23. "GPIO" Parameters**

Parameter	Value
Port number	2
Port location on parent subsystem	Right

## "Pulse Generator" (DiscretePulseGenerator)

**Table 24. "Pulse Generator" Parameters**

Parameter	Value
Pulse type	Time based
Time (t)	Use simulation time
Amplitude	1
Period (secs)	1/100
Pulse Width (% of period)	99
Phase delay (secs)	0

Parameter	Value
Sample time	1
Interpret vector parameters as 1-D	on

## "Random Number" (RandomNumber)

**Table 25. "Random Number" Parameters**

Parameter	Value
Mean	13
Variance	3
Seed	534
Sample time	0.2
Interpret vector parameters as 1-D	on

## "Resistor3" (SimscapeBlock)

**Table 26. "Resistor3" Parameters**

Parameter	Value
ComponentPath	foundation.electrical.elements.resistor
ComponentVariants	foundation.electrical.elements.resistor
ComponentVariantNames	resistor
ClassName	resistor
SchemaVersion	1
Resistance	20
R_unit	kOhm
i	off
i	High
i	0
i_unit	A
v	off
v	High
v	0
v_unit	V

**"Step" (Step)****Table 27. "Step" Parameters**

Parameter	Value
Step time	3
Initial value	0
Final value	1
Sample time	0
Interpret vector parameters as 1-D	on
Enable zero-crossing detection	on

**"Switch" (SimscapeBlock)****Table 28. "Switch" Parameters**

Parameter	Value
ComponentPath	foundation.electrical.elements.controlled_switch
ComponentVariants	foundation.electrical.elements.controlled_switch
ComponentVariantNames	controlled_switch
ClassName	controlled_switch
SchemaVersion	1
Closed resistance R_closed	0.01
R_closed_unit	Ohm
Open conductance G_open	1e-8
G_open_unit	1/Ohm
Threshold	0
Threshold_unit	1
i	off
i	High
i	0
i_unit	A
v	off
v	High
v	0
v_unit	V



**"Switch1" (SimscapeBlock)****Table 29. "Switch1" Parameters**

Parameter	Value
ComponentPath	foundation.electrical.elements.controlled_switch
ComponentVariants	foundation.electrical.elements.controlled_switch
ComponentVariantNames	controlled_switch
ClassName	controlled_switch
SchemaVersion	1
Closed resistance R_closed	0.01
R_closed_unit	Ohm
Open conductance G_open	1e-8
G_open_unit	1/Ohm
Threshold	0
Threshold_unit	1
i	off
i	High
i	0
i_unit	A
v	off
v	High
v	0
v_unit	V

**"Variable Resistor" (SimscapeBlock)****Table 30. "Variable Resistor" Parameters**

Parameter	Value
ComponentPath	foundation.electrical.elements.variable_resistor
ComponentVariants	foundation.electrical.elements.variable_resistor
ComponentVariantNames	variable_resistor
ClassName	variable_resistor
SchemaVersion	1
Minimum resistance R <sub>min</sub>	0
Rmin_unit	Ohm

## Subsystems

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Parameter	Value
i	off
i	High
i	0
i_unit	A
v	off
v	High
v	0
v_unit	V

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# Requirements Traceability

LED\_BBB\_Driver does not contain requirements traceability links.

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# System Model Configuration

**Table 31. LED\_BBB\_Driver Configuration Set**

Property	Value
Description	
Components	[LED_BBB_Driver Configuration Set.Components(1) [23], LED_BBB_Driver Configuration Set.Components(2) [24], LED_BBB_Driver Configuration Set.Components(3) [25], LED_BBB_Driver Configuration Set.Components(4) [-26], LED_BBB_Driver Configuration Set.Components(5) [28], LED_BBB_Driver Configuration Set.Components(6) [30], LED_BBB_Driver Configuration Set.Components(7) [30], LED_BBB_Driver Configuration Set.Components(8) [31], LED_BBB_Driver Configuration Set.Components(9) [33]]
Name	Configuration
SimulationMode	normal

**Table 32. LED\_BBB\_Driver Configuration Set.Components [23](1)**

Property	Value
Name	Solver
Description	
Components	
StartTime	0.0
StopTime	5
AbsTol	auto
FixedStep	auto
InitialStep	auto
MaxNumMinSteps	-1
MaxOrder	5
ZcThreshold	auto
ConsecutiveZCsStepRelTol	10*128*eps
MaxConsecutiveZCs	1000
ExtrapolationOrder	4
NumberNewtonIterations	1
MaxStep	auto
MinStep	auto
MaxConsecutiveMinStep	1
RelTol	1e-5

SolverMode	Auto
EnableConcurrentExecution	off
ConcurrentTasks	off
Solver	ode15s
SolverName	ode15s
SolverType	Variable-step
SolverJacobianMethodControl	auto
ShapePreserveControl	DisableAll
ZeroCrossControl	UseLocalSettings
ZeroCrossAlgorithm	Nonadaptive
SolverResetMethod	Fast
PositivePriorityOrder	off
AutoInsertRateTranBlk	off
SampleTimeConstraint	Unconstrained
InsertRTBMode	Whenever possible
SampleTimeProperty	

**Table 33. LED\_BBB\_Driver Configuration Set.Components [23](2)**

Property	Value
Name	Data Import/Export
Description	
Components	
Decimation	1
ExternalInput	[t, u]
FinalStateName	xFinal
InitialState	xInitial
LimitDataPoints	on
MaxDataPoints	1000
LoadExternalInput	off
LoadInitialState	off
SaveFinalState	off
SaveCompleteFinalSimState	off
SaveFormat	Array
SignalLoggingSaveFormat	Dataset
SaveOutput	on
SaveState	off
SignalLogging	on
DSMLogging	on
InspectSignalLogs	off

VisualizeSimOutput	on
SaveTime	on
ReturnWorkspaceOutputs	off
StateSaveName	xout
TimeSaveName	tout
OutputSaveName	yout
SignalLoggingName	logsout
DSMLoggingName	dsmout
OutputOption	RefineOutputTimes
OutputTimes	[]
ReturnWorkspaceOutputsName	out
Refine	1

**Table 34. LED\_BBB\_Driver Configuration Set.Components [23](3)**

Property	Value
Name	Optimization
Description	
Components	
BlockReduction	on
BooleanDataType	on
ConditionallyExecuteInputs	on
InlineParams	off
UseDivisionForNetSlopeComputation	off
UseFloatMulNetSlope	off
DefaultUnderspecifiedDataType	double
UseSpecifiedMinMax	off
InlineInvariantSignals	off
OptimizeBlockIOStorage	on
BufferReuse	on
GlobalBufferReuse	on
GlobalVariableUsage	None
StrengthReduction	off
AdvancedOptControl	
EnforceIntegerDowncast	on
ExpressionFolding	on
BooleansAsBitfields	off
BitfieldContainerType	uint_T
EnableMemcpy	on
MemcpyThreshold	64

PassReuseOutputArgsAs	Structure reference
PassReuseOutputArgsThreshold	12
FoldNonRolledExpr	on
LocalBlockOutputs	on
RollThreshold	5
StateBitsets	off
DataBitsets	off
ActiveStateOutputEnumStorageType	Native Integer
UseTempVars	off
ZeroExternalMemoryAtStartup	on
ZeroInternalMemoryAtStartup	on
InitFltsAndDblsToZero	off
NoFixptDivByZeroProtection	off
EfficientFloat2IntCast	off
EfficientMapNaN2IntZero	on
OptimizeModelRefInitCode	off
LifeSpan	inf
EvaledLifeSpan	Inf
MaxStackSize	Inherit from target
BufferReusableBoundary	on
SimCompilerOptimization	off
AccelVerboseBuild	off

**Table 35. LED\_BBB\_Driver Configuration Set.Components [23](4)**

Property	Value
Name	Diagnostics
Description	
Components	
RTPrefix	error
ConsistencyChecking	none
ArrayBoundsChecking	none
SignalInfNanChecking	none
SignalRangeChecking	none
ReadBeforeWriteMsg	UseLocalSettings
WriteAfterWriteMsg	UseLocalSettings
WriteAfterReadMsg	UseLocalSettings
AlgebraicLoopMsg	warning
ArtificialAlgebraicLoopMsg	warning
SaveWithDisabledLinksMsg	warning

SaveWithParameterizedLinksMsg	warning
CheckSSInitialOutputMsg	on
UnderspecifiedInitializationDetection	Simplified
MergeDetectMultiDrivingBlocksExec	error
CheckExecutionContextPreStartOutputMsg	off
CheckExecutionContextRuntimeOutputMsg	off
SignalResolutionControl	UseLocalSettings
BlockPriorityViolationMsg	warning
MinStepSizeMsg	warning
TimeAdjustmentMsg	none
MaxConsecutiveZCsMsg	error
MaskedZcDiagnostic	warning
IgnoredZcDiagnostic	warning
SolverPrmCheckMsg	none
InheritedTsInSrcMsg	warning
DiscreteInheritContinuousMsg	warning
MultiTaskDSMMsg	error
MultiTaskCondExecSysMsg	error
MultiTaskRateTransMsg	error
SingleTaskRateTransMsg	none
TasksWithSamePriorityMsg	warning
SigSpecEnsureSampleTimeMsg	warning
CheckMatrixSingularityMsg	none
IntegerOverflowMsg	warning
Int32ToFloatConvMsg	warning
ParameterDowncastMsg	error
ParameterOverflowMsg	error
ParameterUnderflowMsg	none
ParameterPrecisionLossMsg	warning
ParameterTunabilityLossMsg	warning
FixptConstUnderflowMsg	none
FixptConstOverflowMsg	none
FixptConstPrecisionLossMsg	none
UnderSpecifiedDataTypeMsg	none
UnnecessaryDatatypeConvMsg	none
VectorMatrixConversionMsg	none
InvalidFcnCallConnMsg	error
FcnCallInpInsideContextMsg	EnableAllAsError
SignalLabelMismatchMsg	none



UnconnectedInputMsg	warning
UnconnectedOutputMsg	warning
UnconnectedLineMsg	warning
SFcnCompatibilityMsg	none
FrameProcessingCompatibilityMsg	error
UniqueDataStoreMsg	none
BusObjectLabelMismatch	warning
RootOutputRequireBusObject	warning
AssertControl	UseLocalSettings
Echo	
EnableOverflowDetection	off
ModelReferenceIOMsg	none
ModelReferenceVersionMismatchMessage	none
ModelReferenceIOMismatchMessage	none
ModelReferenceCSMismatchMessage	none
ModelReferenceSimTargetVerbose	off
UnknownTsInhSupMsg	warning
ModelReferenceDataLoggingMessage	warning
ModelReferenceSymbolNameMessage	warning
ModelReferenceExtraNoncontSigs	error
StateNameClashWarn	none
SimStateInterfaceChecksumMismatchMsg	warning
SimStateOlderReleaseMsg	error
InitInArrayFormatMsg	warning
StrictBusMsg	ErrorLevel1
BusNameAdapt	WarnAndRepair
NonBusSignalsTreatedAsBus	none
SFUnusedDataAndEventsDiag	warning
SFUnexpectedBacktrackingDiag	warning
SFInvalidInputDataAccessInChartInitDiag	warning
SFNoUnconditionalDefaultTransitionDiag	warning
SFTransitionOutsideNaturalParentDiag	warning
SFUnconditionalTransitionShadowingDiag	warning
SFUndirectedBroadcastEventsDiag	warning
SFTransitionActionBeforeConditionDiag	warning
SFOutputUsedAsStateInMooreChartDiag	error
IntegerSaturationMsg	warning

**Table 36. LED\_BBB\_Driver Configuration Set.Components [23](5)**

Property	Value
Name	Hardware Implementation
Description	
Components	
ProdBitPerChar	8
ProdBitPerShort	16
ProdBitPerInt	32
ProdBitPerLong	32
ProdBitPerLongLong	64
ProdBitPerFloat	32
ProdBitPerDouble	64
ProdBitPerPointer	32
ProdLargestAtomicInteger	Char
ProdLargestAtomicFloat	None
ProdIntDivRoundTo	Undefined
ProdEndianness	Unspecified
ProdWordSize	32
ProdShiftRightIntArith	on
ProdLongLongMode	off
ProdHWDeviceType	32-bit Generic
TargetBitPerChar	8
TargetBitPerShort	16
TargetBitPerInt	32
TargetBitPerLong	32
TargetBitPerLongLong	64
TargetBitPerFloat	32
TargetBitPerDouble	64
TargetBitPerPointer	32
TargetLargestAtomicInteger	Char
TargetLargestAtomicFloat	None
TargetShiftRightIntArith	on
TargetLongLongMode	off
TargetIntDivRoundTo	Undefined
TargetEndianness	Unspecified
TargetWordSize	32
TargetTypeEmulationWarnSuppressLevel	0
TargetPreprocMaxBitsSint	32
TargetPreprocMaxBitsUint	32

TargetHWDeviceType	Specified
TargetUnknown	off
ProdEqTarget	on

**Table 37. LED\_BBB\_Driver Configuration Set.Components [23](6)**

Property	Value
Name	Model Referencing
Description	
Components	
UpdateModelReferenceTargets	IfOutOfDateOrStructuralChange
CheckModelReferenceTargetMessage	error
EnableParallelModelReferenceBuilds	off
ParallelModelReferenceErrorOnInvalidPool	on
ParallelModelReferenceMATLABWorkerInit	None
ModelReferenceNumInstancesAllowed	Multi
PropagateVarSize	Infer from blocks in model
ModelDependencies	
ModelReferencePassRootInputsByReference	on
ModelReferenceMinAlgLoopOccurrences	off
PropagateSignalLabelsOutOfModel	off
SupportModelReferenceSimTargetCustomCode	off

**Table 38. LED\_BBB\_Driver Configuration Set.Components [23](7)**

Property	Value
Name	Simulation Target
Description	
Components	
SimCustomSourceCode	
SimCustomHeaderCode	
SimCustomInitializer	
SimCustomTerminator	
SimReservedNameArray	
SimUserSources	
SimUserIncludeDirs	
SimUserLibraries	
SFSimEnableDebug	off
SFSimOverflowDetection	on
SFSimEcho	on
SimBlas	on

SimCtrlC	on
SimExtrinsic	on
SimIntegrity	on
SimUseLocalCustomCode	off
SimParseCustomCode	on
SimBuildMode	sf_incremental_build
SimDataInitializer	
SimGenImportedTypeDefs	off

**Table 39. LED\_BBB\_Driver Configuration Set.Components [23](8)**

Property	Value
Name	Code Generation
SystemTargetFile	grt.tlc
TLCOptions	
CodeGenDirectory	
GenCodeOnly	off
MakeCommand	make_rtw
GenerateMakefile	on
PackageGeneratedCodeAndArtifacts	off
PackageName	
TemplateMakefile	grt_default_tmf
PostCodeGenCommand	
Description	
GenerateReport	off
SaveLog	off
RTWVerbose	on
RetainRTWFile	off
ProfileTLC	off
TLCDebug	off
TLCCoverage	off
TLCAssert	off
ProcessScriptMode	Default
ConfigurationMode	Optimized
ProcessScript	
ConfigurationScript	
ConfigAtBuild	off
RTWUseLocalCustomCode	off
RTWUseSimCustomCode	off
CustomSourceCode	

CustomHeaderCode	
CustomInclude	
CustomSource	
CustomLibrary	
CustomInitializer	
CustomTerminator	
Toolchain	Automatically locate an installed toolchain
BuildConfiguration	Faster Builds
CustomToolchainOptions	
IncludeHyperlinkInReport	off
LaunchReport	off
PortableWordSizes	off
GenerateErtSFunction	off
CreateSILPILBlock	None
CodeExecutionProfiling	off
CodeExecutionProfileVariable	executionProfile
CodeProfilingSaveOptions	SummaryOnly
CodeProfilingInstrumentation	off
SILDebugging	off
TargetLang	C
IncludeERTFirstTime	off
GenerateTraceInfo	off
GenerateTraceReport	off
GenerateTraceReportSl	off
GenerateTraceReportSf	off
GenerateTraceReportEml	off
GenerateCodeInfo	off
GenerateWebview	off
GenerateCodeMetricsReport	off
GenerateCodeReplacementReport	off
RTWCompilerOptimization	off
ObjectivePriorities	
RTWCustomCompilerOptimizations	
CheckMdlBeforeBuild	Off
CustomRebuildMode	OnUpdate
DataInitializer	
Components	[LED_BBB_Driver Configuration Set.Components(8).Components(1) [33], LED_BBB_Driver Configuration Set.Components(8).Components(2)-[35]]

**Table 40. LED\_BBB\_Driver Configuration Set.Components [23](9)**

Property	Value
Description	
Components	[LED_BBB_Driver Configuration Set.Components(9).Components(1) [37], LED_BBB_Driver Configuration Set.Components(9).Components(2)-[38]]
Name	Simscape
EditingMode	Full
ExplicitSolverDiagnosticOptions	warning
GlobalZcOffDiagnosticOptions	warning
SimscapeLogType	all
SimscapeLogSimulationStatistics	on
SimscapeLogOpenViewer	on
SimscapeLogName	simlog
SimscapeLogDecimation	1
SimscapeLogLimitData	on
SimscapeLogDataHistory	5000
SelectedTab	
Version	1.0
ComponentsAttached	true
Listener	[LED_BBB_Driver Configuration Set.Components(9).Listener(1) [38], LED_BBB_Driver Configuration Set.Components(9).Listener(2) [-38], LED_BBB_Driver Configuration Set.Components(9).Listener(3) [38], LED_BBB_Driver Configuration Set.Components(9).Listener(4)-[38], LED_BBB_Driver Configuration Set.Components(9).Listener(5) [38], LED_BBB_Driver Configuration Set.Components(9).Listener(6)-[38], LED_BBB_Driver Configuration Set.Components(9).Listener(7) [38], LED_BBB_Driver Configuration Set.Components(9).Listener(8) [38], LED_BBB_Driver Configuration Set.Components(9).Listener(9) [38], LED_BBB_Driver Configuration Set.Components(9).Listener(10) [38], LED_BBB_Driver Configuration Set.Components(9).Listener(11) [39]]
someListenersNotInstalled	false
instanceId	

**Table 41. LED\_BBB\_Driver Configuration**  
**Set.Components(8).Components [32](1)**

Property	Value
Name	Code Appearance
Description	
Components	
Comment	
ForceParamTrailComments	off
GenerateComments	on
CommentStyle	Auto
IgnoreCustomStorageClasses	on
IgnoreTestpoints	off
IncHierarchyInIds	off
MaxIdLength	31
PreserveName	off
PreserveNameWithParent	off
ShowEliminatedStatement	off
OperatorAnnotations	off
IncAutoGenComments	off
SimulinkDataObjDesc	off
SFDataObjDesc	off
MATLABFcnDesc	off
IncDataTypeInIds	off
PrefixModelToSubsysFcnNames	on
MangleLength	1
CustomSymbolStr	\$R\$N\$M
CustomSymbolStrGlobalVar	\$R\$N\$M
CustomSymbolStrType	\$N\$R\$M_T
CustomSymbolStrField	\$N\$M
CustomSymbolStrFcn	\$R\$N\$M\$F
CustomSymbolStrFcnArg	rt\$I\$N\$M
CustomSymbolStrBlkIO	rtb_\$N\$M
CustomSymbolStrTmpVar	\$N\$M
CustomSymbolStrMacro	\$R\$N\$M
CustomSymbolStrUtil	\$N\$C
CustomCommentsFcn	
DefineNamingRule	None
DefineNamingFcn	
ParamNamingRule	None

ParamNamingFcn	
SignalNamingRule	None
SignalNamingFcn	
InsertBlockDesc	off
InsertPolySpaceComments	off
SimulinkBlockComments	on
MATLABSourceComments	off
EnableCustomComments	off
InternalIdentifier	Shortened
InlinedPrmAccess	Literals
ReqsInCode	off
UseSimReservedNames	off
ReservedNameArray	

**Table 42. LED\_BBB\_Driver Configuration**  
**Set.Components(8).Components [32](2)**

Property	Value
Name	Target
Description	
Components	
IsERTTarget	off
TargetFcnLib	ansi_tfl_table_tmw.mat
TargetLibSuffix	
TargetPreCompLibLocation	
GenFloatMathFcnCalls	NOT IN USE
TargetLangStandard	C89/C90 (ANSI)
TargetFunctionLibrary	NOT IN USE
CodeReplacementLibrary	None
UtilityFuncGeneration	Auto
ERTMultiwordTypeDef	System defined
ERTMultiwordLength	256
MultiwordLength	2048
GenerateFullHeader	on
InferredTypesCompatibility	off
GenerateSampleERTMain	off
GenerateTestInterfaces	off
ModelReferenceCompliant	on
ParMdlRefBuildCompliant	on
CompOptLevelCompliant	on



ConcurrentExecutionCompliant	on
IncludeMdlTerminateFcn	on
GeneratePreprocessorConditionals	Disable all
CombineOutputUpdateFcns	on
CombineSignalStateStructs	off
SuppressErrorStatus	off
ERTFirstTimeCompliant	off
IncludeFileDelimiter	Auto
ERTCustomFileBanners	off
SupportAbsoluteTime	on
LogVarNameModifier	rt_
MatFileLogging	on
MultiInstanceERTCode	off
CodeInterfacePackaging	Nonreusable function
SupportNonFinite	on
SupportComplex	on
PurelyIntegerCode	off
SupportContinuousTime	on
SupportNonInlinedSFcns	on
SupportVariableSizeSignals	off
ParenthesesLevel	Nominal
CastingMode	Nominal
GenerateClassInterface	off
ModelStepFunctionPrototypeControlCompliant	off
CPPClassGenCompliant	on
AutosarCompliant	off
GRTInterface	off
GenerateAllocFcn	off
UseToolchainInfoCompliant	on
GenerateSharedConstants	on
ExtMode	off
ExtModeStaticAlloc	off
ExtModeTesting	off
ExtModeStaticAllocSize	1000000
ExtModeTransport	0
ExtModeMexFile	ext_comm
ExtModeMexArgs	
ExtModeIntrfLevel	Level1
RTWCAPISignals	off

RTWCAPIParams	off
RTWCAPIStates	off
RTWCAPIRootIO	off
GenerateASAP2	off
MultiInstanceErrorCode	Error

**Table 43. LED\_BBB\_Driver Configuration Set.Components(9).Components [33](1)**

Property	Value
Description	
Components	
Name	SimMechanics
WarnOnRedundantConstraints	on
WarnOnSingularInitialAssembly	off
ShowCutJoints	off
VisOnUpdateDiagram	off
VisDuringSimulation	off
EnableVisSimulationTime	on
VisSampleTime	0
DisableBodyVisControl	off
ShowCG	on
ShowCS	on
ShowOnlyPortCS	off
HighlightModel	on
FramesToBeSkipped	0
AnimationDelay	3
RecordAVI	off
CompressAVI	on
AviFileName	
AutoFitVis	off
EnableSelection	on
LastVizWinPosition	[-1 -1 -1 -1]
CamPosition	[0 0 0]
CamTarget	[0 0 -1]
CamUpVector	[0 1 0]
CamHeight	-1
CamViewAngle	0
VisBackgroundColor	[0.9 0.9 0.95]
DefaultBodyColor	[1 0 0]

MDLBodyVisualizationType	Convex hull from body CS locations
OVRRIDBodyVisualizationType	NONE
VisConfigFile	

**Table 44. LED\_BBB\_Driver Configuration Set.Components(9).Components [33](2)**

Property	Value
Description	SimMechanics 2G
Components	[LED_BBB_Driver Configuration Set.Components(9).Components(2).Components(1) [39], LED_BBB_Driver Configuration Set.Components(9).Components(2).Components(2) [39]]
Name	SimMechanics2G

**LED\_BBB\_Driver Configuration Set.Components(9).Listener(1) (handle.listener, )**

Note: this object has no unfiltered properties.

**LED\_BBB\_Driver Configuration Set.Components(9).Listener(2) (handle.listener, )**

Note: this object has no unfiltered properties.

**LED\_BBB\_Driver Configuration Set.Components(9).Listener(3) (handle.listener, )**

Note: this object has no unfiltered properties.

**LED\_BBB\_Driver Configuration Set.Components(9).Listener(4) (handle.listener, )**

Note: this object has no unfiltered properties.

**LED\_BBB\_Driver Configuration Set.Components(9).Listener(5) (handle.listener, )**

Note: this object has no unfiltered properties.

**LED\_BBB\_Driver Configuration Set.Components(9).Listener(6) (handle.listener, )**

Note: this object has no unfiltered properties.

**LED\_BBB\_Driver Configuration Set.Components(9).Listener(7) (handle.listener, )**

Note: this object has no unfiltered properties.

**LED\_BBB\_Driver Configuration Set.Components(9).Listener(8) (handle.listener, )**

Note: this object has no unfiltered properties.

**LED\_BBB\_Driver Configuration Set.Components(9).Listener(9) (handle.listener, )**

Note: this object has no unfiltered properties.

**LED\_BBB\_Driver Configuration Set.Components(9).Listener(10) (handle.listener, )**

Note: this object has no unfiltered properties.

**LED\_BBB\_Driver Configuration Set.Components(9).Listener(11) (handle.listener, )**

Note: this object has no unfiltered properties.

**Table 45. LED\_BBB\_Driver Configuration Set.Components(9).Components(2).Components [38](1)**

Property	Value
Description	Diagnostics
Components	
Name	DiagnosticsConfigSet
SimMechanicsInvalidVisualProperty	warning
SimMechanicsCrossSectionNullEdge	warning
SimMechanicsUnconnectedFramePorts	warning
SimMechanicsRedundantBlock	warning
SimMechanicsConflictingReferenceFrames	warning
SimMechanicsRigidlyBoundBlock	error
SimMechanicsUnsatisfiedHighPriorityTargets	warning
SimMechanicsJointTargetOverSpecification	error

**Table 46. LED\_BBB\_Driver Configuration Set.Components(9).Components(2).Components [38](2)**

Property	Value
Description	Explorer
Components	
Name	ExplorerConfigSet
SimMechanicsOpenEditorOnUpdate	on
InternalSimMechanicsExplorerSettings	

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# Glossary

**Atomic Subsystem.** A subsystem treated as a unit by an implementation of the design documented in this report. The implementation computes the outputs of all the blocks in the atomic subsystem before computing the next block in the parent system's block execution order (sorted list).

**Block Diagram.** A Simulink block diagram represents a set of simultaneous equations that relate a system or subsystem's inputs to its outputs as a function of time. Each block in the diagram represents an equation of the form  $y = f(t, x, u)$  where  $t$  is the current time,  $u$  is a block input,  $y$  is a block output, and  $x$  is a system state (see the Simulink documentation for information on the functions represented by the various types of blocks that make up the diagram). Lines connecting the blocks represent dependencies among the blocks, i.e., inputs whose current values are the outputs of other blocks. An implementation of a design described in this document computes a root or atomic system's outputs at each time step by computing the outputs of the blocks in an order determined by block input/output dependencies.

**Block Parameter.** A variable that determines the output of a block along with its inputs, for example, the gain parameter of a Gain block.

**Block Execution Order.** The order in which Simulink evaluates blocks during simulation of a model. The block execution order determined by Simulink ensures that a block executes only after all blocks on whose outputs it depends are executed.

**Checksum.** A number that indicates whether different versions of a model or atomic subsystem differ functionally or only cosmetically. Different checksums for different versions of the same model or subsystem indicate that the versions differ functionally.

**Design Variable.** A symbolic (MATLAB) variable or expression used as the value of a block parameter. Design variables allow the behavior of the model to be altered by altering the value of the design variable.

**Signal.** A block output, so-called because block outputs typically vary with time.

**Virtual Subsystem.** A subsystem that is purely graphical, i.e., is intended to reduce the visual complexity of the block diagram of which it is a subsystem. An implementation of the design treats the blocks in the subsystem as part of the first nonvirtual ancestor of the virtual subsystem (see Atomic Subsystem).

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# About this Report

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## Report Overview

This report describes the design of the LED\_BBB\_Driver system. The report was generated automatically from a Simulink model used to validate the design. It contains the following sections:

**Model Version.** Specifies information about the version of the model from which this design description was generated. Includes the model checksum, a number that indicates whether different versions of the model differ functionally or only cosmetically. Different checksums for different versions indicate that the versions differ functionally.

**Root System.** Describes the design's root system.

**Subsystems.** Describes each of the design's subsystems.

**Design Variables.** Describes system design variables, i.e., MATLAB variables and expressions used as block parameter values.

**System Model Configuration.** Lists the configuration parameters, e.g., start and stop time, of the model used to simulate the system described by this report.

**Requirements Traceability.** Shows design requirements associated with elements of the design model. This section appears only if the design model contains requirements links.

**Glossary.** Defines Simulink terms used in this report.

## Root System Description

This section describes a design's root system. It contains the following sections:

**Diagram.** Simulink block diagram that represents the algorithm used to compute the root system's outputs.

**Description.** Description of the root system. This section appears only if the model's root system has a Documentation property or a Doc block.

**Interface.** Name, data type, width, and other properties of the root system's input and output signals. The number of the block port that outputs the signal appears in angle brackets appended to the signal name. This section appears only if the root system has input or output ports.

**Blocks.** This section has two subsections:

- **Parameters.** Describes key parameters of blocks in the root system. This section also includes graphical and/or tabular representations of lookup table data used by lookup table blocks, i.e., blocks that use lookup tables to compute their outputs.

- **Block Execution Order.** Order in which blocks must be executed at each time step in order to ensure that each block's inputs are available when it executes.

**State Charts.** Describes state charts used in the root system. This section appears only if the root system contains Stateflow blocks.

## Subsystem Descriptions

This section describes a design's subsystems. Each subsystem description contains the following sections:

**Checksum.** This section appears only if the subsystem is an atomic subsystem. The checksum indicates whether the version of the model subsystem used to generate this report differs functionally from other versions of the model subsystem. If two model checksums differ, the corresponding versions of the model differ functionally.

**Diagram.** Simulink block diagram that graphically represents the algorithm used to compute the subsystem's outputs.

**Description.** Description of the subsystem. This section appears only if the subsystem has a Documentation property or contains a Doc block.

**Interface.** Name, data type, width, and other properties of the subsystem's input and output signals. The number of the block port that outputs the signal appears in angle brackets appended to the signal name. This section appears only if the subsystem is atomic and has input or output ports.

**Blocks.** Blocks that this subsystem contains. This section has two subsections:

- **Parameters.** Key parameters of blocks in the subsystem. This section also includes graphical and/or tabular representations of lookup table data used by lookup table blocks, blocks that use lookup tables to compute their outputs.
- **Block Execution Order.** Order in which the subsystem's blocks must be executed at each time step in order to ensure that each block's inputs are available when the block executes. This section appears only if the subsystem is atomic. Note: in Acrobat(PDF) reports, the number in square brackets next to the block name is a hyperlink to the block parameter table. The number has no model significance.

**State Charts.** Describes state charts used in the subsystem. This section appears only if the root system contains Stateflow blocks.

## State Chart Descriptions

This section describes the state machines used by Stateflow blocks to compute their outputs, i.e., Stateflow blocks. Each state machine description contains the following sections:

**Chart.** Diagram representing the state machine.

**States.** Describes the state machine's states. Each state description includes the state's diagram and diagrams and/or descriptions of graphical functions, Simulink functions, truth tables, and MATLAB functions parented by the state.

**Transitions.** Transitions between the state machine's states. Each transition description specifies the values of key transition properties. Appears only if a transition has properties that do not appear on the chart.

**Junctions.** Transition junctions. Each junction description specifies the values of key junction properties. Appears only if a junction has properties that do not appear on the chart.

**Events.** Events that trigger state transitions. Each event description specifies the values of key event properties.

**Data.** Data types and other properties of the Stateflow block's inputs, outputs, and other state machine data.

**Targets.** Executable implementations of the state machine used to compute the outputs of the corresponding Stateflow block.

**MATLAB Supporting Functions.** List of functions invoked by MATLAB functions defined in the chart.