

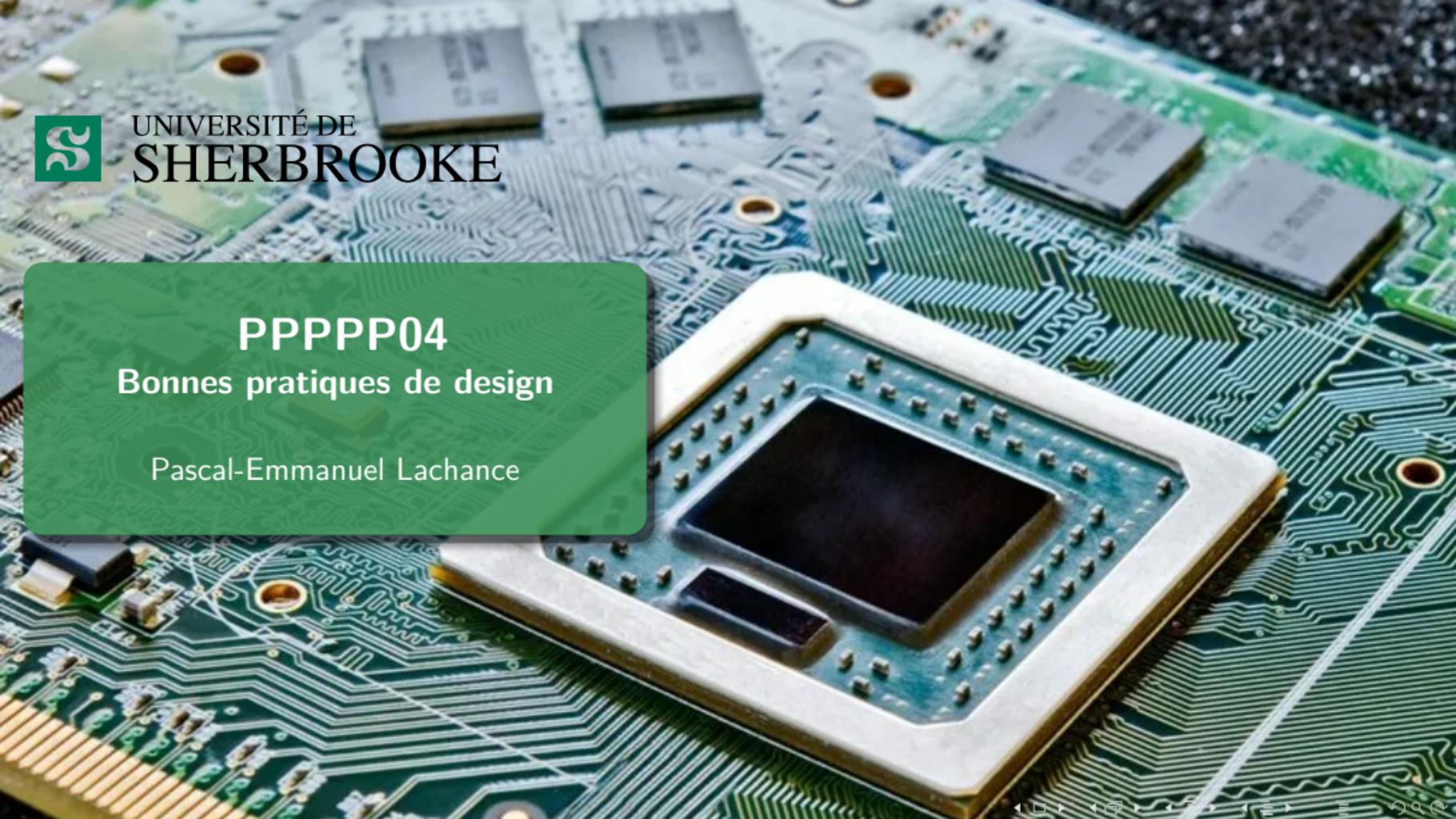


UNIVERSITÉ DE
SHERBROOKE

PPPPP04

Bonnes pratiques de design

Pascal-Emmanuel Lachance



PPPPP04

Bonnes pratiques de design

Par: Pascal-Emmanuel Lachance

-  Comment choisir ses composantes et optimiser son BOM?
-  Comment bien concevoir un symbole et un footprint?
-  Bonnes pratiques de schématisation
-  Bonnes pratiques de layout
-  Comment faire un design review?
-  Communication avec fabricants, assembleurs et programmeurs

Bonnes pratiques générales

- Bonnes pratiques générales
 - Définition des besoins
 - Debugging
 - Simulation
- Bonnes pratiques des composantes & BOM

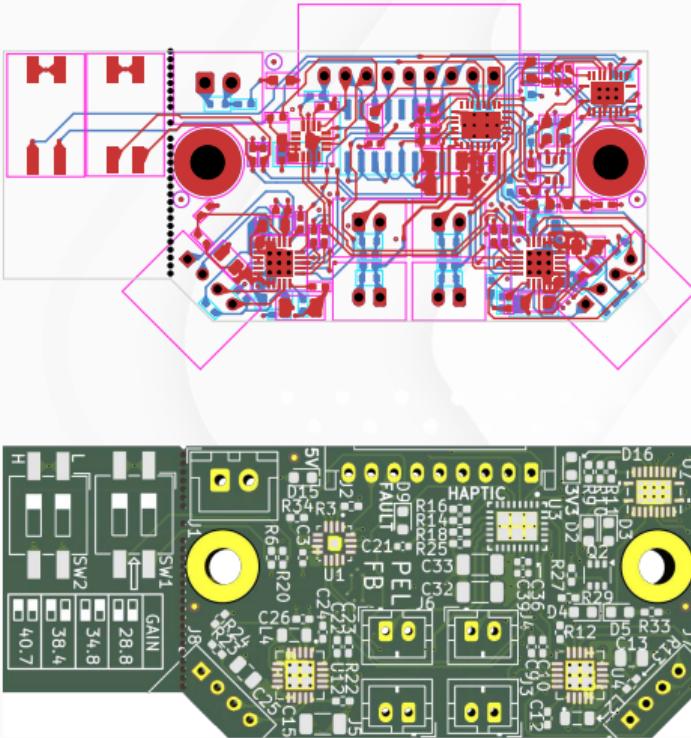
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Mise en contexte — Haptic Board



- Dernier board que j'ai design
 - A24, pour PMC
- Placé au dos de la main au-dessus d'un autre board
- Contrôle des éléments d'haptique
- Dernière partie d'une intégration de 10 PCBs sur le bras



- Dresser une liste des fonctionnalités
 - Activation de 4 solénoïdes
 - Activation de 4 piézo
 - Petit
 - Ne chauffe pas
 - Alimenté 5 V et/ou 3.3 V
 - Contrôlé par I^2C & I^2S
 - Contraintes de bruit électronique

Définition des besoins

- Dresser une liste des fonctionnalités
- Dresser des requis techniques quantifiables
- Activation de 4 solénoïdes
 - 5 V @ 500 mA chaque
- Activation de 4 piézo
 - 60 V @ 200 Hz AC
- Petit
 - 25.5 mm × 45 mm
- Ne chauffe pas
 - $\Delta T_{max} = 40^\circ\text{C}$
- Alimenté 5 V et/ou 3.3 V
- Contrôlé par I^2C & I^2S
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Définition des besoins

- Dresser une liste des fonctionnalités
- Dresser des requis techniques quantifiables

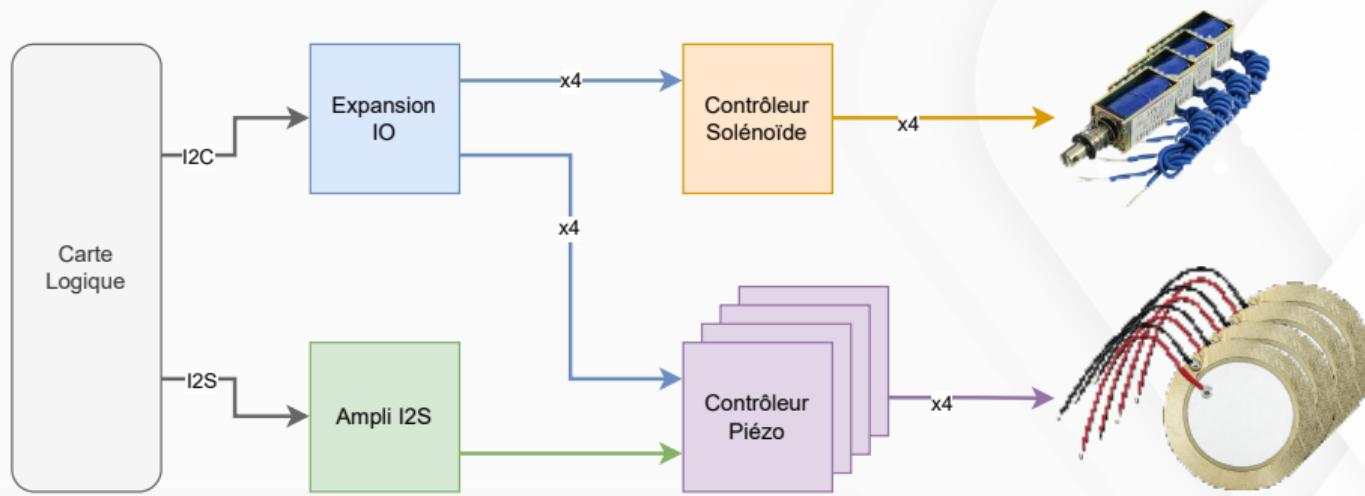
- Combien en as-tu besoin?
- A quel point ils doivent être fiables
- Comment tu vas les tester?
 - Dresser un plan de test!
- Envisager la complexité dès le début

- Activation de 4 solénoïdes
 - 5 V @ 500 mA chaque
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Schéma-Blocs

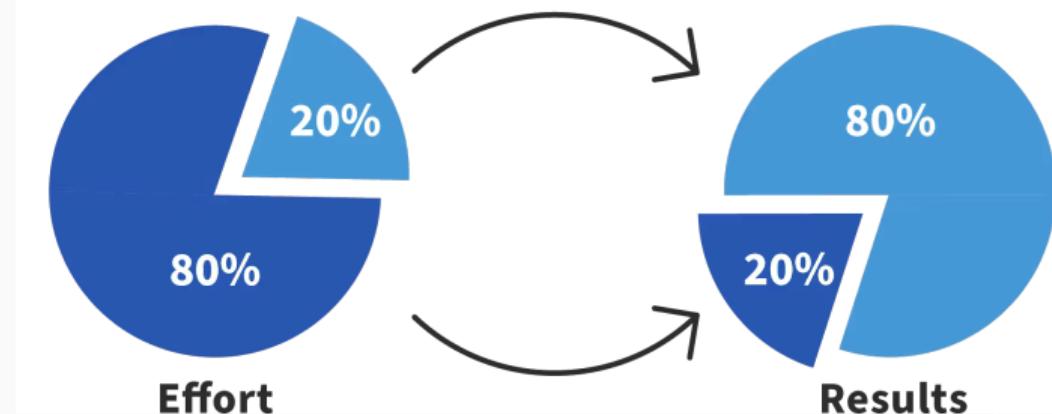
- Faire un schéma-bloc des différentes portions du projet
- À inclure dans le schéma final

- Général
- Power Delivery Network
- MCU/CPU/FPGA
- Communications
- Séquences



- Principe simple:
 - 80% de tes résultats viennent de 20% des efforts
 - Pour obtenir le dernier 20% des résultats, il faut mettre 80% des efforts

Pareto Principle

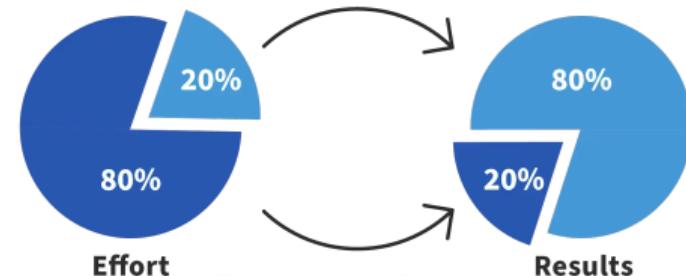


Source: [1]

- Principe simple:
 - 80% de tes résultats viennent de 20% des efforts
 - Pour obtenir le dernier 20% des résultats, il faut mettre 80% des efforts

- 80% des coûts vient de 20% des pièces
- 80% de la complexité vient de 20% du design
- 80% du power consommé par 20% des pièces
- 80% du temps de debug sur 20% des problèmes

Pareto Principle



Source: [1]

Bonnes pratiques générales

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- Bonnes pratiques des composantes & BOM

Multimètre

- Mesures DC
- Mesures de l'alimentation
- Vérifier des shorts



Oscilloscope

- Temporel
- Meilleur outil
- Bruit
- Communication



Analyseur Logique

- Protocole
- Décodage protocole
- Validation communication



Caméra Thermique

- Température
- Trouver pièce brisée
- Valider requis thermiques



Current Clamp

- Courant
- Mesures de l'alimentation
- Non-intrusif



Power Analyzer — SMU

- Mesure power DC
- Précision
- Logging
- Source



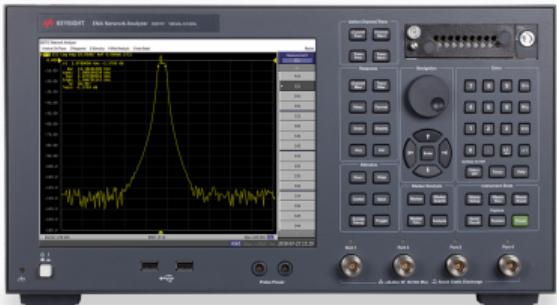
LCR Meter

- Réactance
- Mesure de composants passifs
- Impédance
- Quality Factor



Vector Network Analyzer

- Caractéristiques électriques
- Mesure signal et retour
- Mesure Impédance
- S-Parameter



Spectrum Analyzer

- Oscilloscope sur stéroïdes
- Fourier
- Mesure signal
- Mesure du bruit



Near-Field Probe

- EMI
- Mesure bruit électromagnétique
- Fréquence précise
- EMC



- Avoir plusieurs méthodes de debug
- Design pour pouvoir être debug
- Être conscient des outils de debugging à ta disposition
- Prévoir comment débugger et tester toutes les fonctionnalités
- Rajouter plus de testpoint que nécessaire

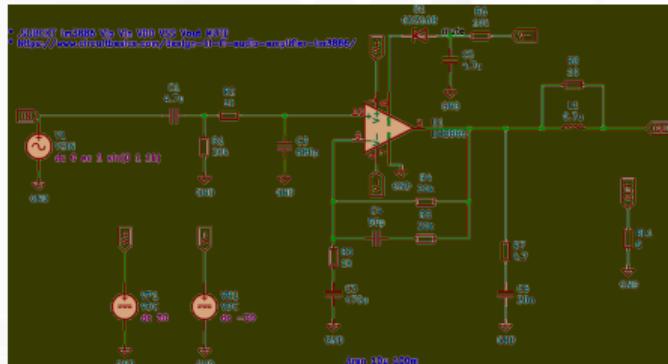
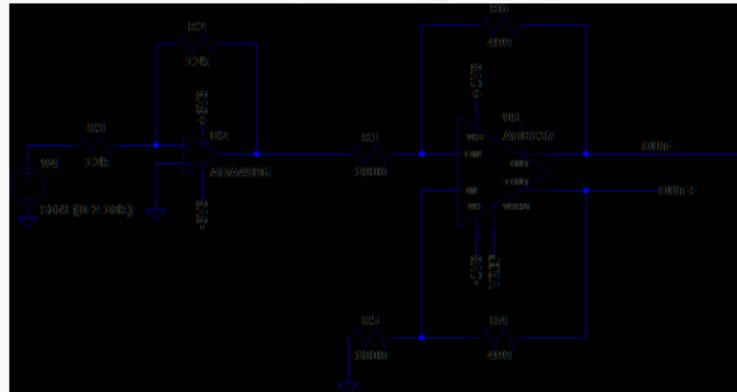
Où vont les testpoints?

- GND GND GND
- Power
- Lignes de communication
- Toute la chaîne analogique
- Clocks et signaux de contrôle
- Et plus!

Bonnes pratiques générales

- Bonnes pratiques générales
 - Définition des besoins
 - Debugging
 - Simulation
- Bonnes pratiques des composantes & BOM

- Décrit un circuit en équations
- Permet de faire des analyses
 - AC
 - DC
 - Transient
 - Noise
- Simulations de circuits AC



Bonnes pratiques des composantes & BOM

- Bonnes pratiques générales
- Bonnes pratiques des composantes & BOM
 - Footprints
 - Symboles
 - Datasheets
 - Recherche de pièces
 - BOM

Bonnes pratiques des composantes & BOM

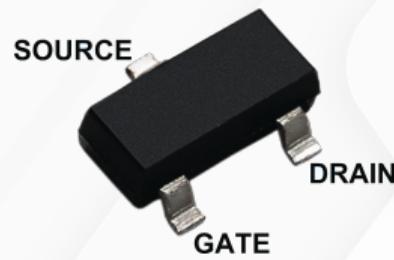
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- Élément très important de la conception de pièces
 - Affecte le layout et l'assemblage
 - Le footprint devrait être clair
 - Le footprint devrait être représentatif
 - Le footprint devrait avoir des bonnes informations mécaniques
 - Le footprint devrait respecter tes capacités d'assemblage
 - Le footprint devrait avoir un modèle 3D
-
- Faire le footprint soi-même
 - Suivre un standard
 - Modifier la pièce plus tard au besoin
 - Avoir des marqueurs de pin 1 consistants
 - Avoir les bonnes couches mécaniques
 - Avoir des bons modèles 3D
 - Valider que le footprint est bon

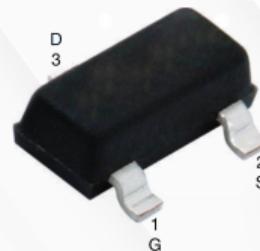
Attention aux footprints!



- Toujours valider tous les footprints
 - Faire attention aux sources de footprints
 - Faire attention particulière aux transistors!
-
- La meilleure option est de faire le footprint

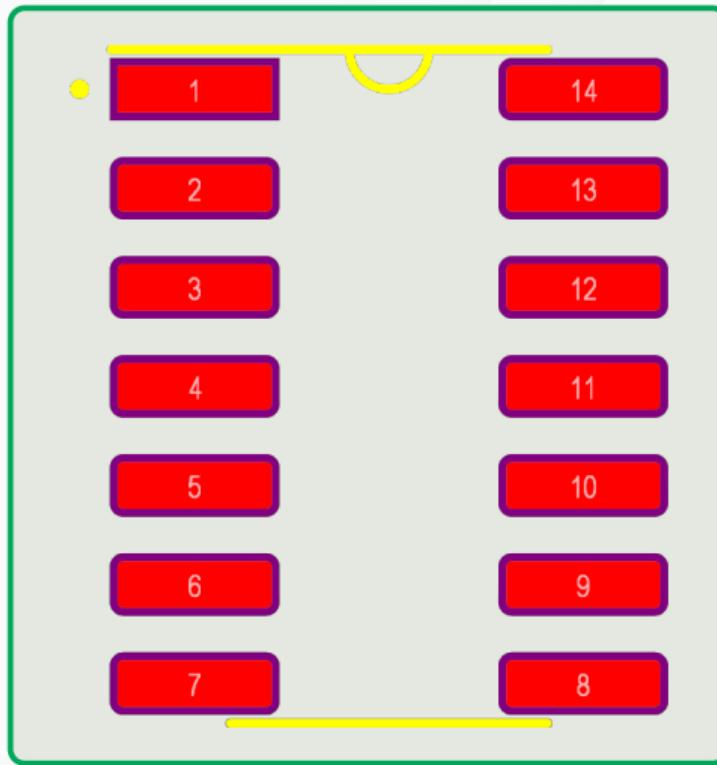


Microchip LND150

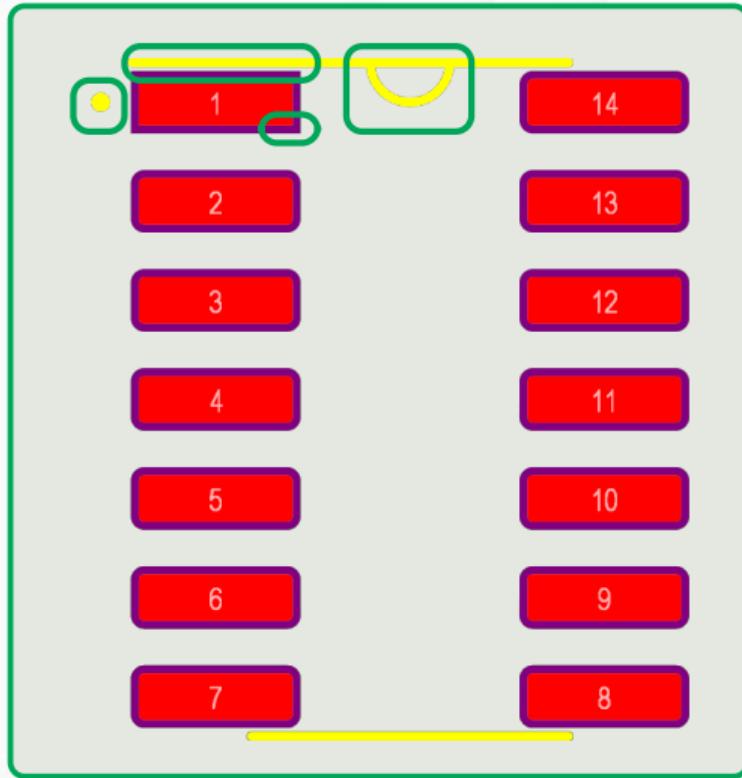


Vishay SQ2318

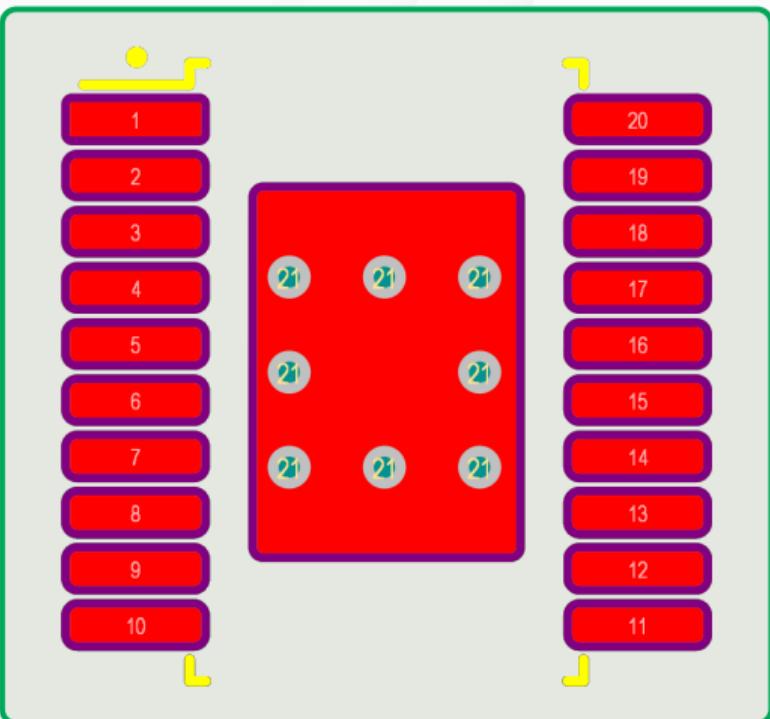
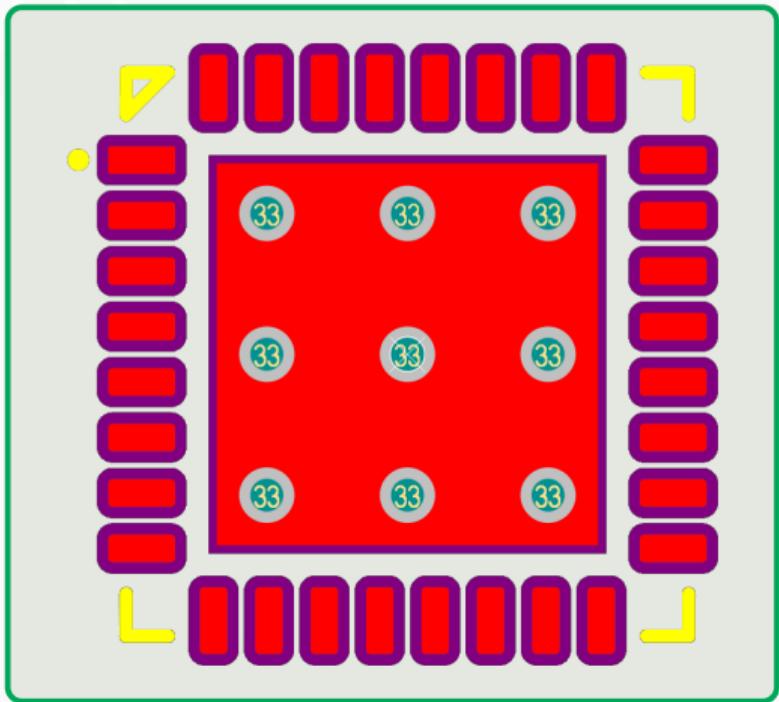
- Doit être visible clairement pendant l'assemblage
 - Couche d'assemblage avec les marqueurs
- Doit être visible après l'assemblage!
- Plusieurs marqueurs possibles



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Marqueurs de pin 1



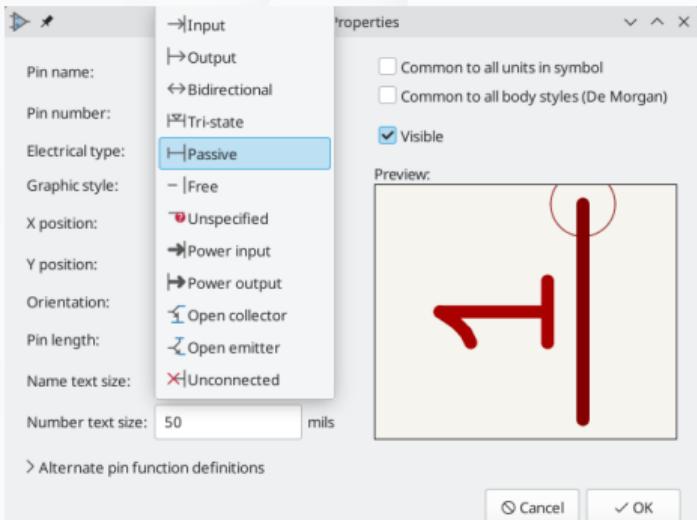
Bonnes pratiques des composantes & BOM

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 - BOM

Fabrication du symbole



- Un des éléments de clareté les plus importants
- Affecte aussi le BOM
- La pièce devrait être représentative
- La pièce devrait être facile à lire
- La pièce devrait contenir toutes les informations pour le BOM
- Faire la pièce soi-même
 - Suivre un standard
 - Modifier plus tard pour fitter le schéma
 - Customize le BOM
 - Validation de la pièce
 - Mettre les types électriques



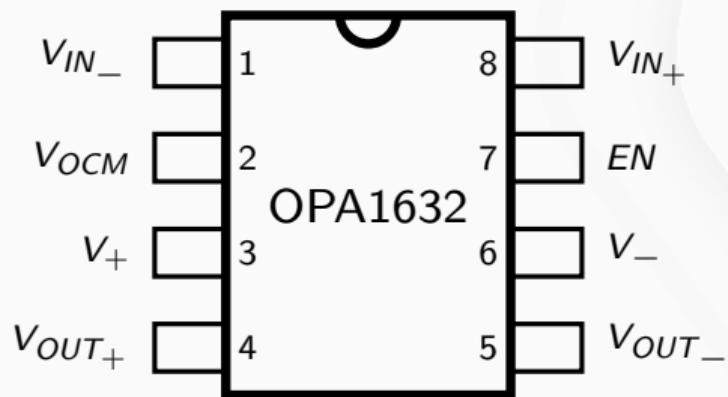
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Pinout du symbole

- Garder les inputs à gauche et outputs à droite
- Ne pas numéroter le symbole comme le footprint
- Utiliser des symboles représentatifs lorsque possible
- Tu ne devrais pas avoir à aller dans la datasheet pour comprendre la pièce

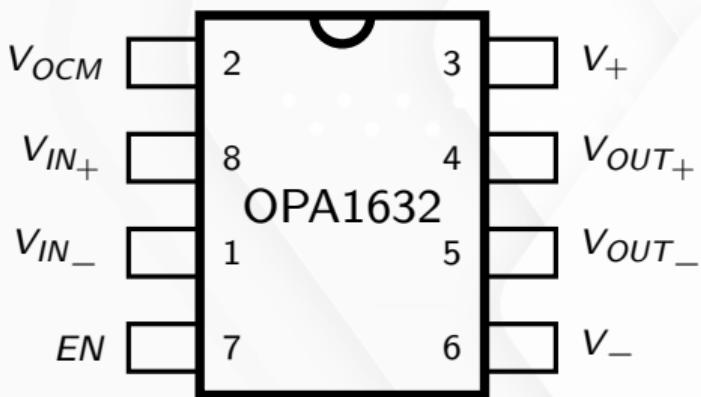
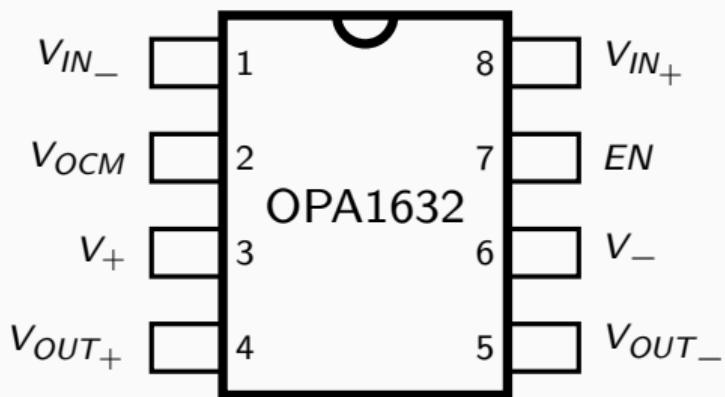
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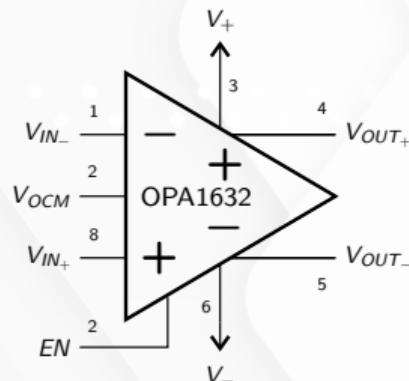
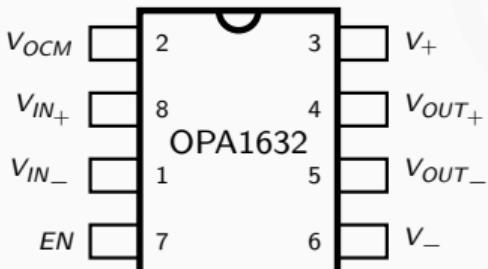
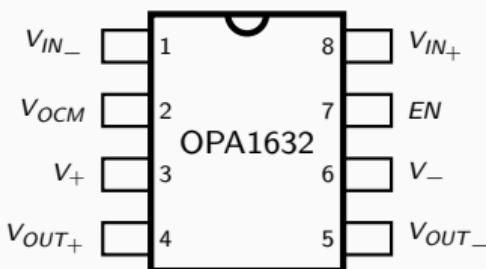
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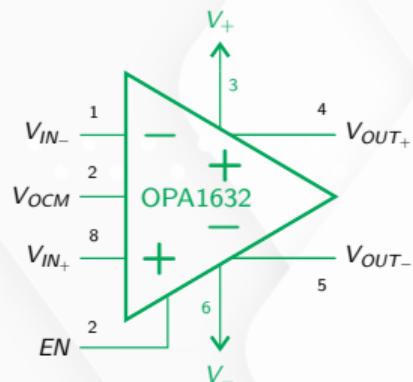
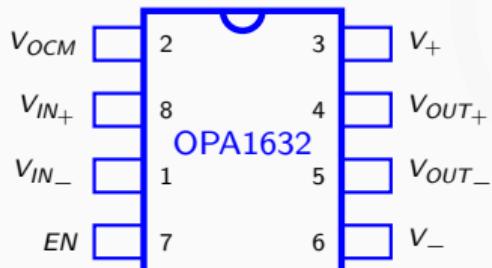
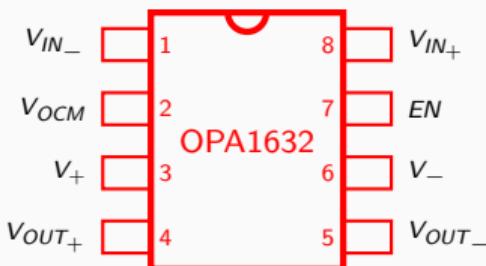
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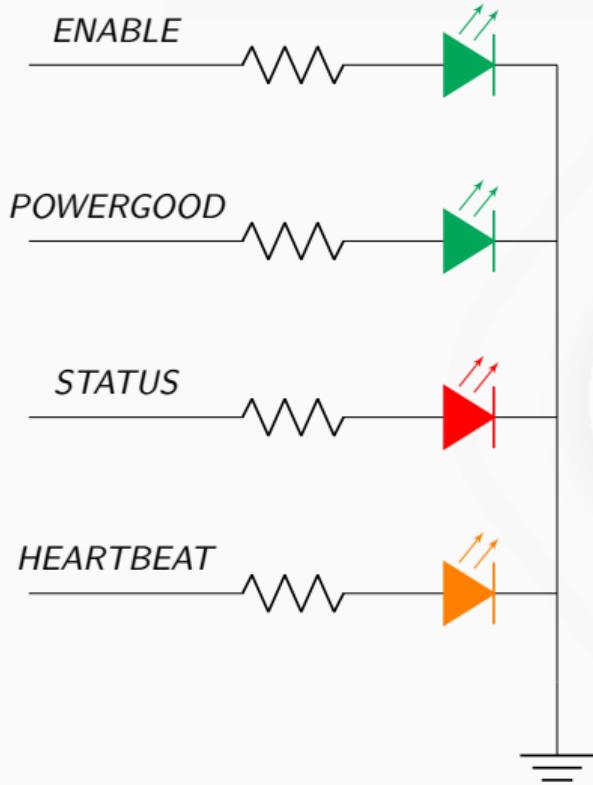


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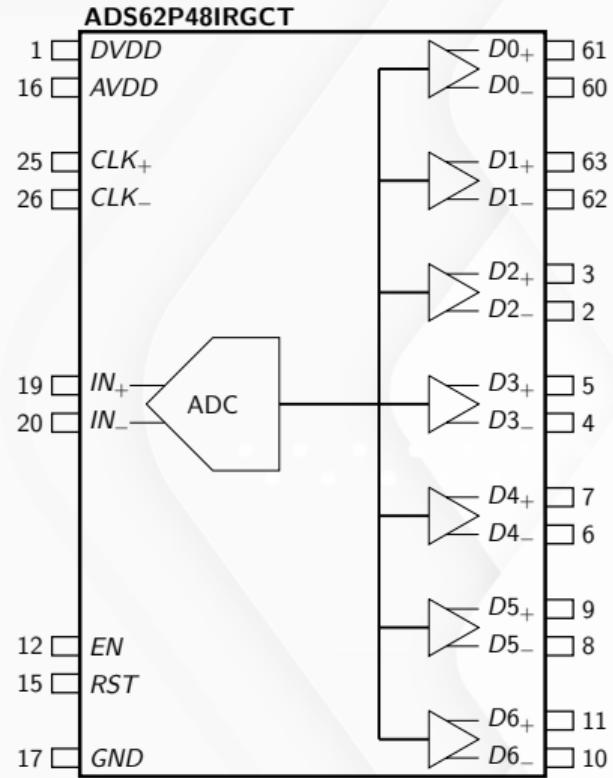
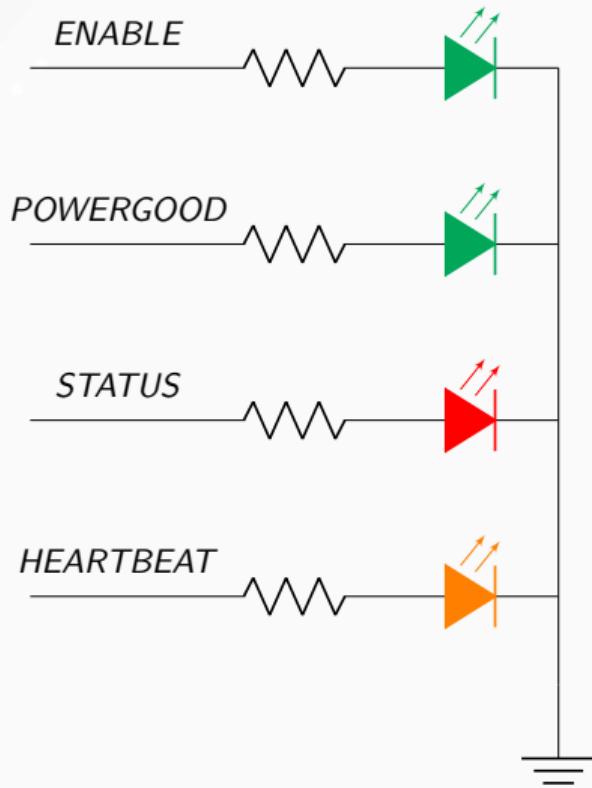
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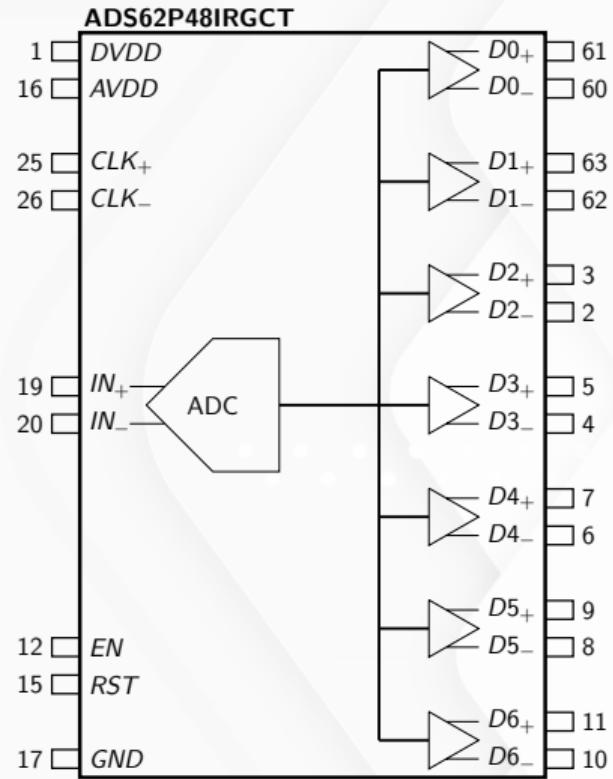
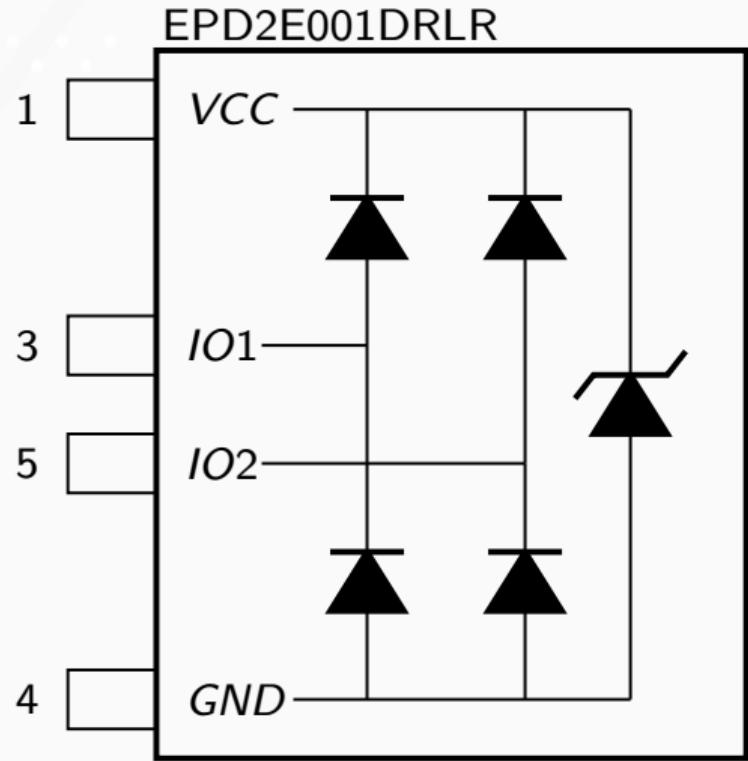
Symboles représentatifs



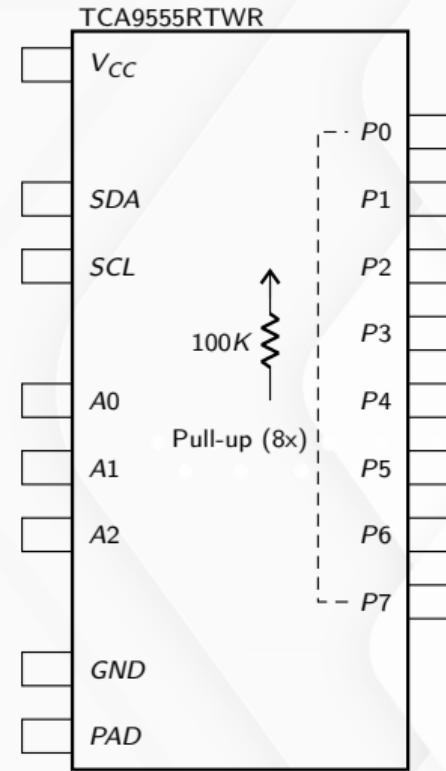
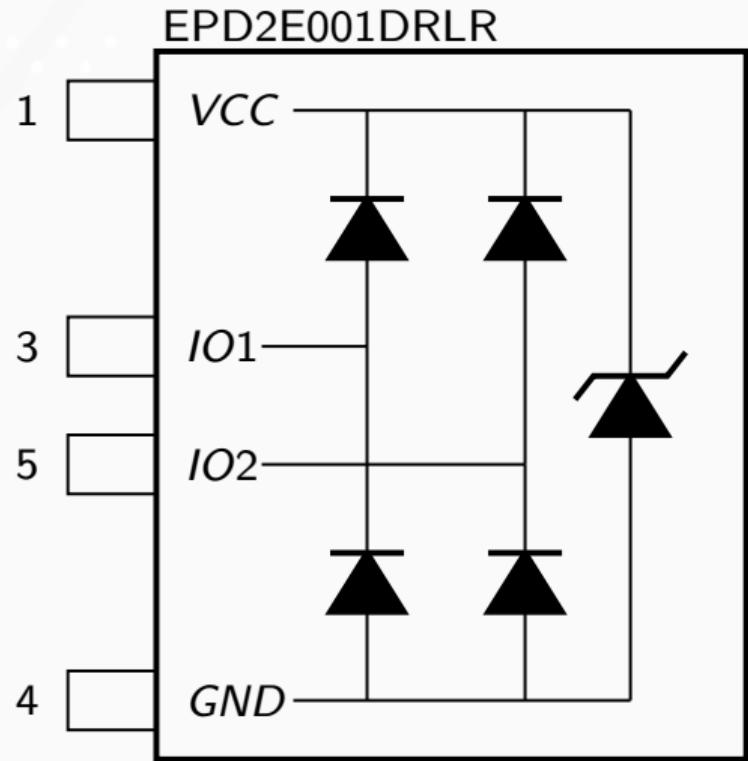
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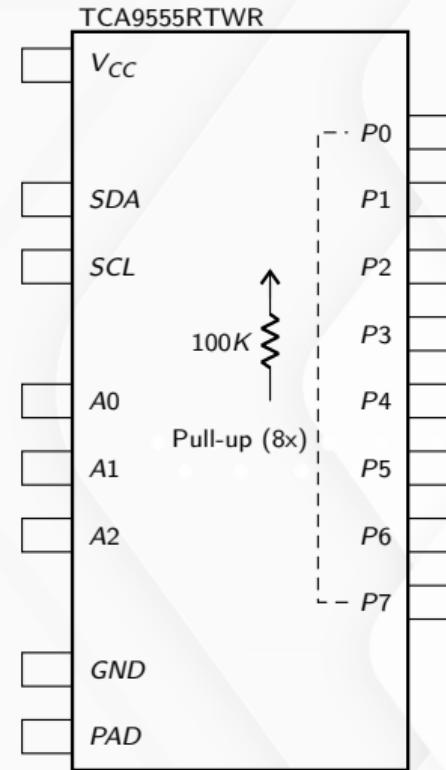
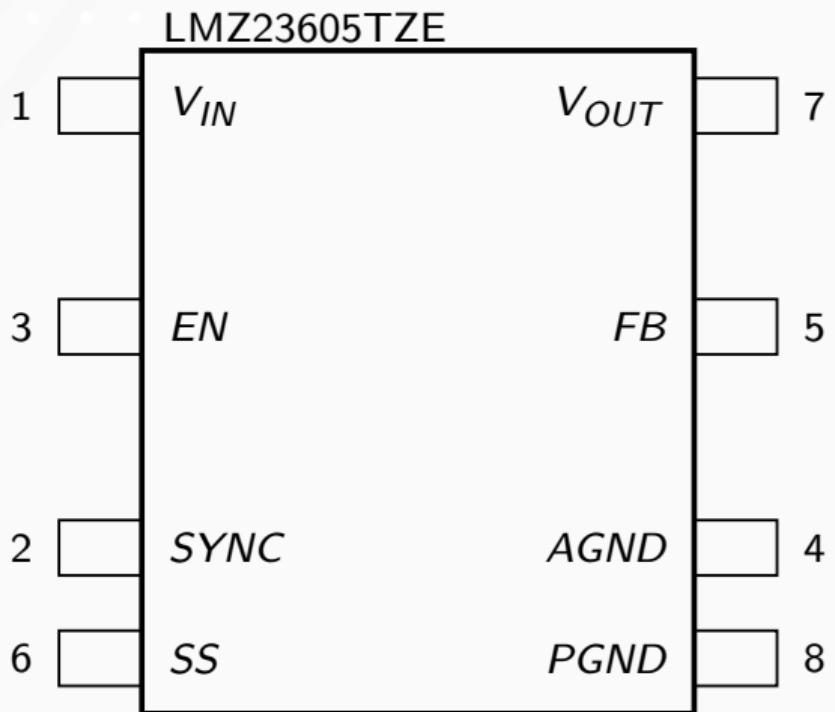
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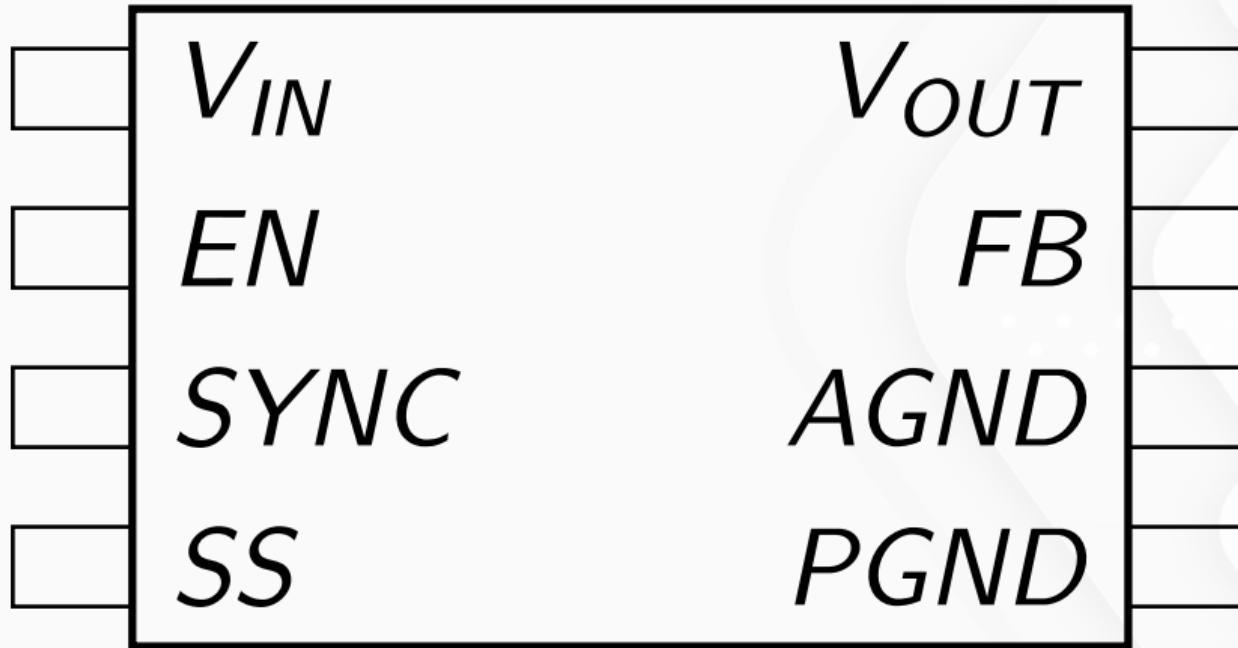
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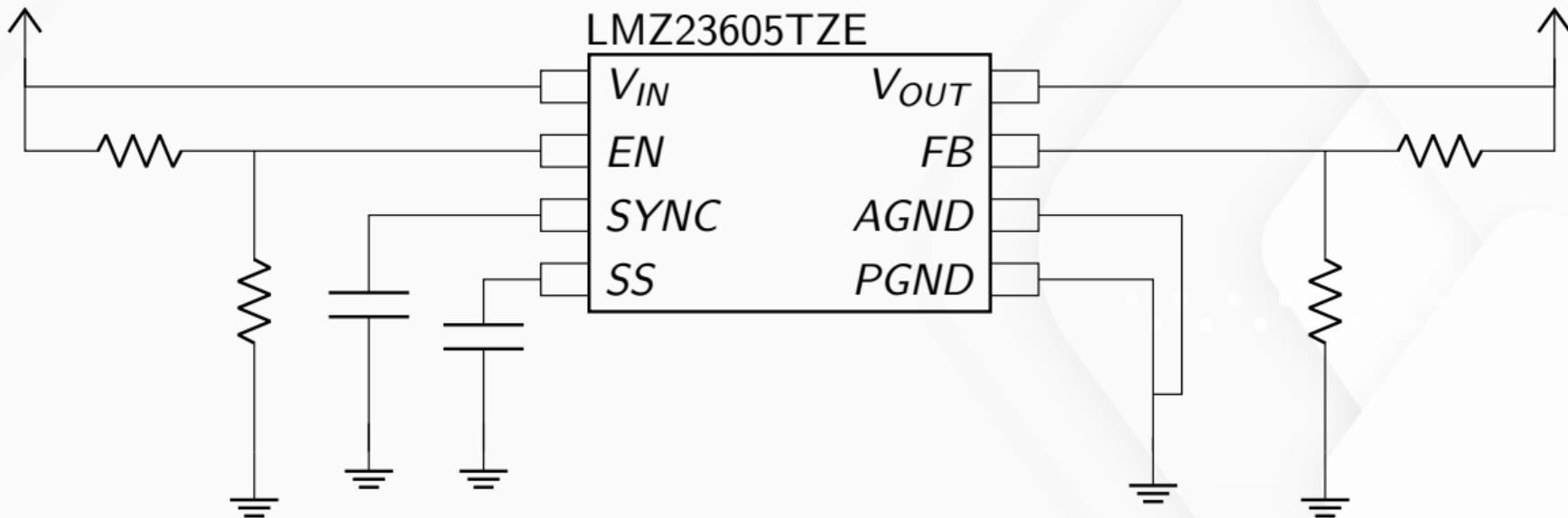


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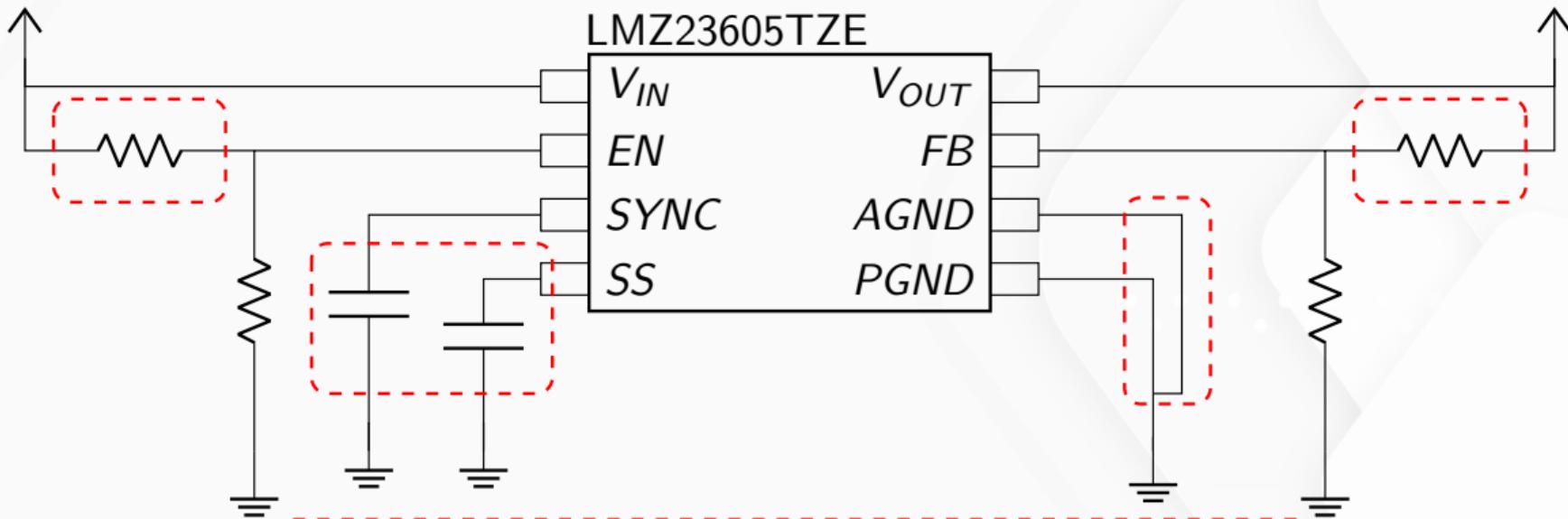


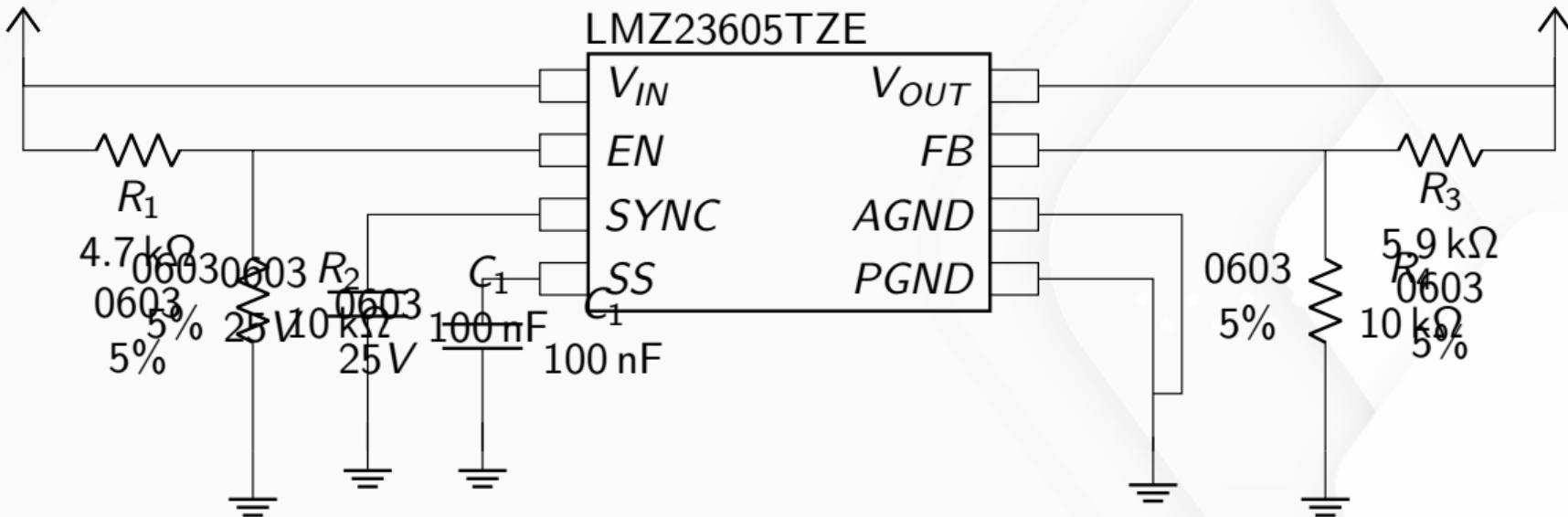
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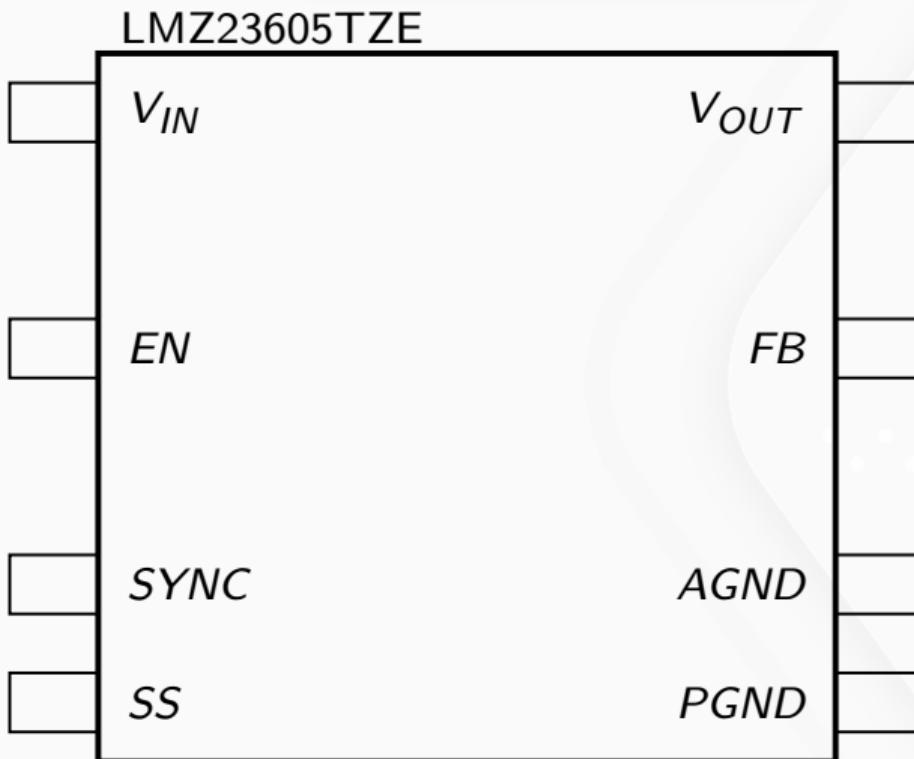




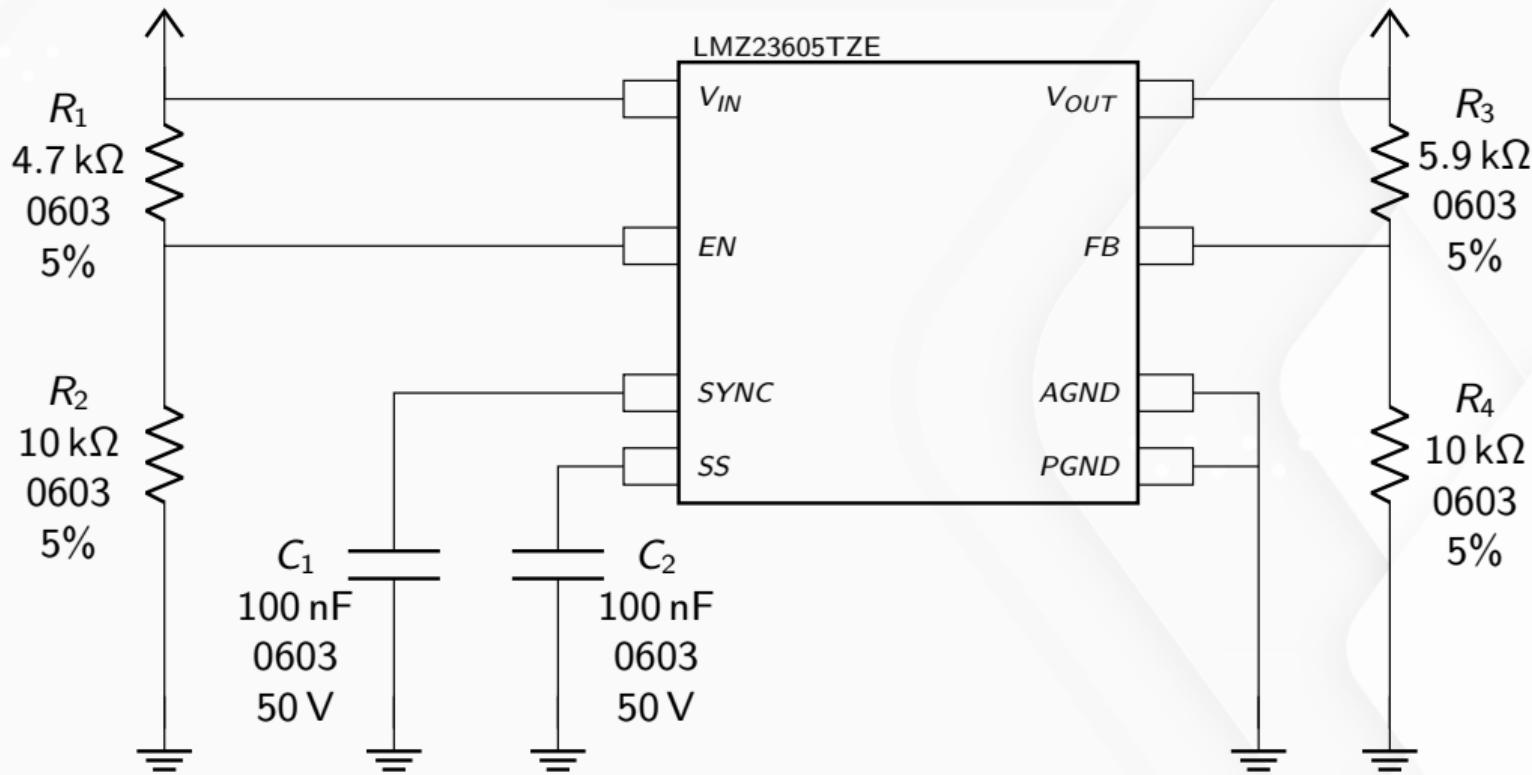
Laisser l'espace pour les composantes passives



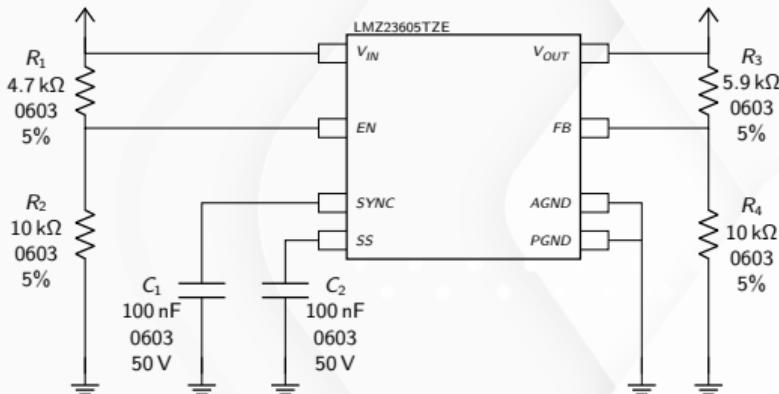
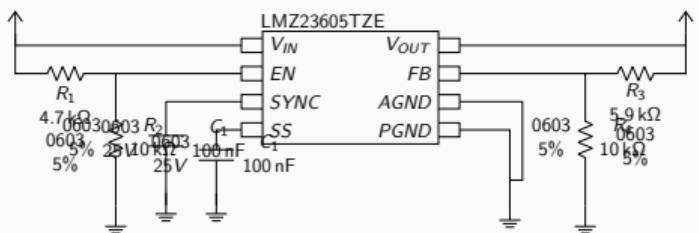




Laisser l'espace pour les composantes passives



Laisser l'espace pour les composantes passives



Informations du BOM

- Toujours mettre la datasheet dans la pièce
- Manufacturier et part number complet (ce qui va être commandé au final)
- Plages d'opérations (température, tension, courant)
- Fournisseurs (avec liens pour les achats)
- Qui a fait le symbole, qui l'a révisé et quand (suivi)

General		Pin Functions							
Fields	Name	Value	Show	Show	Name	H Align	V Align	Italic	Bold
Reference	U5		<input checked="" type="checkbox"/>	<input type="checkbox"/>	Center	Center	<input type="checkbox"/>	<input type="checkbox"/>	
Value	MCP3562RT-E/NC		<input checked="" type="checkbox"/>	<input type="checkbox"/>	Center	Center	<input type="checkbox"/>	<input type="checkbox"/>	
Footprint	mcp3562:TSSOP20_ST_MCH-L		<input type="checkbox"/>	<input type="checkbox"/>	Center	Center	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
Datasheet	https://ww1.microchip.com/downloads/aemDocuments/documents/APID/ProductDocuments/		<input type="checkbox"/>	<input type="checkbox"/>	Center	Center	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
Description	24 Bit Analog to Digital Converter 2, 4 Input 2 Sigma-Delta 20-UQFN (3x3)		<input type="checkbox"/>	<input type="checkbox"/>	Center	Center	<input type="checkbox"/>	<input type="checkbox"/>	
Sampling Rate	153.6 kHz		<input type="checkbox"/>	<input type="checkbox"/>	Center	Center	<input type="checkbox"/>	<input type="checkbox"/>	
Analog Supply Voltage	2.7 V - 3.6 V		<input type="checkbox"/>	<input type="checkbox"/>	Center	Center	<input type="checkbox"/>	<input type="checkbox"/>	
Digital Supply Voltage	1.8 V - 3.7 V		<input type="checkbox"/>	<input type="checkbox"/>	Center	Center	<input type="checkbox"/>	<input type="checkbox"/>	
Operating Temperature	-40 C - 125 C		<input type="checkbox"/>	<input type="checkbox"/>	Center	Center	<input type="checkbox"/>	<input type="checkbox"/>	

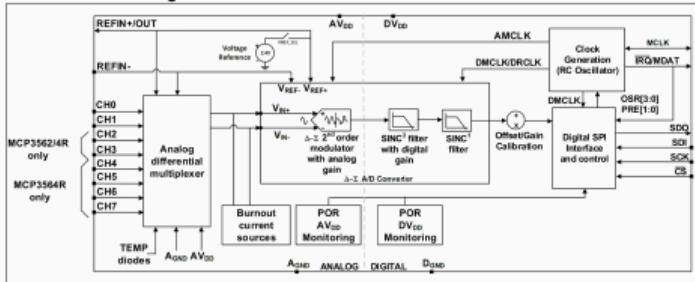
Bonnes pratiques des composantes & BOM

- Bonnes pratiques générales
- Bonnes pratiques des composantes & BOM
 - Footprints
 - Symboles
 - **Datasheets**
 - Recherche de pièces
 - BOM

- Toujours lire la datasheet au complet!

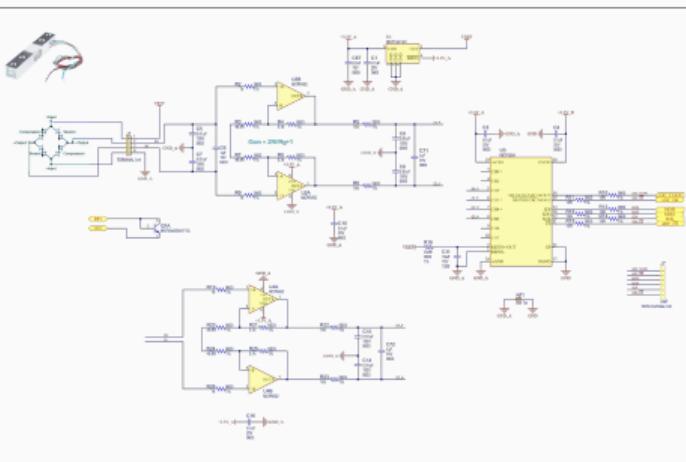
- **Absolute Maximum Ratings**
- Toutes les *electrical Characteristics*
- Spécifications et équations
- Description des pins
- Graphiques (surtout les courbes de power)
- Overview des fonctionnalités
- Modes d'opérations
- Modes de configurations
- Alimentation
- Schémas et Layout recommandés
- Registres

Functional Block Diagram



Lecture de datasheets

- Toujours lire la datasheet au complet!
- Lire les schémas d'*evaluation boards*



- Modes d'utilisation
- Schémas
- Layout
- Logiciel / Code / Firmware
- BOM et choix de pièces
- Calculs

- Toujours lire la datasheet au complet!
- Lire les schémas d'*evaluation boards*
- Lire les application notes
- Modes d'utilisation
- Séquences d'alimentation
- Programmation
- Layouts spécifiques
- Calculs

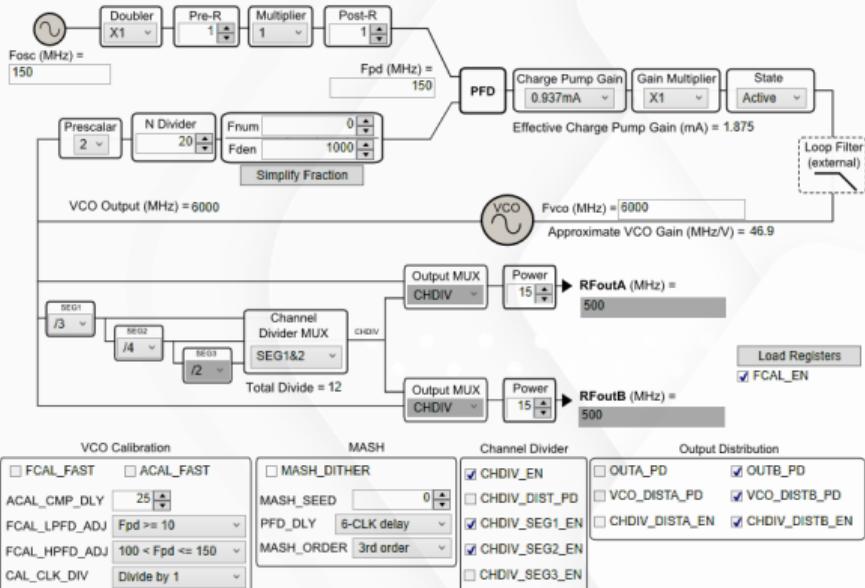
Lecture de datasheets

- Toujours lire la datasheet au complet!
- Lire les schémas d'*evaluation boards*
- Lire les application notes
 - ECP5 and ECP5-5G Family Data Sheet
 - ECP5 and ECP5-5G Hardware Checklist
 - ECP5 and ECP5-5G High-Speed I/O Interface
 - ECP5 and ECP5-5G Memory User Guide
 - ECP5 and ECP5-5G SerDes/PCS Usage Guide
 - ECP5 and ECP5-5G sysCLOCK PLL/DLL
 - ECP5 and ECP5-5G sysIO Usage Guide
 - ECP5 Automotive Family Data Sheet
 - ECP5 Errata - SED Function with Distributed RAM
 - Electrical Recommendations for Lattice SERDES
 - PCB Layout Recommendations for BGA Packages
 - Power Consumption and Management for ECP5 Devices
 - Thermal Management for Lattice Devices

Configurateurs



- Manufacturier donne parfois des configuateurs
- Valider les calculs avec la datasheet
- Ne pas utiliser uniquement le configuateur!
- Donne aussi un BOM sur lequel se fier



Configurateurs (TI WeBench)



Customize TPS566238RQFR - 11.5V-14V to 3.30V @ 5A

Input: DC 11.5 V - 14 V Output: 3.3 V at 5 A Temp: 50 °C +3 Requirements [Change](#)

[SELECT](#)[CUSTOMIZE](#)[SIMULATE](#)[EXPORT](#)

⋮

Summary

Efficiency: 93.5%
BOM Cost: \$1.71
Footprint: 136 mm²

[CHANGE OPTIMIZATION](#)

Configuration Options

Soft Start Time
1.68 ms
(1.68 - 50.4)

Minimum Inductor Current Rating

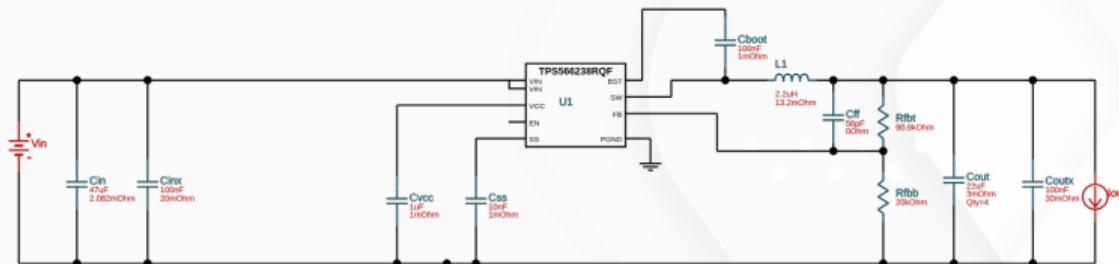
Peak Current

 Add Cff Capacitor(Optional) UVLO voltage

Enable Under Voltage Lock Out
3.3 V
(3.3 - 11.4)

[REDESIGN](#)[SCHEMATIC](#)[BILL OF MATERIALS](#)

Click a component to find out more information or select an alternate part.

[OPERATING VALUES](#)[CHARTS](#)

Vin (V) V Iout (A) A

[RECALCULATE](#)

Design Suggestions

Pascal-Emmanuel Lachance

PPPPP04

2025-05-21

31 / 40

- Valider toutes les courbes au point d'opération
- Valider les plages d'opérations
 - Sur toutes les IO
 - Sur les alimentations
- Valider les plages de tension
 - Besoin d'un heatsink?
 - Besoin de dissipation thermique?
 - A quel point est-ce que ça va chauffer?

TEMPERATURE SPECIFICATIONS

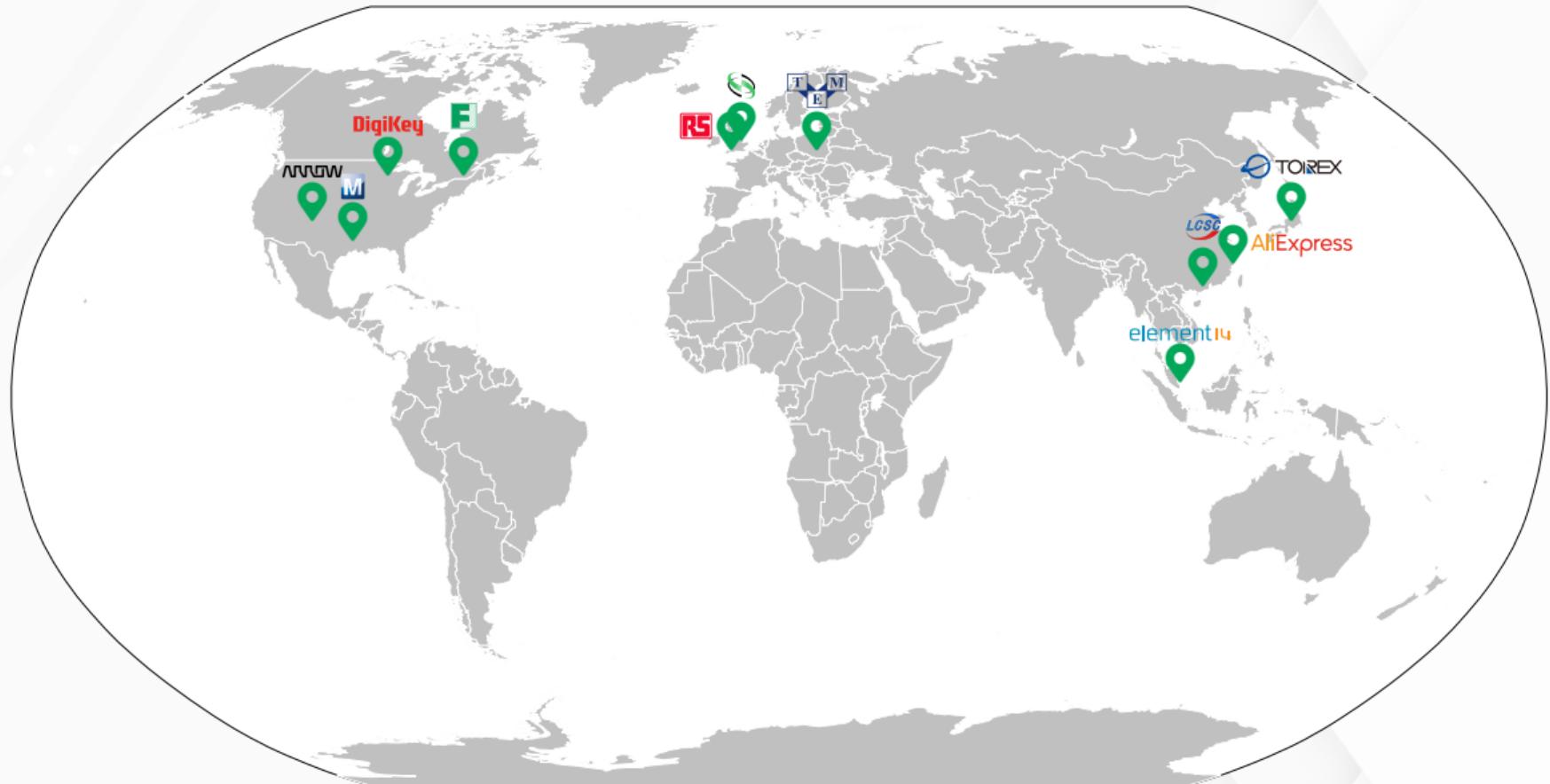
Electrical Specifications: Unless otherwise specified, all parameters apply for $T_A = -40^\circ\text{C}$ to $+125^\circ\text{C}$, $\text{AV}_{DD} = 2.7\text{V}$ to 3.6V , $\text{DV}_{DD} = 1.8\text{V}$ to $\text{AV}_{DD} + 0.1\text{V}$, $D_{GND} = A_{GND} = 0\text{V}$.

Parameters	Sym.	Min.	Typ.	Max.	Units	Conditions
Temperature Ranges						
Specified Temperature Range	T_A	-40	—	+125	°C	
Operating Temperature Range	T_A	-40	—	+125	°C	
Storage Temperature Range	T_A	-65	—	+150	°C	
Thermal Package Resistance						
Thermal Resistance, 20-Lead TSSOP	θ_{JA}	—	44	—	°C/W	
Thermal Resistance, 20-Lead UQFN	θ_{JA}	—	50	—	°C/W	

Note 1: The internal Junction Temperature (T_J) must not exceed the absolute maximum specification of $+150^\circ\text{C}$.

Bonnes pratiques des composantes & BOM

- Bonnes pratiques générales
- Bonnes pratiques des composantes & BOM
 - Footprints
 - Symboles
 - Datasheets
 - Recherche de pièces
 - BOM



- Beaucoup d'outils de recherche

- Mise en situation

- Besoin d'un régulateur 12 V ->5 V
- Consommation de 2 A
- Besoin de *Undervoltage Lockout, Soft Start*
- Pas trop cher

DigiKey

<https://www.digikey.ca/>

DigiKey

switching regulator

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Dark Mode

Showing 48,782 Results for "switching regulator"

Filters

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Categories

Development Boards, Kits, Programmers
Integrated Circuits (ICs)
Power Supplies - Board Mount
Sensors, Transducers
Soldering, Desoldering, Rework Products
Test and Measurement
Tools

Top Results

 Voltage Regulators - DC DC Switching Regulators Power Management (PMIC) 35,477 Items	 DC DC Switching Controllers Power Management (PMIC) 10,125 Items
 Voltage Regulators - Linear + Switching Power Management (PMIC) 1,434 Items	 LED Drivers Power Management (PMIC) 1,151 Items
 Special Purpose Regulators Power Management (PMIC) 285 Items	 Power Management - Specialized Power Management (PMIC) 125 Items
 Current Regulation/Management Power Management (PMIC) 86 Items	 DC DC Converters Power Supplies - Board Mount 44 Items
 AC DC Converters, Offline Switchers Power Management (PMIC) 30 Items	 Power Supplies (Test, Bench) Test Equipment 29 Items
 Power Distribution Switches, Load Drivers Power Management (PMIC) 22 Items	 DC/DC & AC/DC (Off-Line) SMPS Evaluation Boards Evaluation Boards 19 Items

Pascal-Emmanuel Lachance

PPPPP04

2025-05-21

36 / 40

Recherche de régulateur sur Digikey



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Linear - Amplifiers - Instrumentation, OP Amps, Buffer Amps

Linear Amplifier ICs

TOOLS

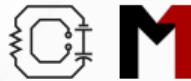
PCB Builder
Conversion Calculators
Scheme-it
Reference Design Library
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Recherche de régulateur sur Digikey



Product Index > Integrated Circuits (ICs) > Power Management (PMIC) > Voltage Regulators - DC DC Switching Regulators

Dark Mode Share

Voltage Regulators - DC DC Switching Regulators

Search Within	Results: 35,417	Filters	Stacked	Scrolling
Manufacturer	Search Filter		Search Filter	
3PEAK	ABLIC Inc.		ACOT®	
Allegro MicroSystems	Alpha & Omega Semiconductor Inc.		ACT510X	
Altera	ams-OSRAM USA INC.		ADP1073	
analog Devices Inc.	Analog Devices Inc./Maxim Integrated		ADP1108	
Analog Technologies	Analog Technologies		ADP1110	
Analog Technologies		ADP1148		Search Filter
Series	Search Filter		Bag	
Packaging	Search Filter		Box	
Product Status	Active		Bulk	
Function	Discontinued at Digi-Key		Case	
Output Configuration	Last Time Buy		Cut Tape (CT)	
Topology	Not For New Designs		Digi-Reel®	
	Obsolete		Strip	
	Tape & Box (TB)		Tape & Reel (TR)	
	Tray		Tape & Box (TB)	
	Tube		Tape & Reel (TR)	
	Clear (1)		Step-Down	
	Ratiometric		Step-Down, Step-Up/Step-Down	
	Ratiometric, Step-Up		Step-Down/Inverted	
	Ratiometric, Step-Up/Step-Down		Step-Up	
	Step-Down		Step-Up, Step-Down	
	Step-Down, Step-Up/Step-Down		Step-Up, Step-Down, Step-Up/Step-Do...	
	Step-Down/Inverted		Step-Up, Step-Down/Step-Up	
	Step-Up		Step-Up, Step-Down, Step-Up/Step-Do...	
	Step-Up, Step-Down		Step-Up, Step-Down/Step-Up	
	Step-Up, Step-Down, Step-Up/Step-Do...		Positive or Negative	
	Step-Up, Step-Down/Step-Up		Positive or Negative, Isolation Capable	
	Positive, Isolation Capable		Positive, Isolation Capable	
Stocking Options	Negative		Boost	
<input checked="" type="checkbox"/> In Stock	Positive		Boost, Buck	
<input type="checkbox"/> Normally Stocking	Positive and Negative		Boost, Buck-Boost	
<input type="checkbox"/> New Product	Positive and Negative (Dual Rail)		Boost, Buck-Boost, Flyback, SEPIC	
Environmental Options	Boost, Buck, Buck-Boost		Boost, Buck, Cuk, Flyback	
<input checked="" type="checkbox"/> RoHS Compliant	Boost, Buck, Cuk, Flyback, Forward Converte		Boost, Buck, Cuk, Flyback, Forward Converte	
<input type="checkbox"/> Non-RoHS Compliant	Boost, Charge Pump		Boost, Charge Pump	
Media	Boost, Charge Pump, Only			
Exclude				
	<input checked="" type="checkbox"/> Marketplace Products		<input type="button" value="Apply All"/>	
			9,551 of 35,417 Results	

Recherche de régulateur sur Digikey



Product Index > Integrated Circuits (ICs) > Power Management (PMIC) > Voltage Regulators - DC DC Switching Regulators

Dark Mode Share

Voltage Regulators - DC DC Switching Regulators

Search Within Results: 9,551

Filters Stacked Scrolling

Output Type	Number of Outputs	Voltage - Input (Min)	Voltage - Input (Max)	Voltage - Output (Min/Fixed)	Voltage - Output (Max)	Current - Output	Frequency - Switching
-	1	<input type="button" value="Search Filter"/>					
Adjustable	1 or 2	11.1V	10V	±5V	4.68V	1.8A (Switch)	4Hz ~ 2MHz
Adjustable (Fixed)	2	11.9V	10.81V	5V	4.73V	1.9A (Switch)	100Hz ~ 100kHz
Adjustable (Programmable)	2 - Dual	12V	11V	5V, 12V	4.8V	2A	220Hz ~ 1.4MHz
Fixed	3	12.4V	11.5V	5V, 5V	4.9V	2A (Switch)	1kHz ~ 5kHz
PFM	4	13.8V	12V	4.95V	4.95V	2A (Switch), 1.2A (Switch)	2kHz
Programmable	8	14V	12.96V	5V	5V, 5.5V	2A, 1.7A	3kHz
Programmable (Fixed)	-	15V	13V	5.1V	5.04V	2A, 1A	4kHz ~ 10kHz
PS2/USB	-	16V	13.2V	5.1V (5.1V)	5.1V	2A, 2A	5kHz, 40kHz
PWM	-	<input type="button" value="Clear (102)"/>	<input type="button" value="Clear (78)"/>	<input type="button" value="Clear (337)"/>	<input type="button" value="Clear (280)"/>	<input type="button" value="Clear (122)"/>	<input type="button" value="Clear (122)"/>
PWM Signal	-						
IC	<input type="button" value="Clear (1)"/>						

Stocking Options

- In Stock
 Normally Stocking
 New Product

Environmental Options

- RoHS Compliant

Media

- Datasheet
 Photo
 EDA/CAD Models

Exclude

- Marketplace Products

Apply All

2,518 of 9,551 Results



Recherche de régulateur sur Digikey



Product Index > Integrated Circuits (ICs) > Power Management (PMIC) > Voltage Regulators - DC DC Switching Regulators

Dark Mode Share

Voltage Regulators - DC DC Switching Regulators

Search Within	Results: 1,396	Filters	Stacked	Scrolling
Manufacturer	Search Filter			
EVVO				
Infineon Technologies				
MaxLinear, Inc.				
Microchip Technology	Search Filter			
Monolithic Power Systems Inc.	-			
Nisshinbo Micro Devices Inc.	ACOT®			
onsemi	ACOT™			
Reed Semiconductor Corp.	D-CAP2™			
Renesas Electronics Corporation	D-CAP3™			
<input type="button" value="Clear (15)"/>	DCS-Control™			
	Eco-Mode™			
	EZBuck™			
	11546			
Series	Search Filter			
EVVO	-			
Infineon Technologies	ACOT®			
MaxLinear, Inc.	ACOT™			
Microchip Technology	D-CAP2™			
Monolithic Power Systems Inc.	D-CAP3™, Eco-Mode™			
Nisshinbo Micro Devices Inc.	DCS-Control™			
onsemi	Eco-Mode™			
Reed Semiconductor Corp.	EZBuck™			
<input type="button" value="Clear (15)"/>				
Packaging	Bulk	Step-Down	Boost, Charge Pump, Flyback, SEPIC	Adjustable
	Cut Tape (CT)	Step-Up, Step-Down	Flyback, Forward Converter	Adjustable (Fixed)
	Digi-Reel®	Step-Up, Step-Up/Step-Down	Boost, Flyback, SEPIC	Programmable
	Strip	Step-Up/Step-Down	Boost, SEPIC	Programmable (Fixed)
	Tape & Reel (TR)		Buck	
	Tray		Buck-Boost	
	Tube		Buck, Boost	
Function			Buck, Buck-Boost	
			Buck, SEPIC	
			Buck, Split Rail	
			Charge Pump	
Topology				
Output Type				
Voltage - Input (Min)	Search Filter			
5V	0V / V			
6V	5V			
6.5V	5.5V			
7V	6V			
7.5V	6.5V			
8V	7V			
9V	7.5V			
Voltage - Input	Search Filter			
100V	8V			
105V	9V			

Stocking Options

- In Stock
- Normally Stocking
- New Product

Environmental Options

- RoHS Compliant

Media

- Datasheet
- Photo
- EDA/CAD Models

Exclude

- Marketplace Products

Apply All

1,160 of 1,396 Results

APPLIED FILTERS [Remove All](#)

Mounting Type	Number of Outputs	Function	Current - Output	Operating Temperature	Output Configuration	Voltage - Input (Max)
Voltage - Output (Max)	Voltage - Input (Min)	Voltage - Output (Min/Fixed)	Product Status	Stocking Options	Environmental Options	Media



Recherche de régulateur sur Digikey



APPLIED FILTERS Remove All

Mounting Type	Number of Outputs	Function	Current - Output	Operating Temperature	Output Configuration	Voltage - Input (Max)
Voltage - Output (Max)	Voltage - Input (Min)	Voltage - Output (Min/Fixed)	Product Status	Stocking Options	Environmental Options	Media
Exclude	Manufacturer					

Showing 1 - 25 * of 1,160

Sort By: Featured

Download Table

Mfr Part #	Quantity Available	Price	Series	Package	Product Status	Function	Output Configuration	Topology	Output Type	Number of Outputs	Voltage - Input (Min)	Voltag
		Price by Quantity										
<input type="checkbox"/>  TPS562243DRLR IC REG BUCK ADJ 2A SOT563 Texas Instruments	3,899 In Stock	1 : \$0.22000 Cut Tape (CT) 4,000 : \$0.08776 Tape & Reel (TR)	TPS56224x	Tape & Reel (TR)  Cut Tape (CT)  Digi-Reel® 	Active	Step-Down	Positive	Buck	Adjustable	1	4.2V	
<input type="checkbox"/>  TPS562246DRLR IC REG BUCK ADJ 2A SOT563 Texas Instruments	3,230 In Stock	1 : \$0.22000 Cut Tape (CT) 4,000 : \$0.08776 Tape & Reel (TR)	TPS56224x	Tape & Reel (TR)  Cut Tape (CT)  Digi-Reel® 	Active	Step-Down	Positive	Buck	Adjustable	1	4.2V	
<input type="checkbox"/>  TPS563203DRLR IC REG BUCK ADJ 3A SOT563 Texas Instruments	1,704 In Stock	1 : \$0.22000 Cut Tape (CT) 4,000 : \$0.08776 Tape & Reel (TR)	-	Tape & Reel (TR)  Cut Tape (CT)  Digi-Reel® 	Active	Step-Down	Positive	Buck	Adjustable	1	4.2V	
<input type="checkbox"/>  TPS562202DRLR IC REG BUCK ADJ 2A SOT563 Texas Instruments	10,197 In Stock	1 : \$0.25000 Cut Tape (CT) 4,000 : \$0.10186 Tape & Reel (TR)	-	Tape & Reel (TR)  Cut Tape (CT)  Digi-Reel® 	Active	Step-Down	Positive	Buck	Adjustable	1	4.3V	
<input type="checkbox"/>  TPS562207DRLR IC REG BUCK ADJ 2A SOT563 Texas Instruments	3,984 In Stock	1 : \$0.25000 Cut Tape (CT) 4,000 : \$0.10186 Tape & Reel (TR)	-	Tape & Reel (TR)  Cut Tape (CT)  Digi-Reel® 	Active	Step-Down	Positive	Buck	Adjustable	1	4.3V	17V 
<input type="checkbox"/>  TPS563202DRLR IC REG BUCK ADJ 3A SOT563 Texas Instruments	16,196 In Stock	1 : \$0.29000 Cut Tape (CT)	-	Tape & Reel (TR)  Cut Tape (CT) 	Active	Step-Down	Positive	Buck	Adjustable	1	4.3V	17V



Recherche de régulateur sur Digikey





TPS562243DRLR

Digikey Part Number: 294-TPS562243DRLRTRPND - Type A Reel (TR)
294-TPS562243DRLRCTNAD - Cut Tape (CT)
294-TPS562243DRLRDWRND - Digi-Reel®

Manufacturer: Texas Instruments

Manufacturer Product Number: TPS562243DRLR

Description: IC REG BUCK ADJ 2A 90T590

Manufacturer Standard Lead Time: 12 Weeks

Customer Reference:

Detailed Description: Buck Switching Regulator IC Positive Adjustable 0.6V 1 Output DA SOT-593, 90T-666

Datasheet: [Datasheet](#)

EDA/CAD Models: [TPS562243DRLR Models](#)

Product Attributes

TYPE	DESCRIPTION	SELECT ALL
Category	Integrated Circuits (ICs) Power Management (PMIC) Voltage Regulators - DC/DC Switching Regulators	<input type="radio"/> <input checked="" type="radio"/>
MR	Texas Instruments	<input type="checkbox"/>
Series	TPS56224x	<input type="checkbox"/>
Packaging	Tape & Reel (TR)  Cut Tape (CT)  Digi-Reel® 	<input type="checkbox"/>
Part Status	Active	<input type="checkbox"/>
Function	Step-Down	<input type="checkbox"/>
Output Configuration	Positive	<input type="checkbox"/>
Topology	Buck	<input type="checkbox"/>
Output Type	Adjustable	<input type="checkbox"/>
Number of Outputs	1	<input type="checkbox"/>
Voltage - Input (Min)	4.2V	<input type="checkbox"/>
Voltage - Input (Max)	17V	<input type="checkbox"/>
Voltage - Output (Max/Fixed)	0.6V	<input type="checkbox"/>
Voltage - Output (Max)	7V	<input type="checkbox"/>
Current - Output	2A	<input type="checkbox"/>
Frequency - Switching	1.28MHz	<input type="checkbox"/>
Synchronous Rectifier	Yes	<input type="checkbox"/>
Operating Temperature	-40°C ~ 125°C (Tj)	<input type="checkbox"/>
Grade	-	<input type="checkbox"/>

In-Stock: 3,899

Can ship immediately
New Product 

QUANTITY

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All prices are in USD

Cut Tape (CT) & Digi-Reel®

QUANTITY	UNIT PRICE	EXT PRICE
1	\$0.23000	\$0.22
10	\$0.18100	\$1.51
25	\$0.13900	\$3.34
100	\$0.11400	\$11.42
250	\$0.18492	\$26.23
500	\$0.09932	\$49.66
1,000	\$0.09469	\$94.69

* All Digi-Reel orders will add a \$7.00 reeling fee.

Tape & Reel (TR)

QUANTITY	UNIT PRICE	EXT PRICE
4,000	\$0.08776	\$351.04
8,000	\$0.08518	\$681.44
12,000	\$0.08359	\$1,006.68
20,000	\$0.08246	\$1,649.20
28,000	\$0.08162	\$2,285.56
40,000	\$0.08092	\$3,232.60
100,000	\$0.07909	\$7,909.00

 Manufacturers Standard Package



TEXAS INSTRUMENTS

TPS562243, TPS562246
SLUPGDR – JUNE 2024

TPS56224x 4.2V to 17V Input, 2A, Synchronous Buck Converter in SOT563

1 Features

- Configured for a wide range of applications
- Input voltage range: 4.2V to 17V
- Output voltage range: 0.6V to 7V
- Reference voltage: 0.6V
- ±1.5% reference voltage accuracy
- Integrated FETs: 100mΩ and 55mΩ
- Low quiescent current for TPS562243: 110µA
- Switching frequency: 1280kHz
- Maximum 95% duty cycle operation
- Fixed soft-start time: 1.4ms
- Easy of use and small design size
- TPS562243 Eco-mode and TPS562246 FCCM mode at light load
- D-CAP3™ control mode with fast transient response
- Support start-up with prebiased output
- Non-latch for OT and UVLO protection
- Cycle-by-cycle over current limit
- Hiccup mode for UV protection
- Operating junction temperature range: -40°C to 125°C
- SOT563 package: 1.6mm × 1.6mm
- Create a custom design using the TPS56224x with the WEBENCH® Power Designer

2 Applications

- WLAN/Wi-Fi access point
- Modem (cable/DSL/GFAST)
- Small business router
- Electricity meter
- STV and DVR
- Appliances

3 Description

The TPS56224x is a simple, easy-to-use, synchronous buck converter with input voltage ranging from 4.2V to 17V and supports up to 2A continuous current.

The device is designed to operate with minimum external component counts and low standby current.

This switch mode power supply (SMPS) device employs D-CAP3 control mode providing a fast transient response and supporting both low equivalent series resistance (ESR) output capacitors such as specialty polymer and ultra-low ESR ceramic capacitors with no external compensation components.

The TPS562243 operates in Eco-mode, which maintains high efficiency during light load operation. The TPS562246 operates in FCCM mode, which keeps the same frequency and lower output ripple during all load conditions. The TPS56224x integrates complete protection including OCP, UVLO, OTP, and LVP with hiccup.

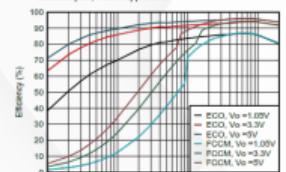
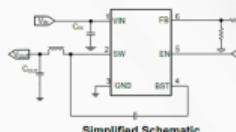
The TPS56224x is available in a 6pin, 1.6mm × 1.6mm SOT563 (DRL) package. The junction temperature is specified from -40°C to 125°C.

Device Information

PART NUMBER	MODE	PACKAGE ⁽¹⁾	PACKAGE SIZE ⁽²⁾
TPS562243	Eco-mode	DRL (SOT563, 6)	1.60mm × 1.60mm
TPS562246	FCCM mode		

(1) For more information, see Section 10.

(2) The package size (length × width) is a nominal value and includes pins, where applicable.



5.5 Electrical Characteristics

Over operating $T_J = -40^\circ\text{C} - 125^\circ\text{C}$, $V_{IN} = 12\text{ V}$ (unless otherwise noted)

PARAMETER		TEST CONDITIONS	MIN	TYP	MAX	UNIT
INPUT SUPPLY VOLTAGE						
V _{IN}	Input voltage range		4.2	17	17	V
I _{VIN}	VIN supply current	No load, $V_{EN} = 1.5\text{ V}$, non-switching, ECO version		110		µA
		No load, $V_{EN} = 1.5\text{ V}$, $V_{FB} = 0.9\text{ V}$, FCCM version ⁽¹⁾		350		µA
I _{INSDN}	VIN shutdown current	$V_{EN} = 0\text{ V}$		7		µA
UVLO						
UVLO	VIN undervoltage lockout	Wake up VIN voltage	3.6	3.8	4	V
UVLO	VIN undervoltage lockout	Shut down VIN voltage	3.2	3.4	3.6	V
UVLO	VIN undervoltage lockout	Hysteresis VIN voltage		400		mV
FEEDBACK VOLTAGE						
V _{FB}	FB voltage	$T_J = 25^\circ\text{C}$, $V_{IN} = 4.2 - 17\text{ V}$	591	600	609	mV
V _{FB}	FB voltage	$T_J = -40^\circ\text{C} \text{ to } 125^\circ\text{C}$, $V_{IN} = 4.2 - 17\text{ V}$	588	600	612	mV

Recherche de régulateur sur Digikey



Product Index > Integrated Circuits (ICs) > Power Management (PMIC) > Voltage Regulators - DC DC Switching Regulators >

Rohm Semiconductor BD95841MUV-E2



BD95841MUV-E2
 Dig-Key Part Number
BD95841MUV-E2TR-N0 - Tape & Reel (TR)
 BD95841MUV-E2CT4ND - Cut Tape (CT)
 BD95841MUV-E2SKR-N0 - Bag-Reel (BR)

 Manufacturer
Rohm Semiconductor

 Manufacturer Product Number
IC REG BUCK ADJ 4A 16V/PIN

 Description
IC REG BUCK ADJ 4A 16V/PIN

 Manufacturer Standard Lead Time
17 Weeks

 Customer Reference

 Detailed Description
Digital Switching Regulator IC Positive Adjustable 0.8V to Output 4A 16-VQFN Exposed Pad

 Datasheet
[Datasheet](#)

 I²C/CAN Models
BD95841MUV-E2 Models

Product Attributes

TYPE	DESCRIPTION	SELECT ALL <input type="checkbox"/>
Category	Integrated Circuits (ICs) Power Management (PMIC) Voltage Regulators - DC DC Switching Regulators	<input checked="" type="radio"/> <input type="radio"/>
Manufacturer	Rohm Semiconductor	<input type="checkbox"/>
Series	H ² PS	<input type="checkbox"/>
Packaging	Tape & Reel (TR) <input checked="" type="radio"/> Cut Tape (CT) <input type="radio"/> Dip-Reel <input type="radio"/>	<input type="checkbox"/>
Part Status	Active	<input type="checkbox"/>
Function	Step-Down	<input type="checkbox"/>
Output Configuration	Positive	<input type="checkbox"/>
Topology	Buck	<input type="checkbox"/>
Output Type	Adjustable	<input type="checkbox"/>
Number of Outputs	1	<input type="checkbox"/>
Voltage - Input (Min)	7.9V	<input type="checkbox"/>
Voltage - Input (Max)	18V	<input type="checkbox"/>
Voltage - Output (Min/Feed)	0.8V	<input type="checkbox"/>
Voltage - Output (Max)	5.5V	<input type="checkbox"/>
Current - Output	4A	<input type="checkbox"/>
Frequency - Switching	500kHz = 800kHz	<input type="checkbox"/>
Synchronous Rectifier	Yes	<input type="checkbox"/>
Operating Temperature	-20°C ~ 100°C (TA)	<input type="checkbox"/>
Mounting Type	Surface Mount	<input type="checkbox"/>

In-Stock: 29,800
Can ship immediately

QUANTITY

Add to List
Add to Cart

All prices are in USD

Cut Tape (CT) & Digi-Reel®

QUANTITY	UNIT PRICE	EXT PRICE
1	\$1.04000	\$1.04
10	\$0.74700	\$7.47
25	\$0.67440	\$16.86
100	\$0.59470	\$59.47
500	\$0.55668	\$278.32
900	\$0.53772	\$483.96
1,000	\$0.51400	\$514.00

* All Digi-Reel orders will add a \$7.00 reeling fee.

Tape & Reel (TR)

QUANTITY	UNIT PRICE	EXT PRICE
1,000	\$0.49148	\$474.47
6,000	\$0.46307	\$2,778.42
9,000	\$0.47435	\$4,269.18
15,000	\$0.46401	\$7,001.18
21,000	\$0.46431	\$9,770.51

* Manufacturers Standard Package

7.5V to 15V, 4A Integrated MOSFET 1ch Synchronous Buck DC/DC Converter

BD95841MUV

Description

BD95841MUV is a 1ch synchronous buck converter that can generate output voltage (0.8V to 5.5V) at the input voltage range (7.5V to 15V). Space-saving and high efficient switching regulator can be achieved due to built-in N-MOSFET power transistors. The IC also incorporates H²Reg™ technology, a Rohm proprietary constant ON TIME control mode which facilitates ultra-high transient response against changes in load without external compensation components. Fixed soft start function, power good function, short circuit / over voltage protection with timer latch functions are incorporated. The BD95841MUV is designed for power supplies for Digital AV Equipment.

Applications

- LCD TVs
- Set Top Boxes (STB)
- DVD/Blu-ray players/recorders
- Broadband Network and Communication Interface
- Amusement, other.

Typical Application

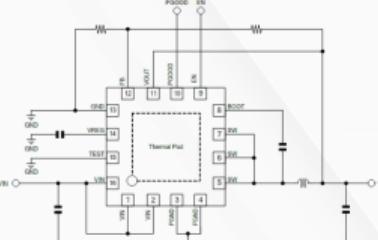


Figure 1. Typical Application Circuit

Features

- Input Voltage Range: 7.5V to 15.0V
- Reference Voltage: 0.8V ± 1.5%
- Output Voltage Range: 0.8V to 5.5V
- Output Current: 4.0A (Max.)
- Switching Frequency: 500kHz to 800Hz (depend on input-output condition)

Built-In Power MOS FET
High-side Nch FET ON resistance: 65mΩ (typ.)
Low-side Nch FET ON resistance: 45mΩ (typ.)

- Fast Transient Response due to H²Reg control
- Over Current Protection (OCP) - Cycle-by-Cycle
- Thermal Shut Down (TSD)
- Under-Voltage Lock-Out (UVLO)
- Short Circuit Protection (SCP)
- Over Voltage Protection (OVP)
- Fixed Soft Start (1ms/sec : typ)
- Power Good function

Package

W(Typ.) x D(Typ.) x H(Max.)
3.0mm x 3.0mm x 1.0mm

Pin Configuration (TOP VIEW)

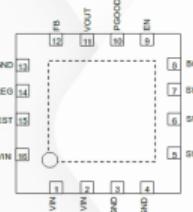
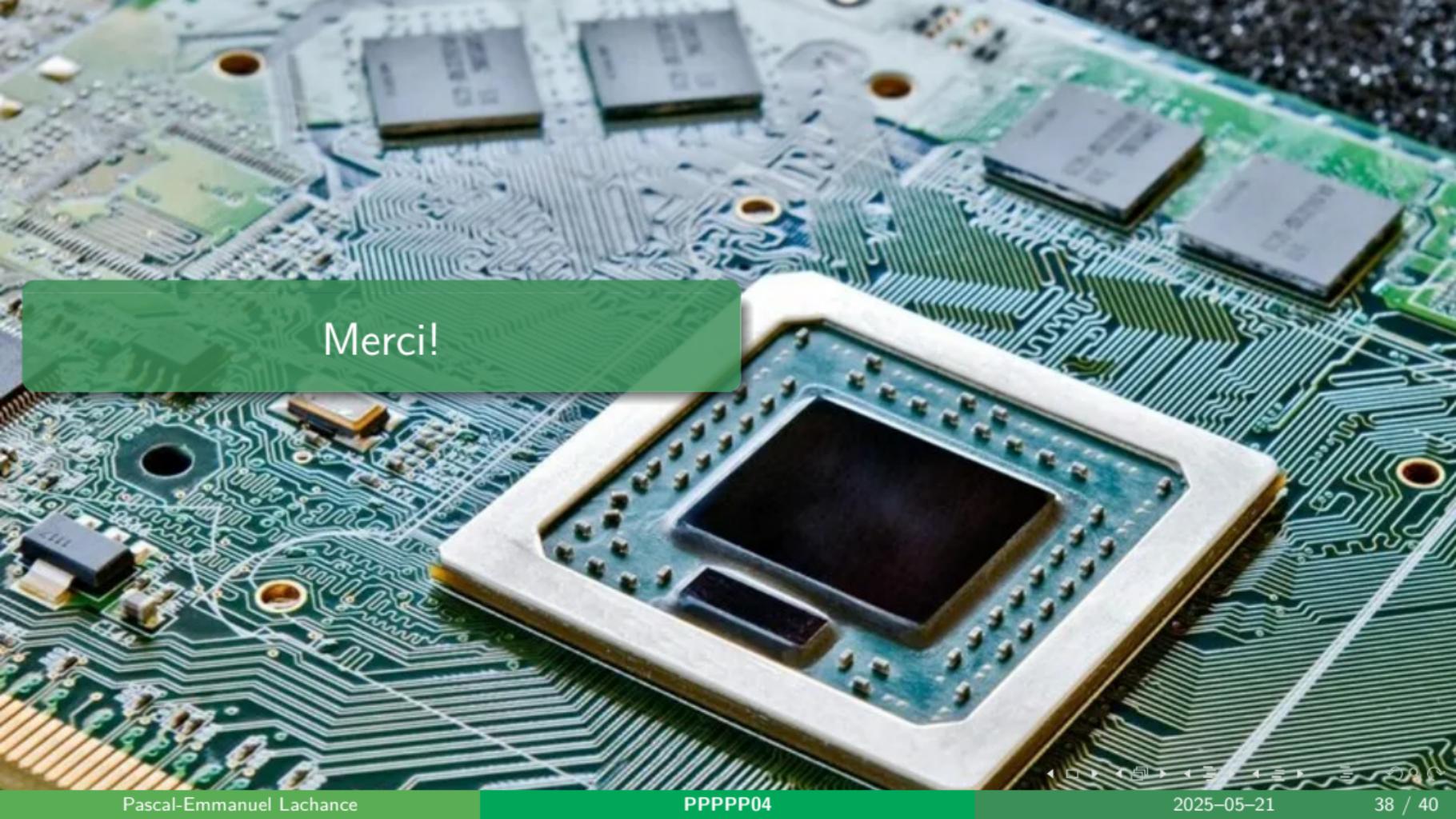


Figure 2. Pin Configuration

Bonnes pratiques des composantes & BOM

- Bonnes pratiques générales
- Bonnes pratiques des composantes & BOM
 - Footprints
 - Symboles
 - Datasheets
 - Recherche de pièces
 - BOM



Merci!

Prochain PPPPP

Comment se déplace un signal?

- Où l'impédance est la plus faible?
- Retour de courant
- Ground Bounce
- Vitesse de déplacement d'un signal
- Tout est une ligne de transmission

- [1] *The pareto principle*, Mar. 2025. [Online]. Available: <https://www.interaction-design.org/literature/topics/pareto-principle>.
- [2] *Symbols and symbol libraries*, Mar. 2025. [Online]. Available: https://docs.kicad.org/8.0/fr/eeschema/eeschema_symbols_and_libraries.html.