WeEn Semiconductors

- Sales tool for EV charger applications

WeEn Semiconductors: **50-Years Leading Experience in Power**

PHILIPS

1969
- High Voltage Transistors (HVT)
- Fast, Ultrafast & Hyperfast Power Diodes
- Bipolar 4-Quadrant Triacs

1980s
- Bipolar 3-Quadrant Hi-Com Triacs

2000s
- Hyperfast diodes
- Triac & SCR Planar Technology Platform

NXP

2006
- Super Advanced Best Efficiency Rectifier Diodes (SABER)
- Generation 1: Schottky Barrier Diodes

2009
- ACT & ACTT Platform (AC Switch), Casco Diodes

2013
- Temperature & Overload Protected Triac (TOPTriac)

WeEn

2015
- Enhanced Efficiency Pt Planar diodes (EEPP)
- Generation 2: Schottky Barrier Diodes
- Silicon Carbide Diodes
- High Voltage SCRs

2019
- Standard Power Diodes
- Automotive SCRs
- 1600V Planar SCRs

WeEn Global Footprint

WeEn Nanchang Reliability & Failure Analysis Laboratory

- In Sep 2018, WeEn opened its new, in-house, reliability and failure analysis laboratory in Nanchang, Jiangxi Province, which is the largest scale & most advanced LAB in central China. And it can conduct the tests on Power Diodes, Thyristors, HVT and any other discrete device.

WeEn Semiconductors Ltd. Manufacturing Locations

CR Micro, Chongqing
Wafer Manufacturing
Southwest China

WeEn FE
Jilin China
Wafer Manufacturing

GCS (SiC)
FE Foundry in US

WeEn Backend SubCon Site

E-Tech, Shandong
North China

WeEn Backend SubCon Sites

HS Guangdong
South China

TC Guangdong,
South China

WeEn Backend SubCon Sites

Seefull, Shanghai
East China

TFME, Jiangsu
East China

JCET, Jiangsu
East China

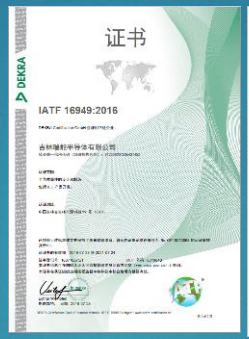
Legend

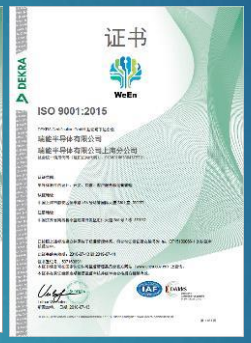
Wafer fab

Assembly, test and packaging

WeEn Semiconductors Co., Ltd.
Quality Certification

- ISO9001
- IATF 16949
- ISO14001
- OHSAS 18001
- UL on isolation products
- RoHS and REACH compliant
- Sony Green Partner

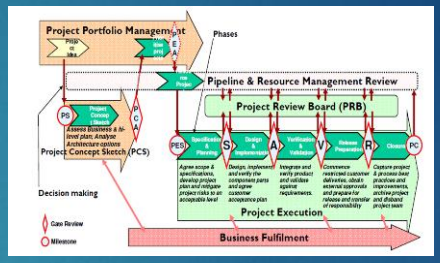




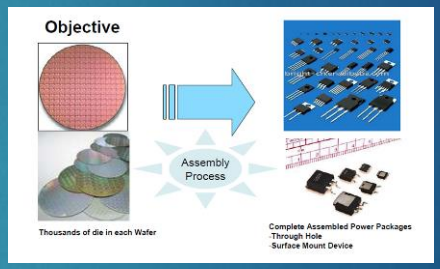
- Shanghai office has **ISO9001 certificate** in the name of **WeEn Semiconductors Co., Ltd**.
- Jilin manufacturing site has IATF 16949 in the name of **Jilin WeEn Semiconductors Co., Ltd,** but also including R & D, Sales & Customer Service in Shanghai.

WeEn Semiconductors Co., Ltd.
Product Quality

- Product Design & Development
  - BCaM, Advanced Product Quality Planning
  - Portfolio management, Gate review
  - Design optimizing, DOE
  - Risk management, FMEA

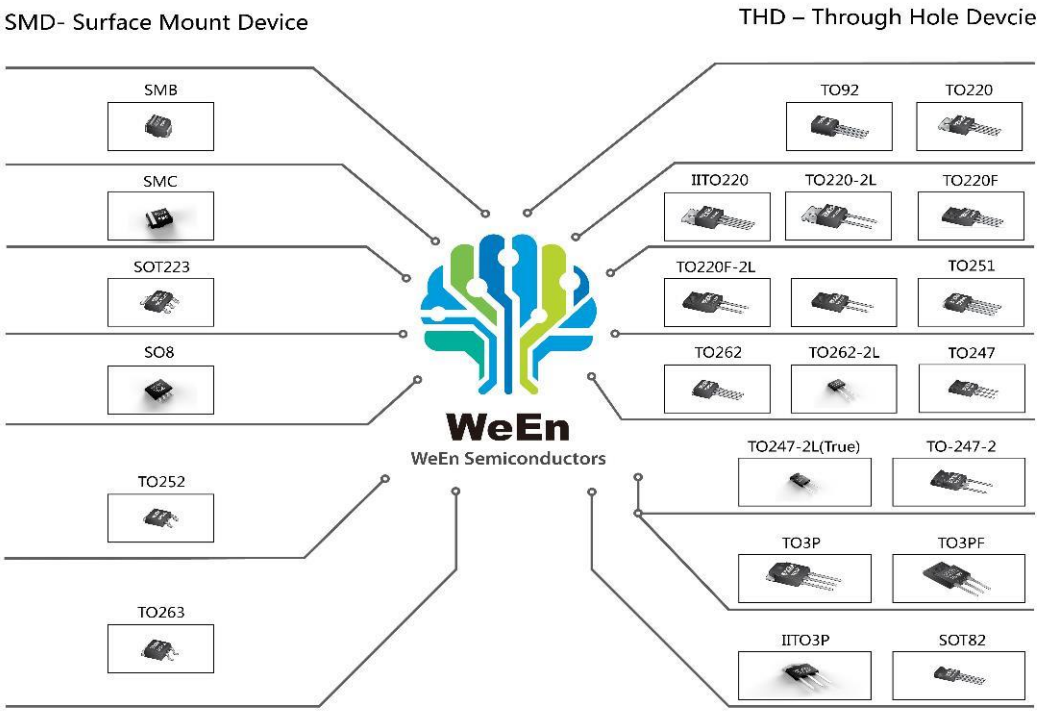


- Product Manufacturing
  - IATF 16949 certified, VDA6.3 audited
  - Process capability, CPK 1.67
  - 100% electrically testing, OQC 0PPM
  - Routine reliability monitoring



- Product Supporting
  - e-PCN
  - e-Complaint handling，8D methodology
  - Application lab

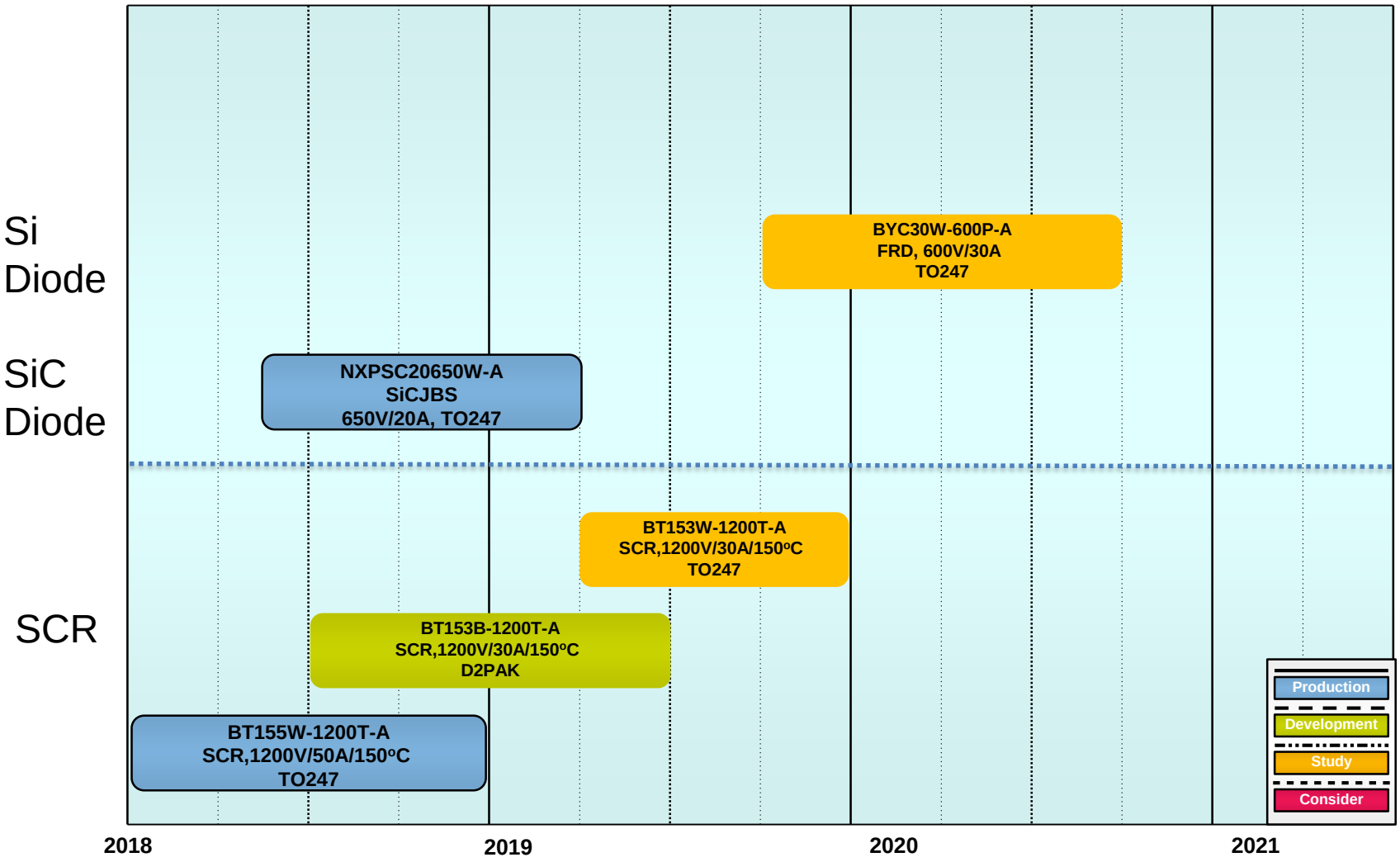
WeEn Discrete Package



Technology Roadmap

Automotive Grade Products, AEC-Q101 Qualified

WeEn



Product Roadmap Thyristors

Triacs and SCR's

Planar Passivated SCRs
0.8A –40A/50A/60A/80A from 200V to 1600V
SOT223/TO220/DPAK/D2PAK/TO3P/TO247
150ºC Tjmax capability

TOPTriac
Temp. & Overload Protection
12A/16A with 800V

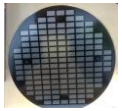
AC Thyristors & AC Thyristor Triacs
0.2A -- 16Awith 600V/800V
SOT223/TO220/DPAK/D2PAK 150ºC Tjmax capability

3Q Hi-Com™ Triacs
BTA2,BTA3,BTA4 series
0.8A -- 45A with 600V/800V/1000V
150ºC Tjmax capability

Planar Passivated 4Q Triacs
BT136,BT137,BT138,BT139 , BTA41,BTA45 series
0.6A -- 40A from 400V to 800V
150ºC Tjmax capability

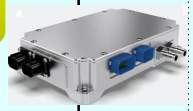
1600V Thyristors Module
162A
SCR Half Bridge

1600V/116A Thyristors Module
Half Bridge
TO240AA



BT152-1200T
20A/1200V/150ºC,
TO220AB

SCR,BT153B-1200T-A
30A/1200V/150ºC, D2PAK
AEC-Q101 compliant



SCR,BT155W-1200T-A
150ºC / TO247
AEC-Q101 compliant

TOPT16B-800C0
TOPTriac, 16A/800V
D2PAK

3Q, BTA208X-800CT
8A/800V
150ºC, TO220FP

SCR,TYN30 / TYN50
30A/50A/800V
150ºC, TO220/IITO220

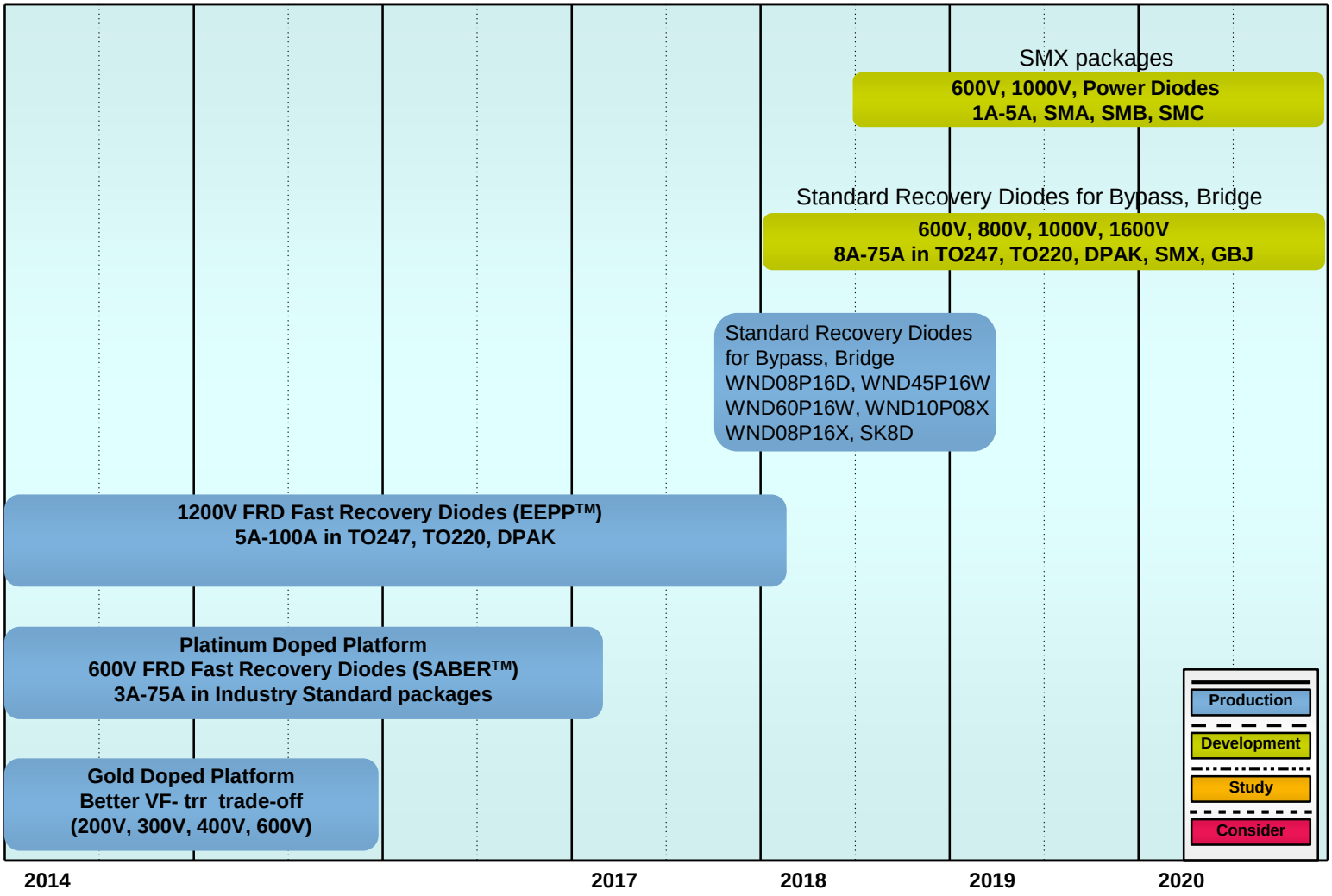
SCR,NCR125W-125M
1.25A/1250V
SOT223

SCR,NCR100Q-6M
0.8A/600V
SOT89

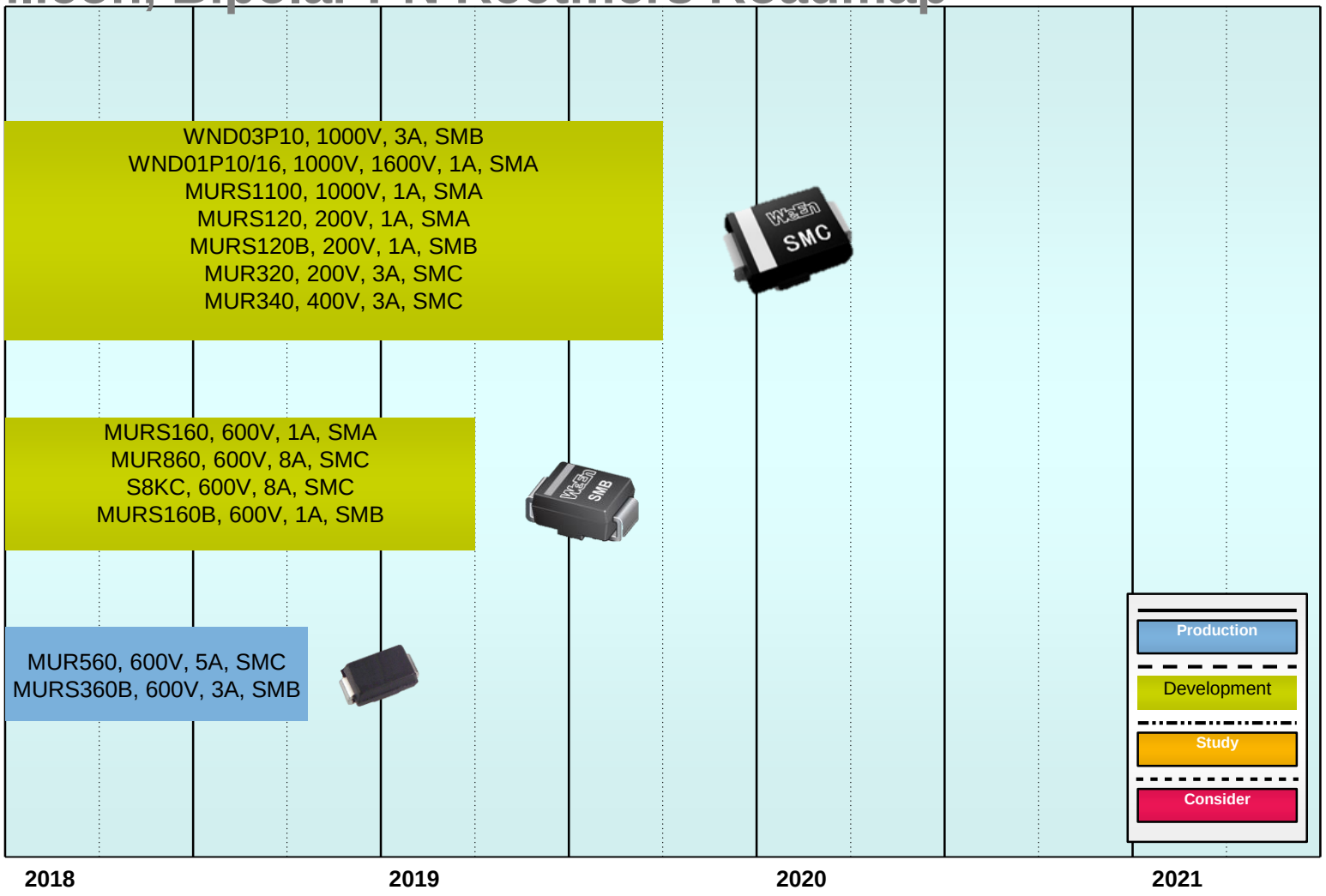
Production
Development
Study
Consider

2015 2016 2017 2018 2019 2020

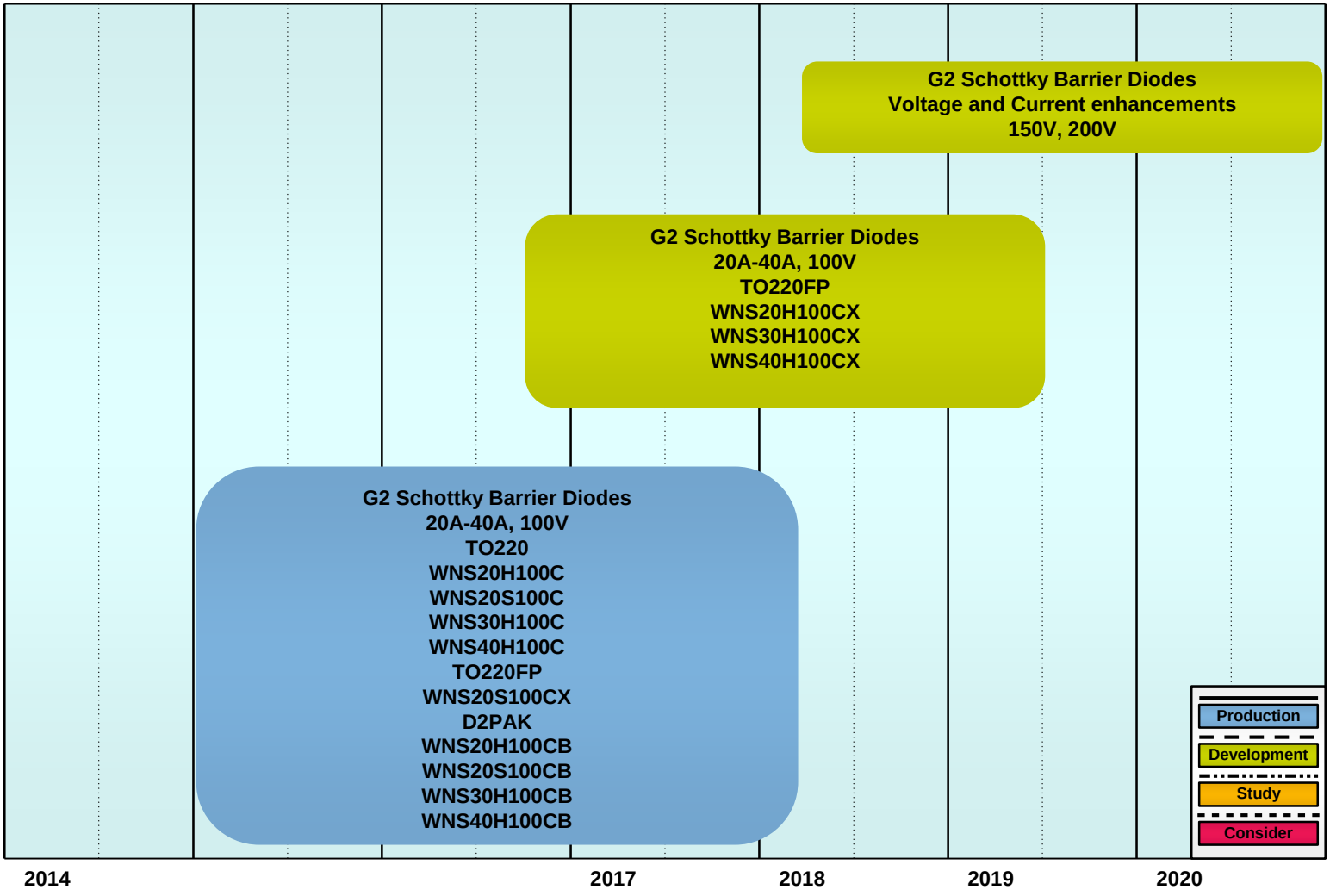
WeEn Silicon, Bipolar PN Rectifiers Roadmap



WeEn SMA, SMB, SMC (SMX)
Silicon, Bipolar PN Rectifiers Roadmap

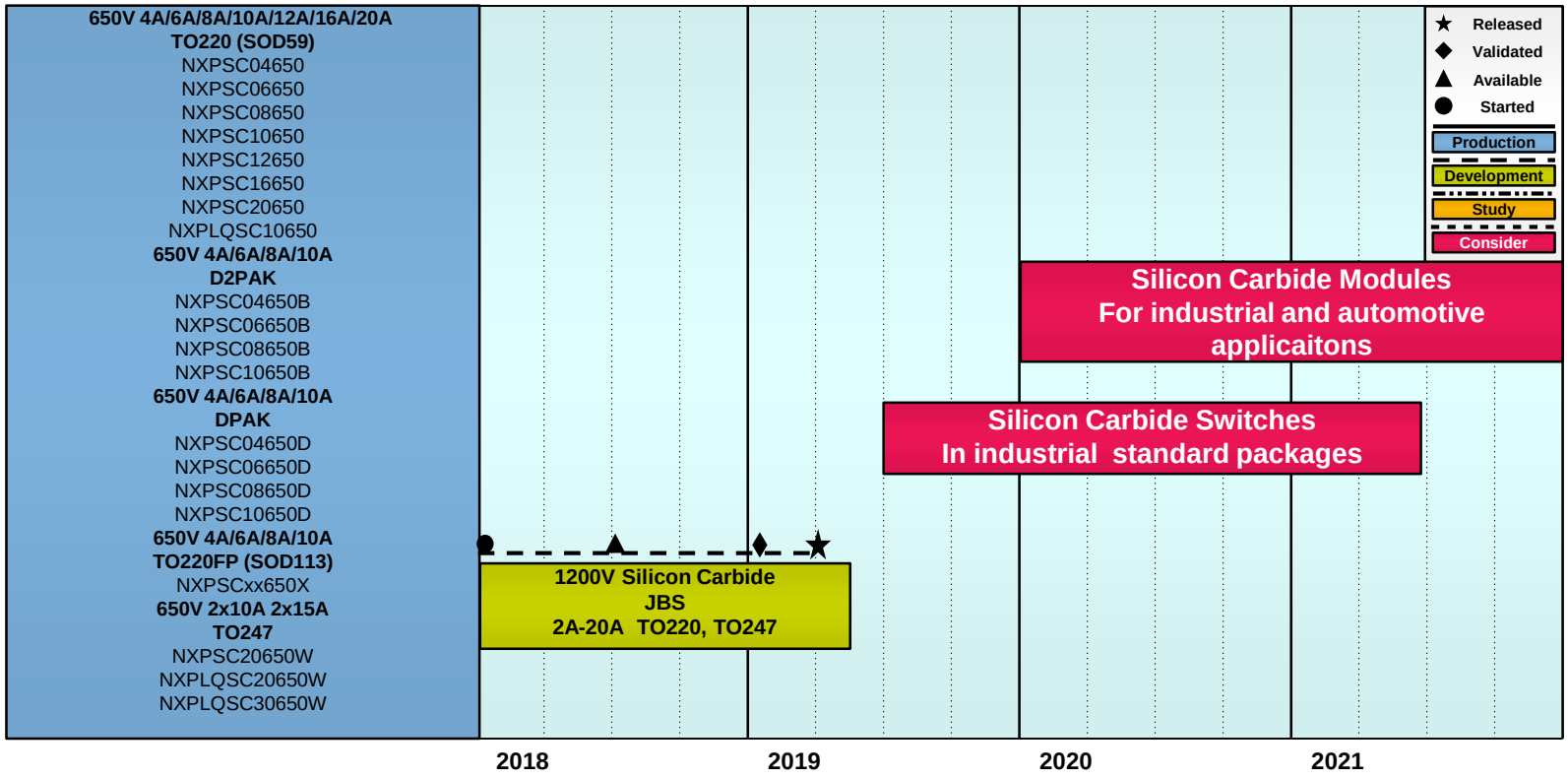


WeEn Silicon, SBD Schottky Barrier Diodes Roadmap



WeEn Silicon Carbide Roadmap

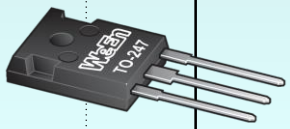
WeEn 650V SiC JBS Diodes transferred to 6 inch wafers



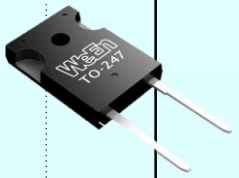
Existing Portfolio

WeEn Silicon Carbide 1200V Diodes Roadmap

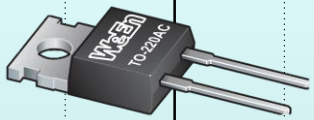
WNSC101200CW, TO247, 3 pin, dual diode
WNSC201200CW, TO247, 3 pin, dual diode
WNSC301200CW, TO247, 3 pin, dual diode



WNSC101200W, TO247, 2 pin
WNSC201200W, TO247, 2 pin



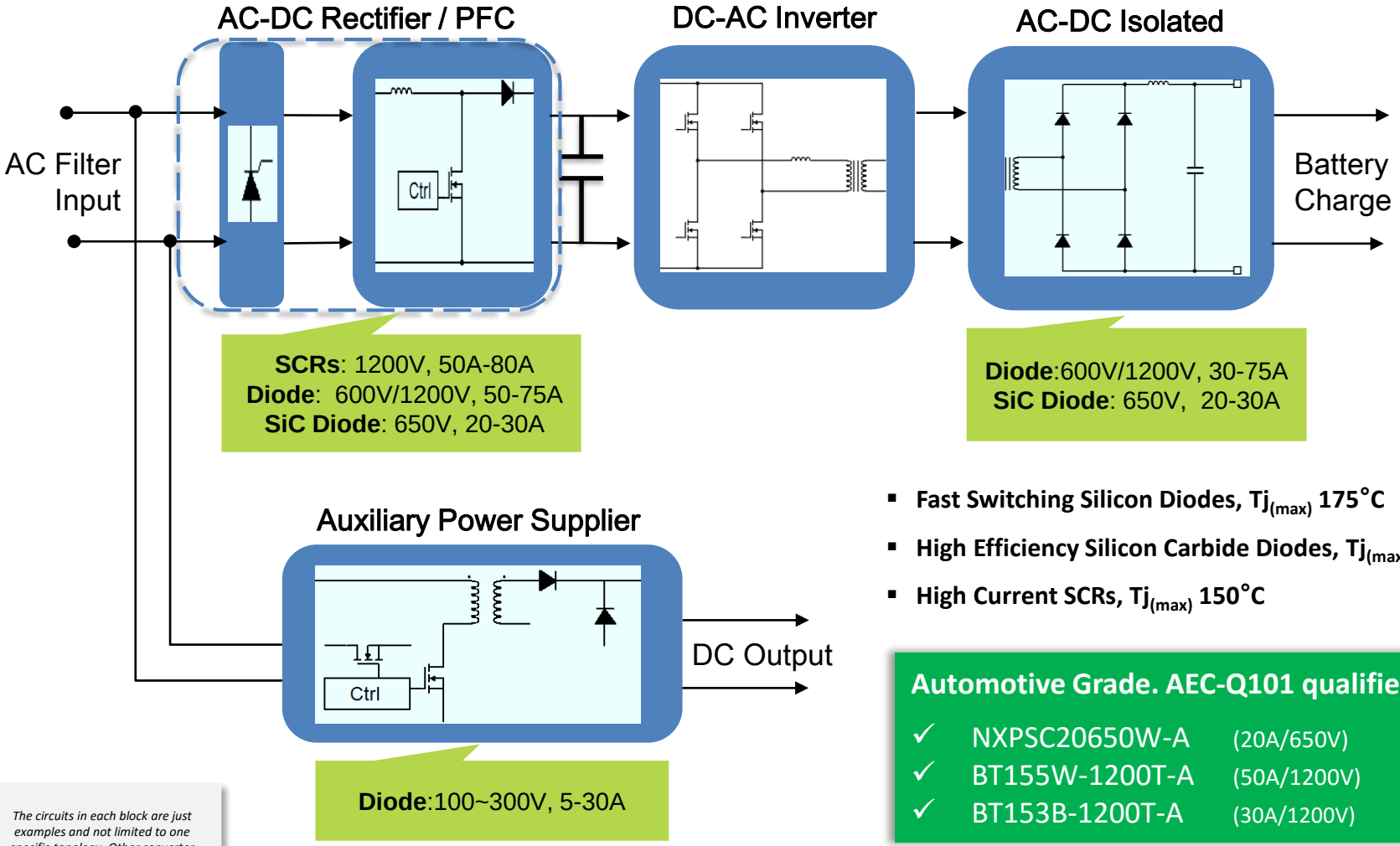
WNSC021200, TO220AC, 2 pin
WNSC051200, TO220AC, 2 pin
WNSC101200, TO220AC, 2 pin



Production
Development
Study
Consider

2018 2019 2020 2021

EV Charger System Block Diagram



- **Fast Switching Silicon Diodes, $Tj_{(max)}$ 175°C**
- **High Efficiency Silicon Carbide Diodes, $Tj_{(max)}$ 175°C**
- **High Current SCRs, $Tj_{(max)}$ 150°C**

Automotive Grade. AEC-Q101 qualified

✓	NXPSC20650W-A	(20A/650V)
✓	BT155W-1200T-A	(50A/1200V)
✓	BT153B-1200T-A	(30A/1200V)

The circuits in each block are just examples and not limited to one specific topology. Other converter topologies would also be possible.

Product Line-up for EV Charger

SCRs (Tj(max)150°C)

Product	V_{DRM}	$I_{T(AV)}$	Package
BT153B-1200T-A (AEC-Q101)	1200V	30A	D2Pak
BT155W-1200T-A (AEC-Q101)	1200V	50A	TO247
BT155W-1200T	1200V	50A	TO247
BT155K-1200T	1200V	50A	TO3P
BT155Z-1200T	1200V	50A	IITO3P
BT158W-1200T	1200V	80A	TO247
TYN60K-1400T	1400V	60A	TO3P

Diodes

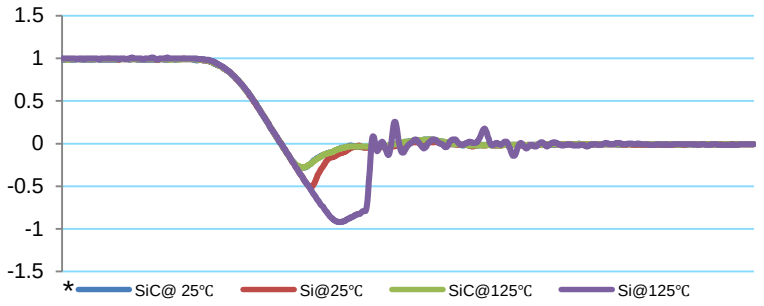
Product	Families	V_{RRM}	I_F	Package
NXPSC20650-A (AEC-Q101)	SiC Diode	650V	20A	TO-220
NXPSC20650	SiC Diode	650V	20A	TO-220
NXPLQSC20650W	SiC Diode	650V	20A	TO-247
NXPSC20650W	SiC Diode	650V	20A	TO-247
NXPLQSC30650W	SiC Diode	650V	30A	TO-247
BYC5-1200P	EEPP™	1200V	5A	TO-220
BYC8-1200P	EEPP™	1200V	8A	TO-220
BYC10-1200P	EEPP™	1200V	10A	TO-220
BYC15-1200P	EEPP™	1200V	15A	TO-220
BYC30-1200P	EEPP™	1200V	30A	TO-220
BYC30W-1200P	EEPP™	1200V	30A	TO-247
BYC30-600P	SABER™	600V	30A	TO-220
BYC30W-600P	SABER™	600V	30A	TO-247
BYC60W-600P	SABER™	600V	60A	TO-247
BYV60W-600P	SABER™	600V	60A	TO-247
BYC75W-600P	SABER™	600V	75A	TO-247

WeEn Power Silicon Carbide (SiC) Solution

Product Plan overview

- JBS(Junction Barrier Schottky) Structure Diode
- Voltage: 650V
- Current: 4A~30A
- Pb & Halogen Free
- Package: TO220/TO220FP/DPAK/D2PAK/TO247

Core SiC JBS benefit



Key features

- Benchmark switching behavior
- No reverse recovery charge
- Temperature independent switching behavior
- High operating temperature (Tj_{max} 175°C)

Applications

- PFC power supply
- Industrial motor drives
- PV inverter
- UPS
- EV Charger

Key benefits to applications

- System efficiency improvement compared to Si diodes
- Reduced cooling requirements
- Enabling higher frequency/increased power density
- Higher system reliability due to lower operating temperature
- Reduced EMI

SiC expertise

WeEn SiC diodes are designed by a team of experts pioneering this technology for over 10 years. Combined with our packaging and applications expertise we create now leading edge products, enabling high performance solutions for the power supply market.

*** Note that the 125C curve for SiC is virtually coincident with the 25C line and therefore not clearly visible.*

WeEn Si Power Diodes – EEPP™ (1200V Pt doping)

Solution Overview

- Voltage: 1200V
- Current: 5A/8A/15A/30A/40A/60A/75A/100A
- Packages: TO220 / TO247
- Configuration: Single
- Halogen free

Product Line-up

- BYC30-1200P/ BYC30W-1200P
- BYC5-1200P/BYC8-1200P/BYC8D-1200P
- BYC15-1200P
- BYC40W-1200P
- BYC60W-1200P
- BYC75W-1200P
- BYC75W-1200P
- BYC100W-1200P

What is EEPP™

EEPP- Efficiency Enhanced Pt Planar rectifier.

EEPP utilizes state of the art planar technology which improves overall system reliability and power efficiency. Major process improvements are designed to:
1) Reduce switching losses;
2) Maximize operating temperature;
3) Improve surge capability;
4) Reduce leakage to improve reliability.

By suitable choice and accurate control of the epitaxial layer and diffusion depths, combined with state-of-the-art minority carrier lifetime control technology using Platinum doping, we achieve the optimum combination of V_F and t_{rr} at each voltage grade, yielding the best converter efficiency in PFC and SMPS applications.

Key Features and Benefits

- Fast recovery
  - System power efficiency improvement.
- Soft recovery
  - Reduce system EMI.
  - Reduce diode voltage overshoot.
  - Eliminate snubber circuit.
- Low reverse recovery current/charge – I_{RM}/Q_r
  - Reduce MOSFET switch-on peak current.
  - Reduce MOSFET switch-on loss.
- Ultra low leakage current
- Avalanche ruggedness to improve reliability
- High operating temperature capability (T_j max = 175°C)
- Higher I_{FSM} capability

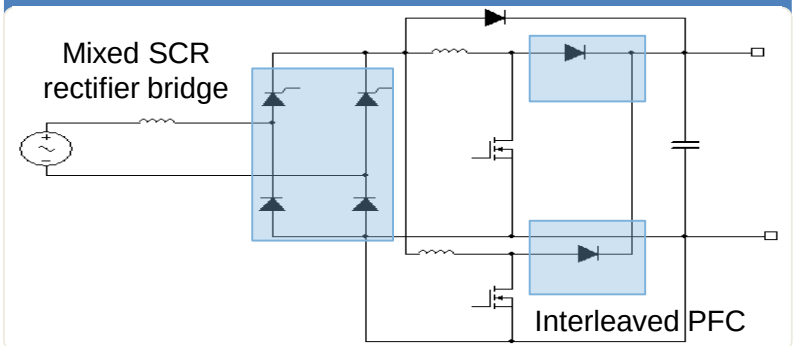
WeEn Power Solution in AC-DC & PFC control

Typical applications



3.3KW/6.6KW OBC 7-30kw Charger station

Schematics



Application requirements

- Power rating 0~3.3Kw:
  - 10~60A : Diodes,
  - 20~30A : SCRs
- Power rating >3.3Kw:
  - 10~75A : Diodes,
  - 50~80A : SCRs

Comprehensive advantages

- System efficiency improvement diodes
- Reduced cooling requirements and EMI impact
- Enabling higher frequency/increased power density
- Higher system reliability due to lower operating temperature

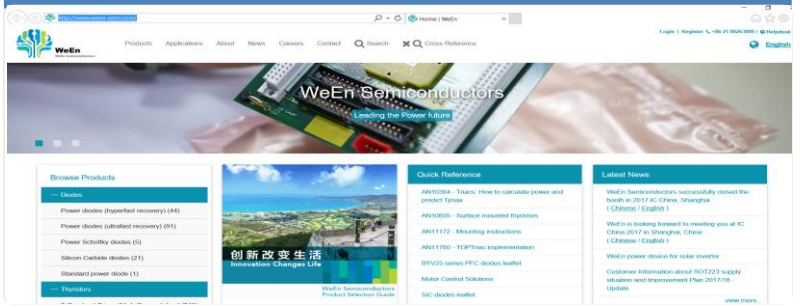
Diodes & SCRs products

- NXPSC20650W/NXPLQSC20650W
- BYC30W-600P/BYC60W-600P
- BYC30W-1200P
- BT155W(K)-1200T
- BT158W-1200T

TO-220AC

TO-247

Product information on the Web



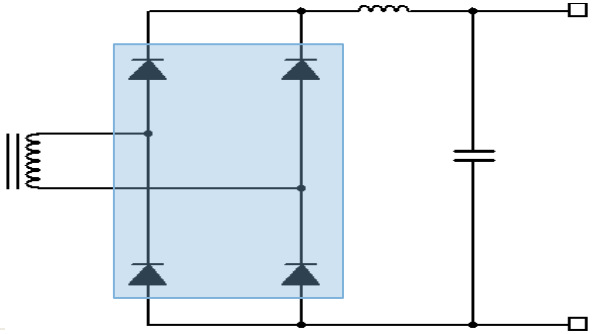
WeEn power solution in: Secondary Rectifier

Typical applications



3.3KW/6.6KW OBC 7-30kw Charger station

Schematics



Application requirements

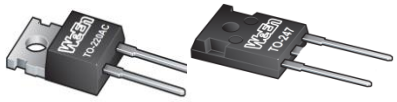
• Power rating 0~3.3Kw:	• 1200V, 30A : Power diodes
• Power rating >3.3Kw:	• 1200V, 75A : Power diodes

Comprehensive advantages

- Fast recovery System power efficiency improvement.
- Avalanche ruggedness to improve reliability
- High operating temperature capability (Tj_{max} = 175°C)
- Higher IFSM capability

Hyperfast Diodes products

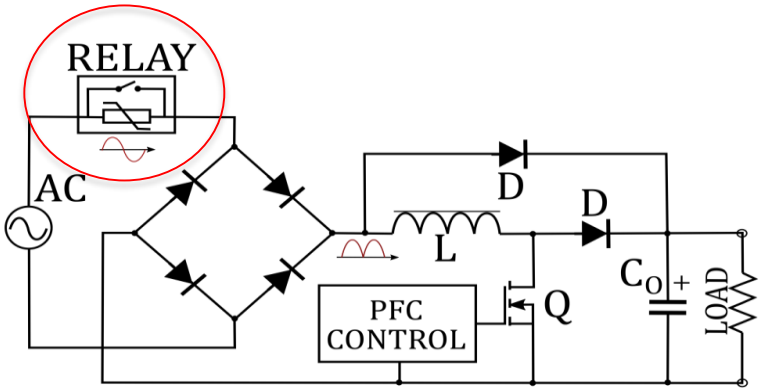
- BYC30-1200P
- BYC30W-1200P
- BYC75W-1200P



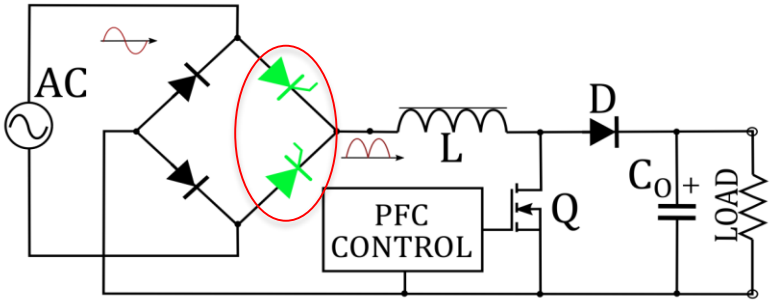
Product information on the Web

SCR as Soft starter to replace Relay at AC input (inrush current limiter)

Design with Relay



Design with SCR



- SCRs can act as soft starter and replace a Relay at AC input (Inrush current limiter)
- SCRs can share the heatsink with the bridge rectifier diodes and minimize the size of the application
- SCR's feature Automatic Commutation (turn-off) at current zero-crossing, resulting in less EMI
- No moving parts, no arcing, no wear-out
- Long Life time
- Automotive Grade (AEC-Q101 qualified) → BT155W-1200T-A / BT153B-1200T-A

founded by NXP

WeEn

WeEn Semiconductors