SPS Devices

Catalog that includes only former Hitachi products among Renesas Technology products.

Switching Power Supply Control ICs Products

April, 2003
Multi Purpose Semiconductor Device Div.
Analog & Discrete Semiconductor BU
Renesas Technology Corp.

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- AC/DC Power Supply ICs
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- Redundant Power Supply ICs.
- DC/DC ICs
- Half Bridge Power Supply IC
- Full Bridge Power Supply IC

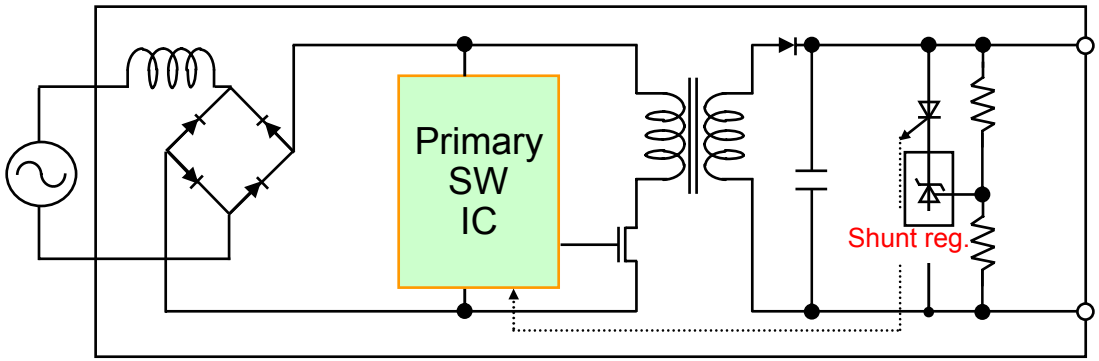
Classified of Switching Regulator

- Isolated (Used transformer)
  - AC/DC converter
  - 48 V input (brick, d2d)
  - UPS
  - redundant
- Non isolated
  - DC/DC converter for battery
  - Single phase
  - Multi phase
- Other
  - Shunt regulator

AC/DC Power Supply ICs

AC/DC Power Supply ICs

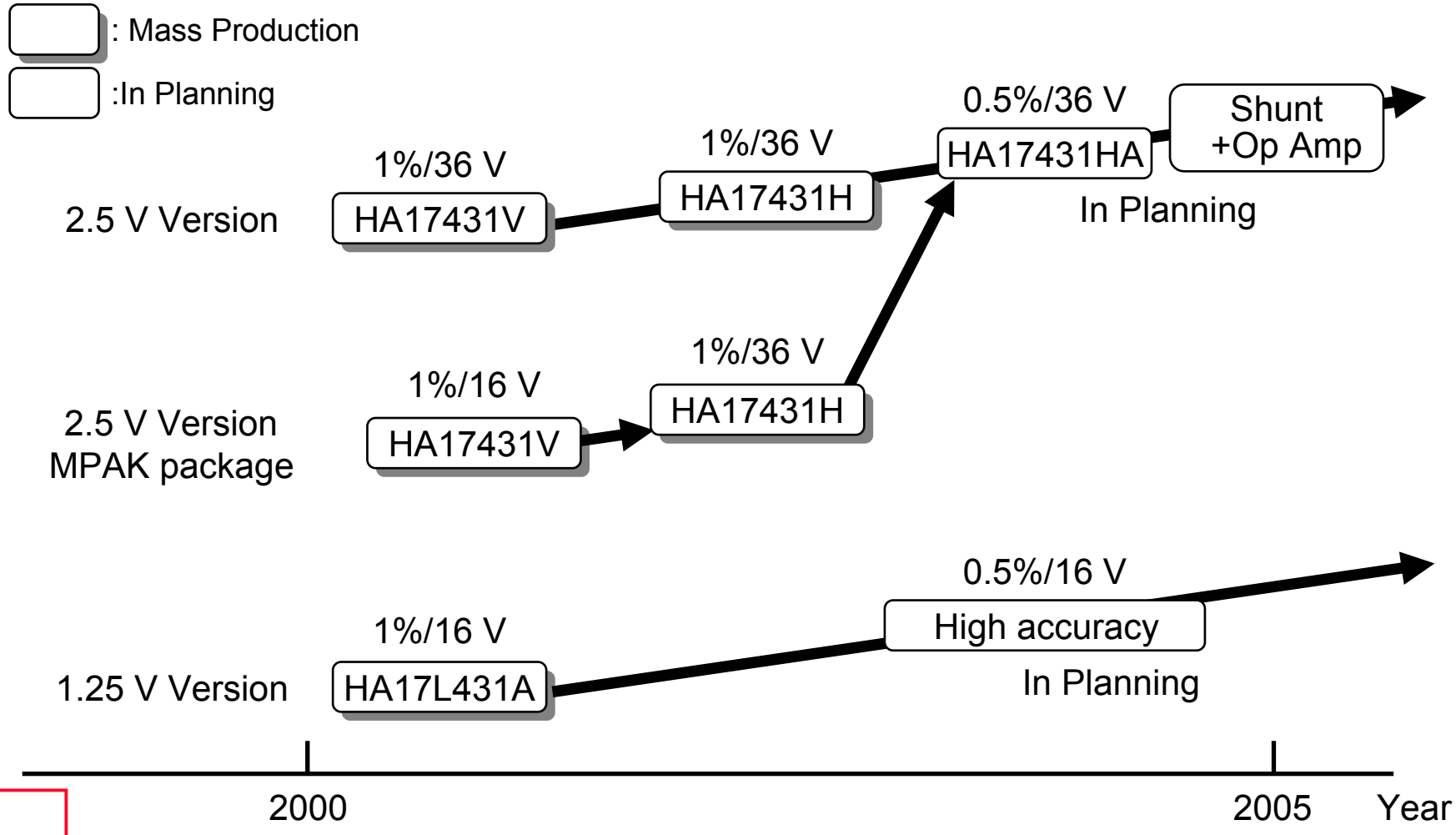
Type	SW mode V	SW mode C	f	Package	Main SW	Note
HA17384 HA17385	—	√	500 kHz	DIP-8 SOP-8	Power MOS	C-Mode UC3842
HA16107 HA16108	√	—	600 kHz	DIP-16 SOP-16	Power MOS	Timer latch



Notes)
#V: Voltage mode
#C: Current mode

Shunt Regulator

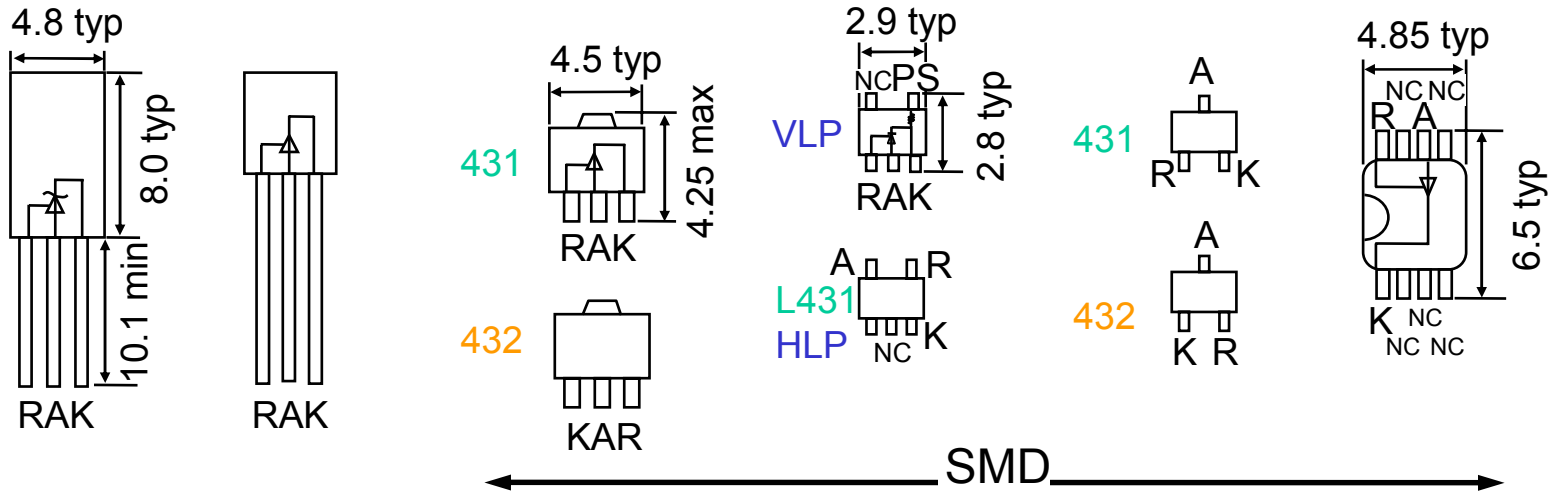
Shunt Regulator IC Road Map



Shunt Regulator ICs

HA17LXXX: 1.24 V HA17XXX: 2.50 V

TO-92MOD	TO-92	UPAK	MPAK-5	MPAK	SOP-8
HA17431PA	HA17L431AP HA17431VP HA17431PNA HA17431AP HA17431HP	HA17L431UP HA17L432UP HA17431UA HA17431HUP HA17432UA HA17432HUP	HA17L431ALP HA17431VLP HA17431HLP	HA17L431ALTP HA17L432ALTP HA17431HLTP HA17431VLTP HA17432HLTP HA17432VLTP	HA17431FPA



Note: Top of View

Many kind of packages.

Shunt Regulator ICs

Vx max (V)	Vref and Accuracy	Ik max (V)	Parts name	Package
16	1.24 V ±1.0%	-30 to 50	HA17L431AP	TO-92
			HA17L431ALP	MPAK-5
			HA17L431ALTP/432ALTP	MPAK
	1.24 V ±1.5%	-30 to 50	HA17L431UP/432UP	UPAK
	2.5 V ±1.0%	-50 to 50	HA17431VP	TO-92
			HA17431VLP	MPAK-5
			HA17431VUP/432VUP	UPAK
			HA17431VLTP/432VLTP	MPAK
36	2.5 V ±1.0%	-50 to 50	HA17431HP	TO-92
			HA17431HLP	MPAK-5
			HA17431HUP/432HUP	UPAK
			HA17431HLTP/432HLTP	MPAK
40	2.5 V ±2.2%	-100 to 150	HA17431PA	TO-92MOD
			HA17431PNA	TO-92
			HA17431UA/UPA	UPAK
			HA17432UA/UPA	UPAK
			HA17431FPA	SOP-8

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Shunt Regulator IC Cross Reference (1)

	Standard Type Maker/Vref/Accuracy						
Package	Renesas 2.500 V ±1%	Toshiba 2.495 V ±2.2%	NEC 2.495 V ±2.2%	TI 2.495 V ±2.2%, ±1%	NS 2.495 V ±2.2%, 1%	ST 2.495 V ±2.2%, ±1%	ON 2.495 V ±2.2%, ±1%
TO-92	HA17431HP	TA76431S*1	µPC1093J	TL431CLP TL431ACLP TL431ILP TL431AILP	LM431ACZ LM431BCZ LM431AIZ LM431BIZ	TL431CZ TL431ACZ	TL431CLP TL431ILP TL431ACLP TL431AILP
UPAK	HA17431HUP	TA76431FR		TL431CPK TL431IPK			
	HA17432HUP	TA76431F	µPC1093T				
MPAK	HA17431HLTP						
	HA17432HLTP				LM431ACM3 LM431BCM3 LM431AIM3 LM431BIM3	TS2431ILT*2 TS2431AILT*3	
MPAK-5	HA17431HLP		µPC1093TA	TL431CDBV*4 TL431IDBV*4			

This cross reference is especially about the Voltage Reference and package.
*1: TO-92MOD
*2: TS2431ILT: 2.500 V±2%
*3: TS2431AILT: 2.500 V±1%
*4: Pin arrangement is different.

Shunt Regulator IC Cross Reference (2)

Low Voltage Type.
Maker/Vref/Accuracy

Package	Renesas 1.24 V ±1%	Toshiba 1.26 V ±1.4%	NEC 1.26 V ±2.4%	TI 1.24 V ±1.5%, ±1%	NS 1.24 V ±1.5%, 1%	ST 1.24 V ±2%, ±1%	ON 1.24 V ±1%
TO-92	HA17L431AP	TA76432S*1	µPC1944J	TLV431CLP TLV431ACLP TLV431ILP TLV431AILP	LMV431CZ LMV431ACZ LMV431AIZ LMV431AIZ	TS431CZ TS431ACZ	TLV431ALP
UPAK	HA17L431UP*2	TA76432FR	µPC1943T				
	HA17L432UP*2	TA76432F	µPC1944T				
MPAK	HA17L431ALTP						
	HA17L432ALTP						
MPAK-5	HA17L431ALP	TA76432FC*3		TLV431CDBV*3 TLV431IDBV*3 TLV431ACDBV*3 TLV431AIDBV*3	LMV431CM5*3 LMV431ACM5*3 LMV431IM5*3 LMV431AIM5*3	TS431ILT*3 TS431AILT*3	TLV431ASN*3

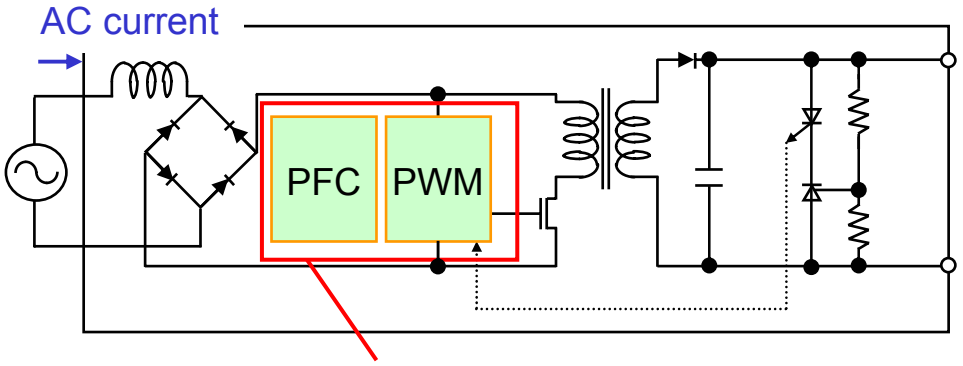
This cross reference is especially about the Voltage Reference and package.
*1: TO-92MOD
*2: HA17L431UP, HA17L432UP: 1.24 V±1.5%
*3: Pin arrangement is different.

PFC + PWM ICs

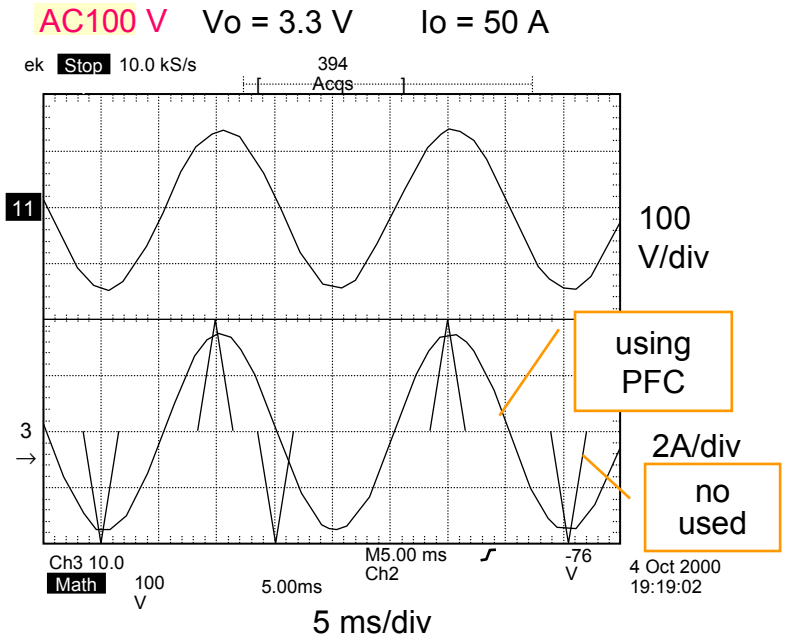
Power Factor (PFC) + SW Reg. (PWM) ICs

Type	SW mode V	SW mode C	f	Package	Main SW	Note
HA16141 HA16142	—	√	PFC: 100 kHz PWM: 200 kHz	DIP-16 SOP-16	Power MOS	Primary IC of HA16341
HA16158	—	√	PFC: 65 kHz PWM: 130 kHz	DIP-16 SOP-16	Power MOS	f adj., f-down

Note) HA16158 WS: 2Q/2002



note) Input ac current becomes fine Sin-curve by PFC.



PFC+PWM IC, HA16158 (1)

- Features
  - Can adjust frequency
  - f-down at light load
  - Soft start function
  - OVP for PWM

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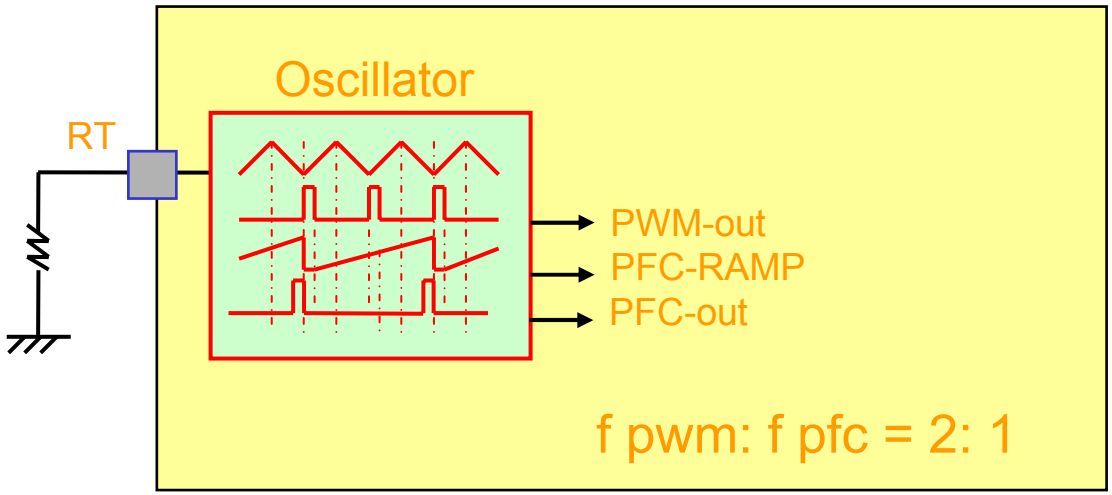
PFC+PWM IC, HA16158 (2)



- High noise immunity by synchronized between PFC and PWM
- Smaller capacitor on PFC out by PWM turn on when PFC turn off.

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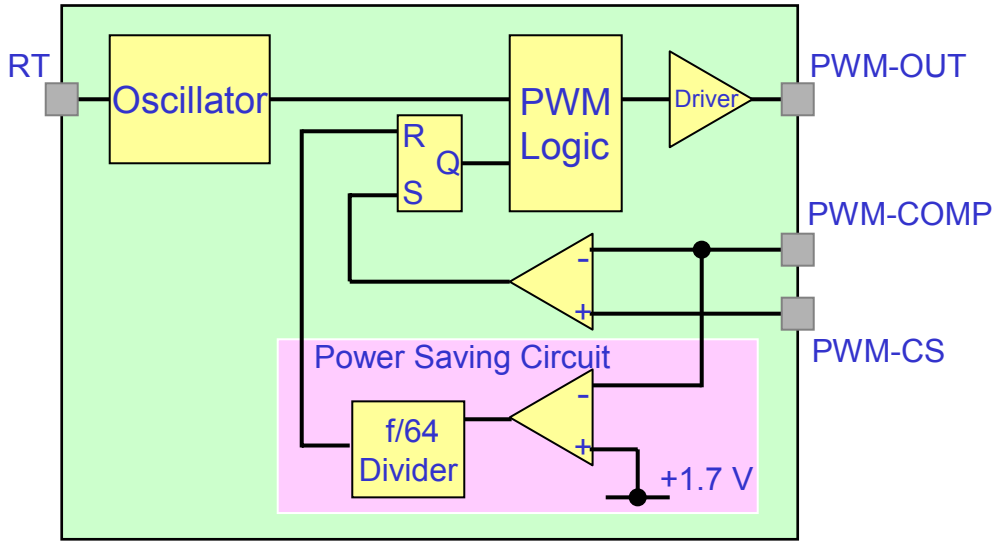
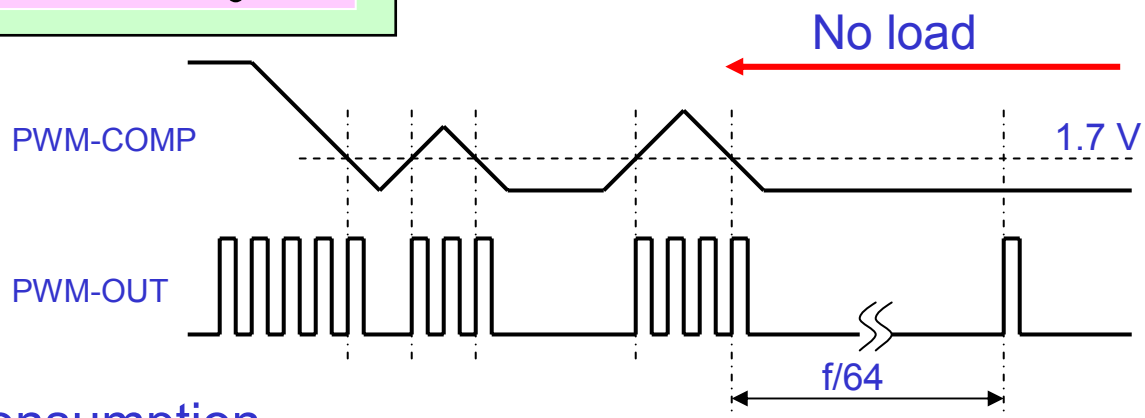
PFC+PWM IC, HA16158 (3)

Power saving at light load



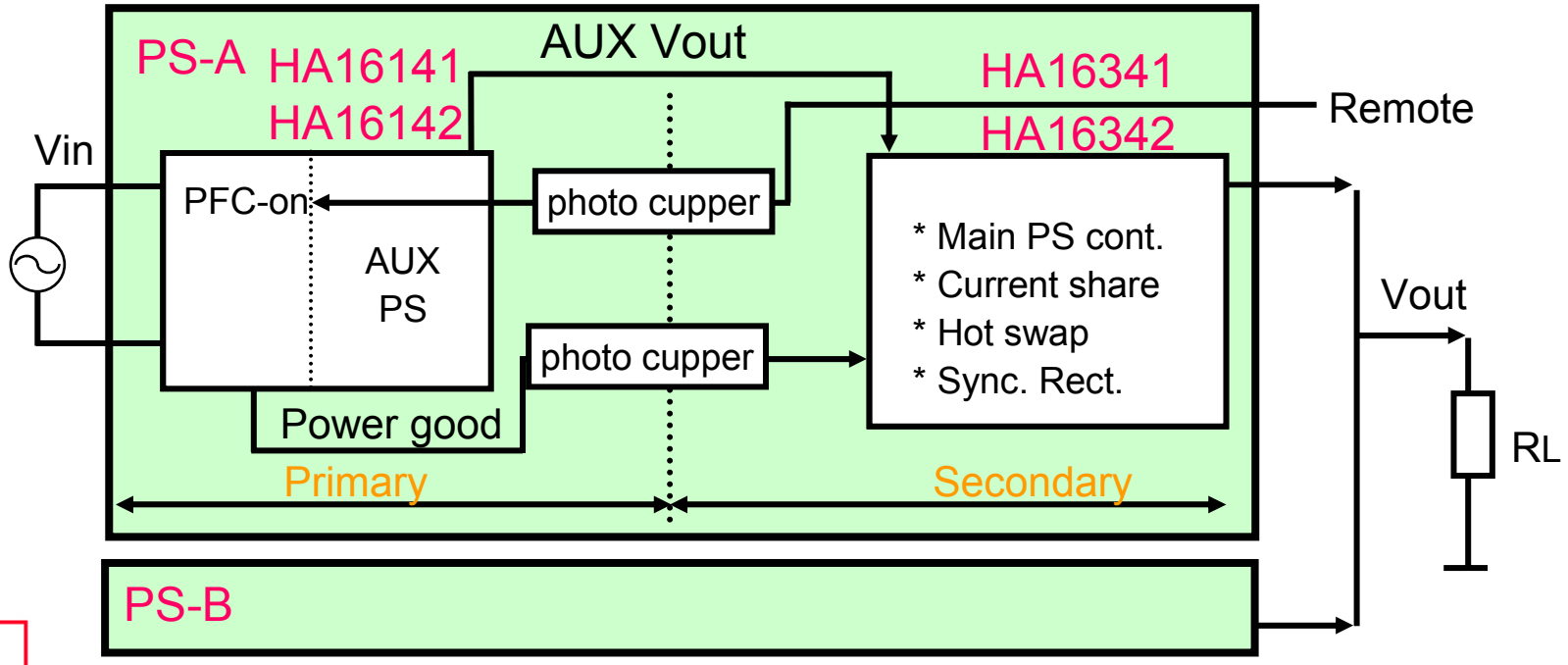


Low Power Consumption.

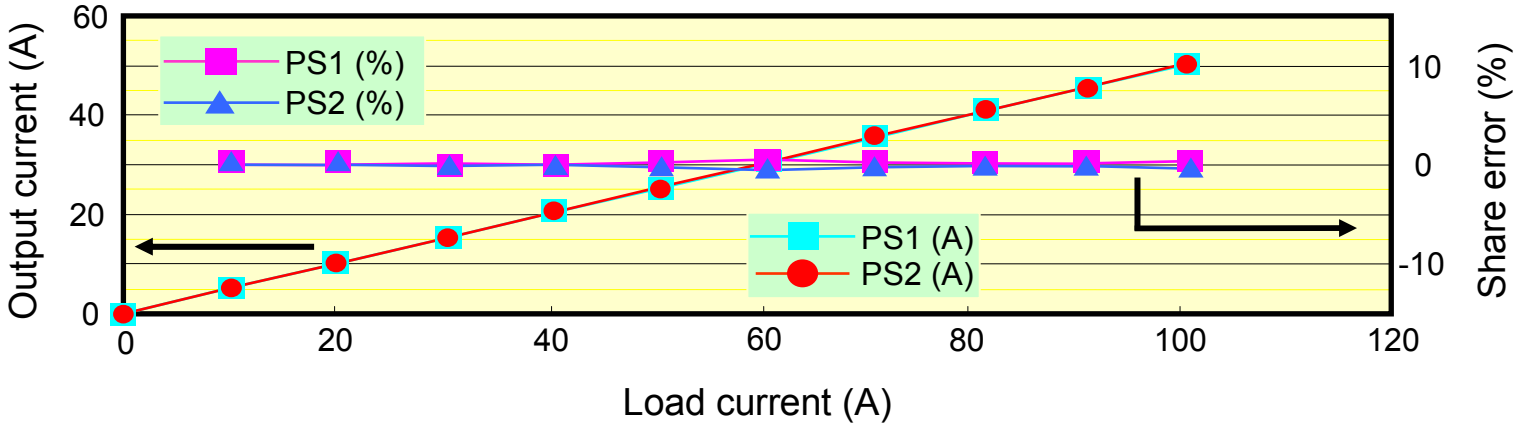
Redundant Power Supply ICs.

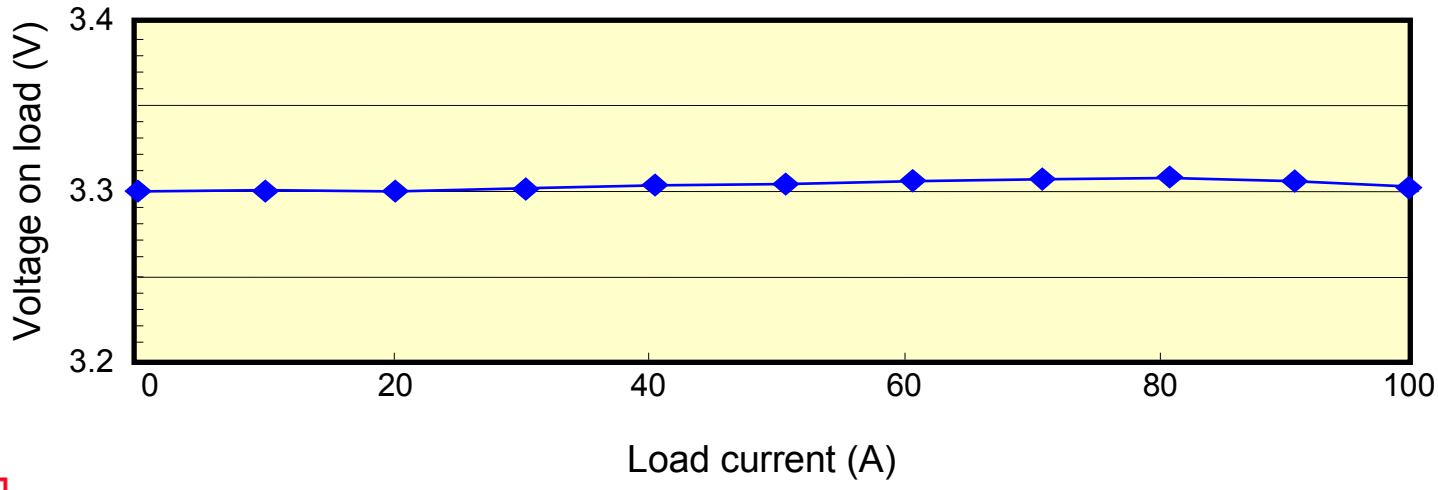
Redundant Power Supply ICs

Type	SW mode V	SW mode C	f	Package	Main SW	Note
HA16141 HA16142	—	√	PFC: 100 kHz PWM: 200 kHz	DIP-16 SOP-16	Power MOS	Pair with HA16341
HA16341 HA16342		√	200 kHz			Current share Hot swap



Current Share and Load Regulation

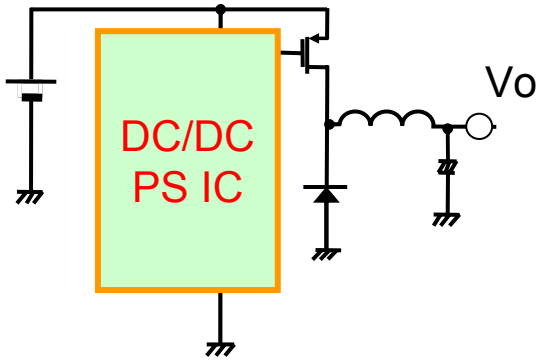




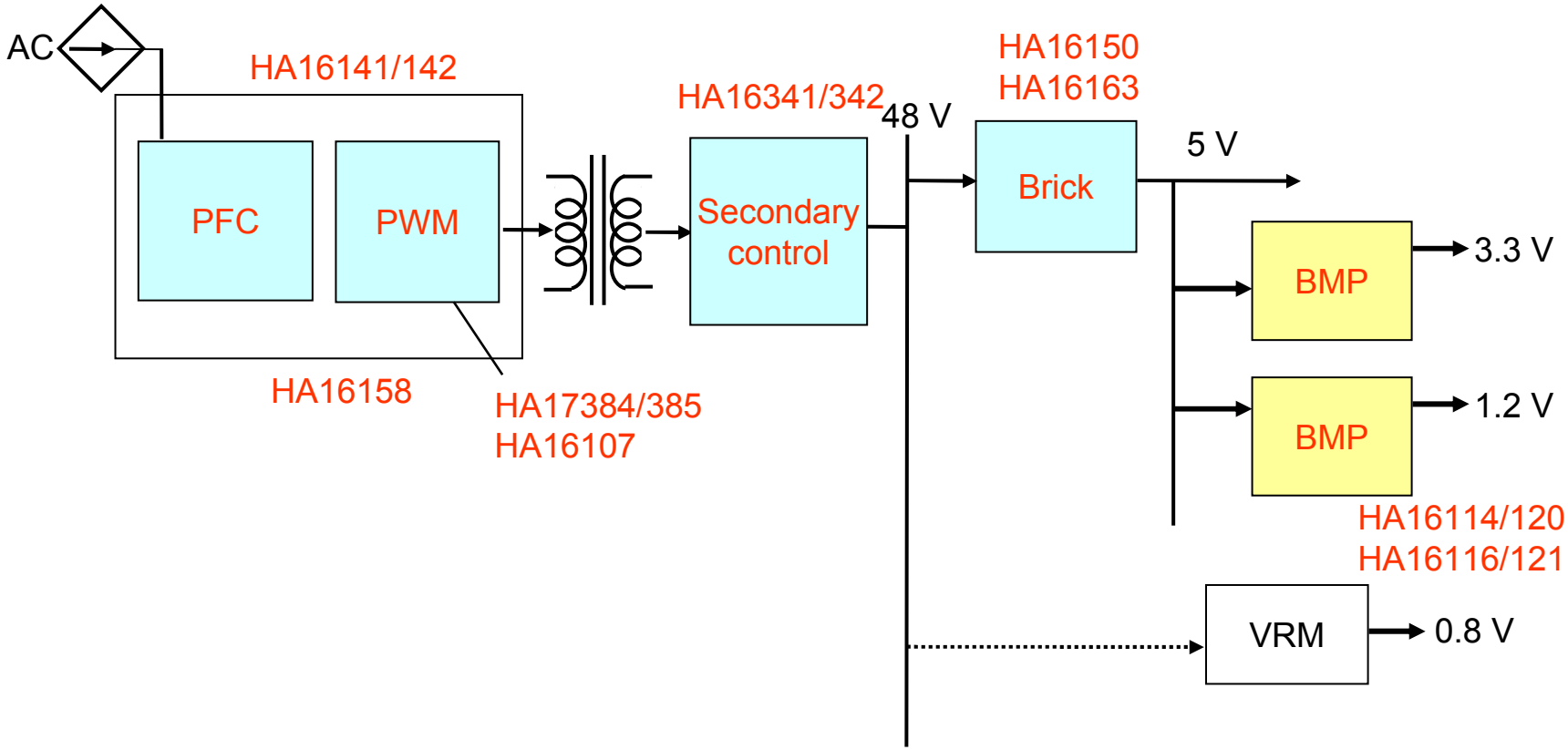
DC/DC ICs

DC/DC Switching Regulator ICs

Type	SW mode V	SW mode C	f	Package	Main SW	Note	
HA16114	√	—	600 kHz	DIP-16 SOP-16	Bip. Trs	Step down	< Single ch >
HA16120	√	—	600 kHz	DIP-16 SOP-16	Bip.Trs	Boost	
HA17451A	√	—	500 kHz	DIP-16 SOP-16	Bip power	TL451 Step down	< Dual ch >
HA16116	√	—	600 kHz	DIP-16 SOP-16	Power MOS	Step down	
HA16121	√	—	600 kHz	DIP-16 SOP-16	Power MOS	Step down and boost	



Distributed Power Supply System



Note)
BMP: Board mounted Power Supply (DC/DC power supply)
VRM: Voltage Regulated Module

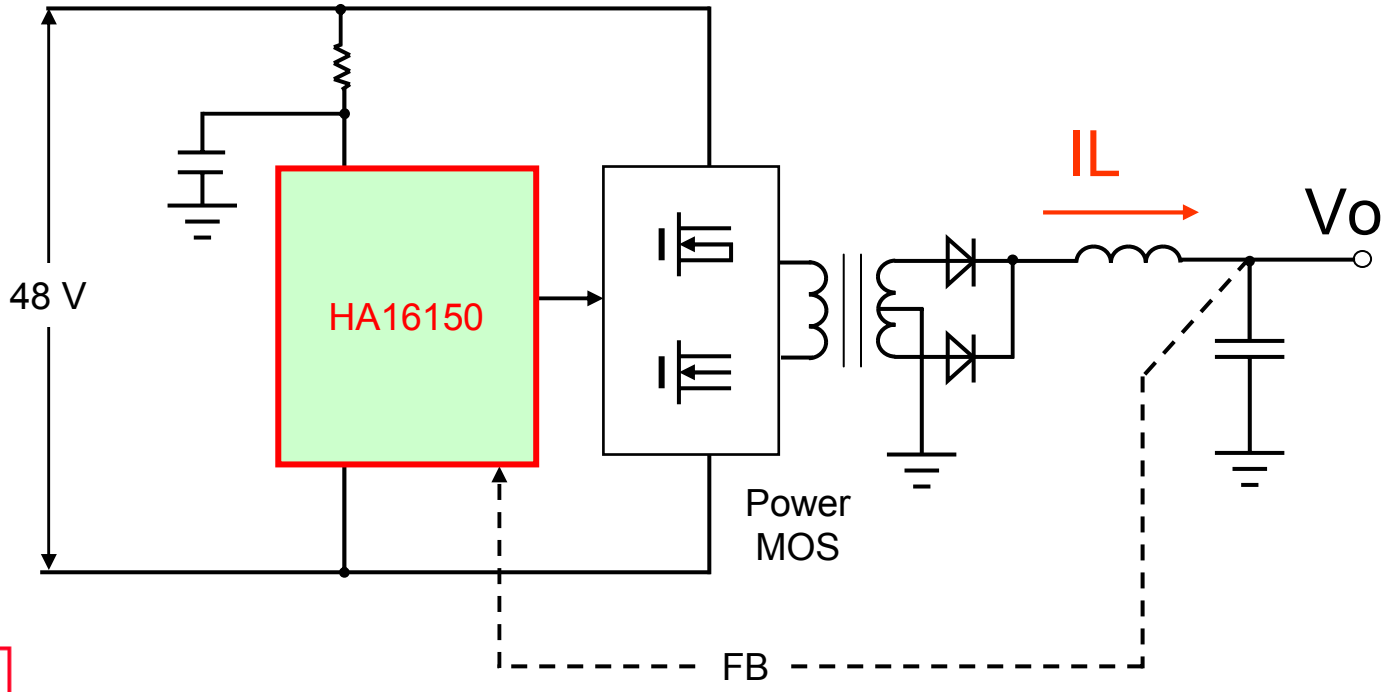
Half Bridge Power Supply IC

48 V Input DC/DC Power Supply IC

Type	SW mode V	SW mode C	f	Package	Main SW	Note
HA16150	—	√	1 MHz	DIP-16 TSSOP-16	Power MOS	48 V DC/DC

for half bridge

note) WS: Available



48 V Input DC/DC HA16150 (1)

- Features
  - PWM Current mode
  - FET driver
  - 1 MHz max.
  - Can adjust dead time
  - Small and thin package: TSSOP-16

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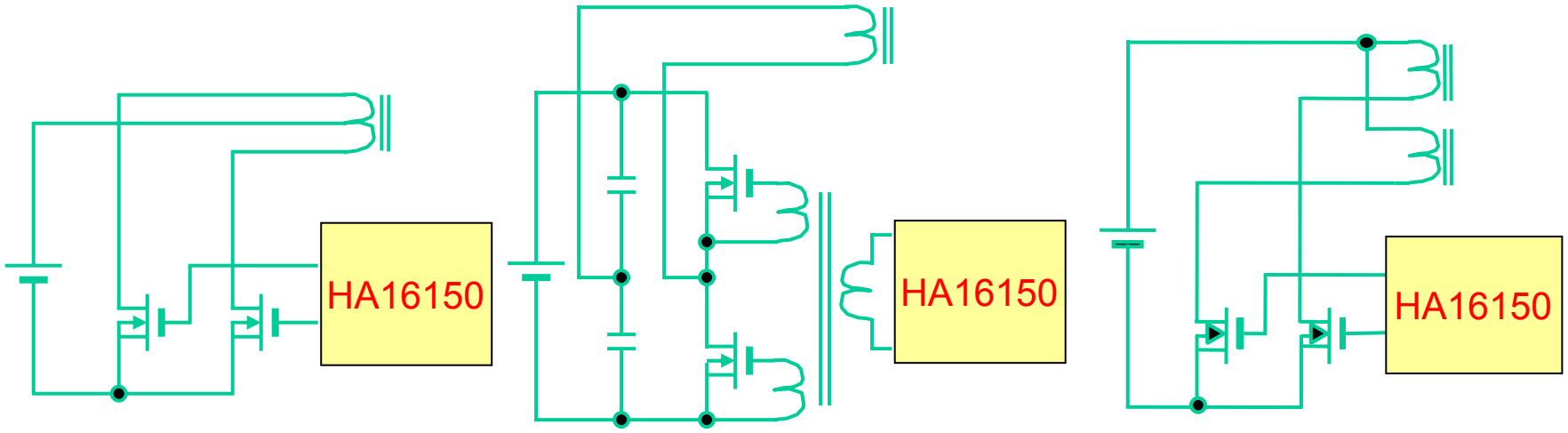
48 V Input DC/DC HA16150 (2)

Dual high current outputs for FET drive



a) Push Pull b) Half Bridge c) Double Forward

for Wide Applications

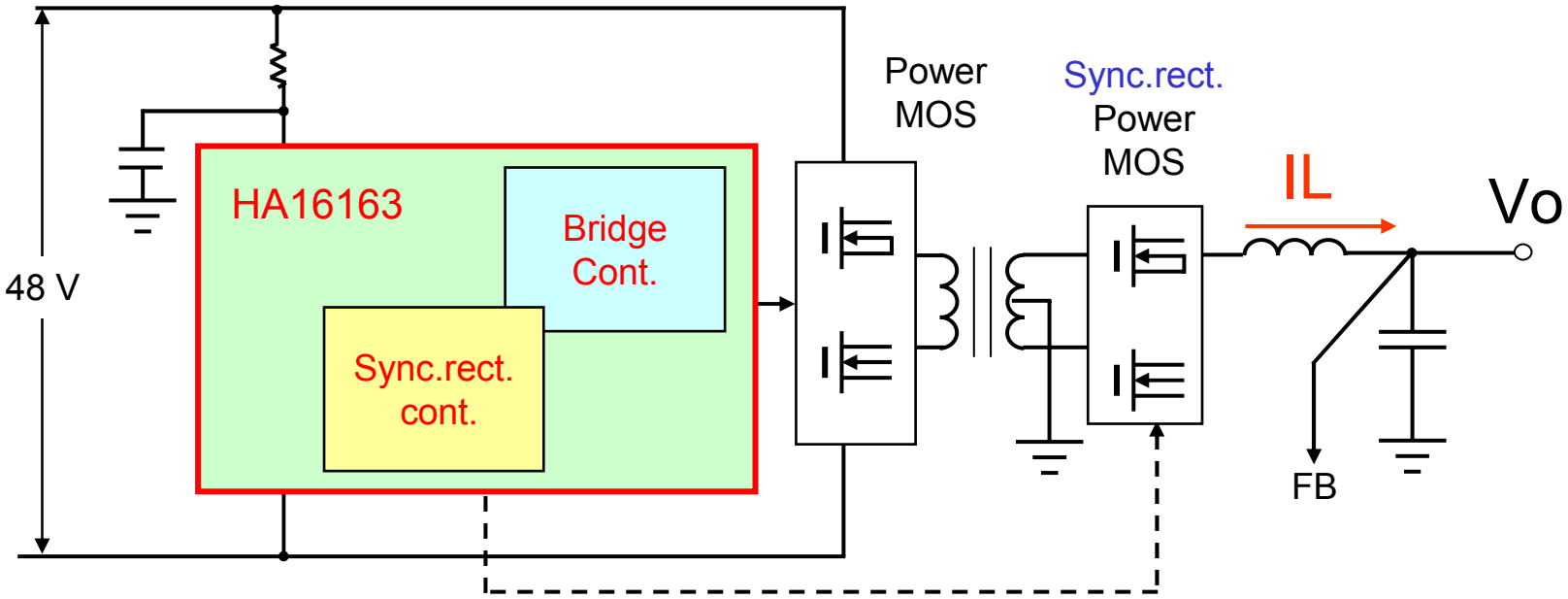
Full Bridge Power Supply IC

48 V Input DC/DC Power Supply IC

Type	SW mode V	SW mode C	f	Package	Main SW	Note
HA16163	—	√	2 MHz	TSSOP20	Power MOS	Bridge cont. Sync.rect.

Note) WS: Available

for full bridge



PWM by phase shift control for full-bridge topology

48 V Input DC/DC HA16163 (1)

Preliminary

- Features

- 2 MHz max. ⇒ Miniaturized

- Phase-shift switching
- Synchronous rectification with adjustable delay ⇒ High Efficiency

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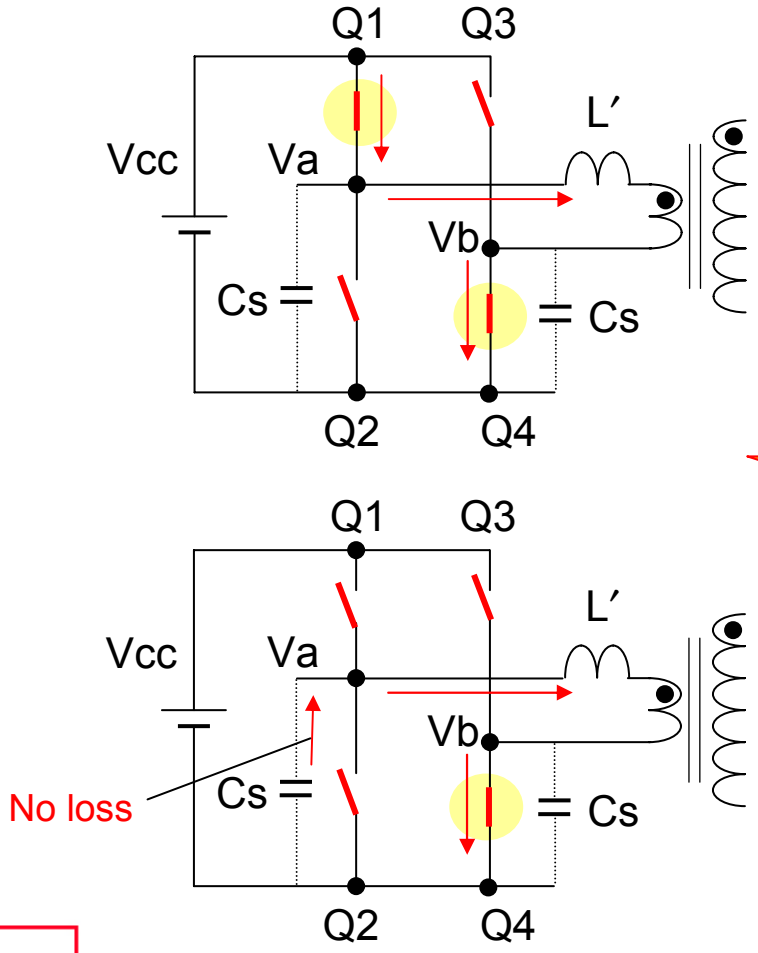
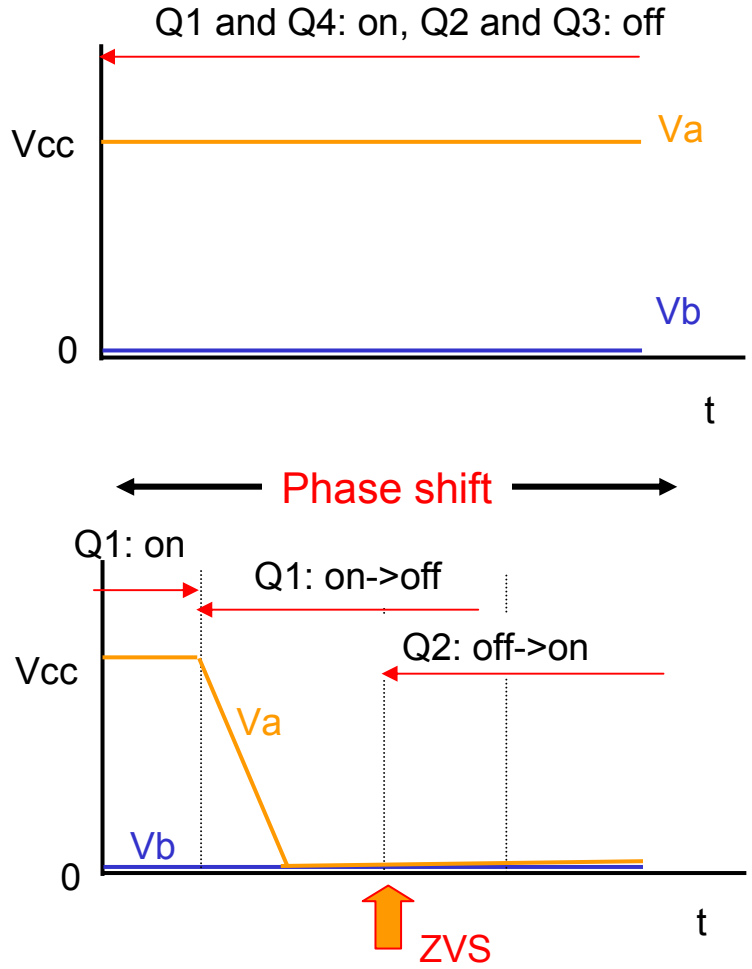
48 V Input DC/DC HA16163 (2)

Phase shift switching → ZVS → low loss





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