



FIDES

Electric vehicle charging for wall-recessed outlet

Disruptive Innovation to sustainable EV charger

Novel Methodology of AC zero crossing hybrid relay EVSE

Tangible benefits in terms of reliability, Free maintenance, Small size and operating in extreme temperature environments



FIDES

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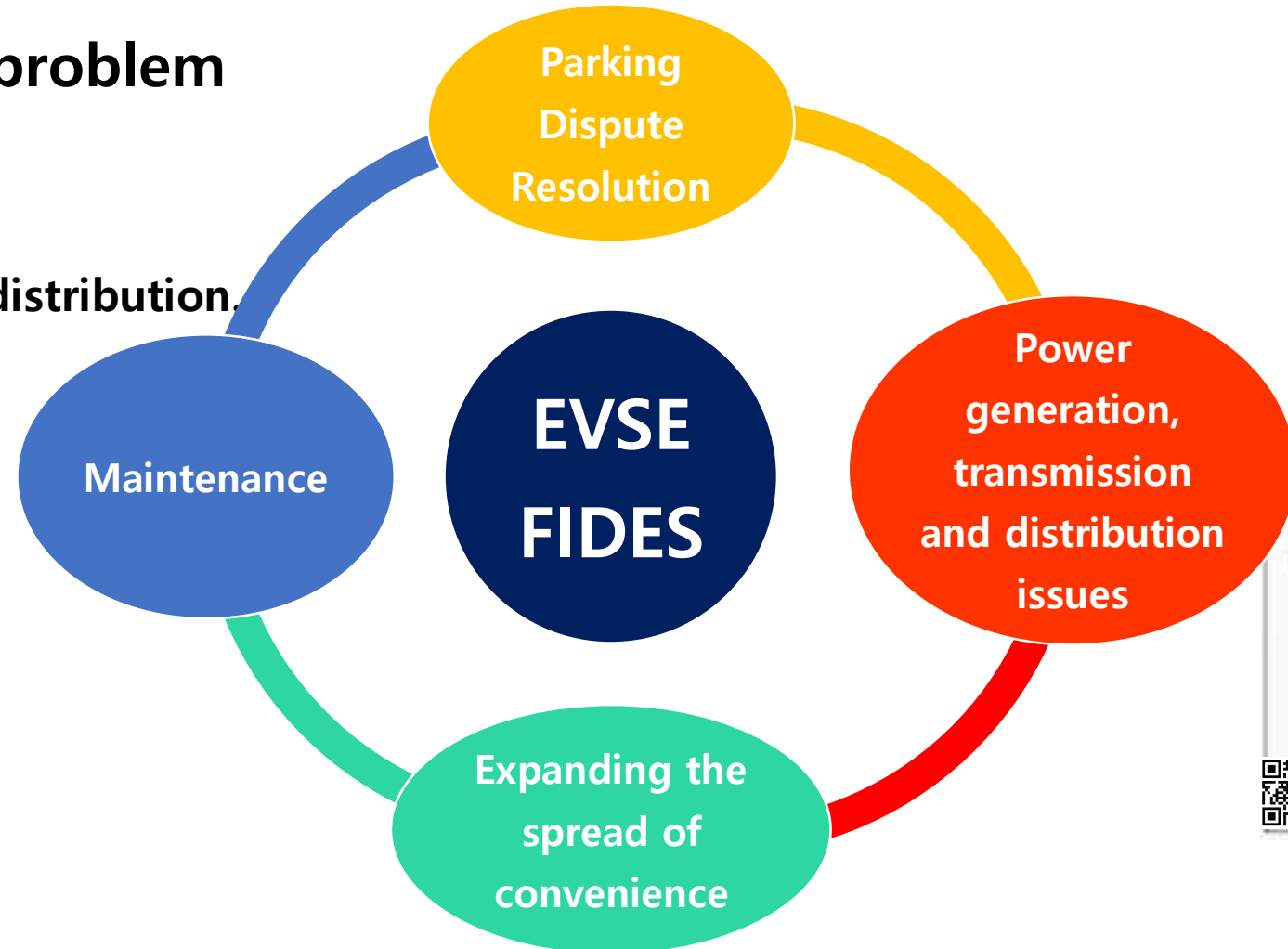
<http://www.standbyzero.com>

Electric car charger



Electric car charging problem

1. Social problem.
2. Power transmission and distribution.
3. New service market.
4. Convenience.
5. Solution.



Types of electric vehicle chargers



KNOW YOUR EV CHARGING STATIONS

AC Level One



VOLTAGE

120v 1-Phase AC

AMPS

12–16 Amps

CHARGING LOADS

1.4 to 1.9 kW

CHARGE TIME FOR VEHICLE

3–5 Miles of Range Per Hour

AC Level Two



VOLTAGE

208V or 240V 1-Phase AC

AMPS

12–80 Amps (Typ. 32 Amps)

CHARGING LOADS

2.5 to 19.2 kW (Typ. 7 kW)

CHARGE TIME FOR VEHICLE

10–20 Miles of Range Per Hour

DC Fast Charge



VOLTAGE

208V or 480V 3-Phase AC

AMPS

<125 Amps (Typ. 60 Amps)

CHARGING LOADS

<90 kW (Typ. 50 kW)

CHARGE TIME FOR VEHICLE

80% Charge in 20–30 Minutes



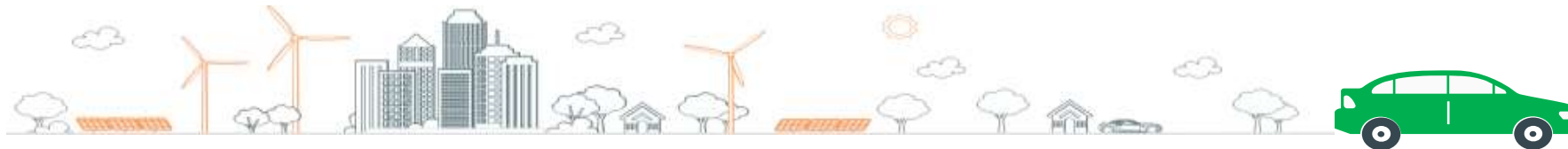
General electric vehicle



Internal OBCM 7.2-KW	Distance travelled
AC Level I 1 hour charge (120V、 16A)	6.4Km
AC Level II 1 hour charge (240V、 32A)	40Km
Mount Battery 66-kWh	417 km
Average daily driving distance	39Km



현대차 차세대 전기차 NE	
전장	4635mm
전폭	1890mm
전고	1605mm
휠베이스	3000mm
장착 배터리	58kWh(기본형), 73kWh(향속형)
1회 충전 주행거리	354km(기본형), 450km(향속형)
양산시기	2021년 1월
생산공장	울산1공장 2라인
생산계획	2021년 7만4000대 2022년 8만9000대 이상



Electric car



What do you need now?



- Solve the parking problem.
- Eliminate charging stress.
- Billing problem solved with self-integrating wattmeter.
- KEPCO's power transmission and distribution management is improved.
- Annual carbon reduction of 276,000tCO₂eq compared to gasoline vehicles (200,000 units standard).

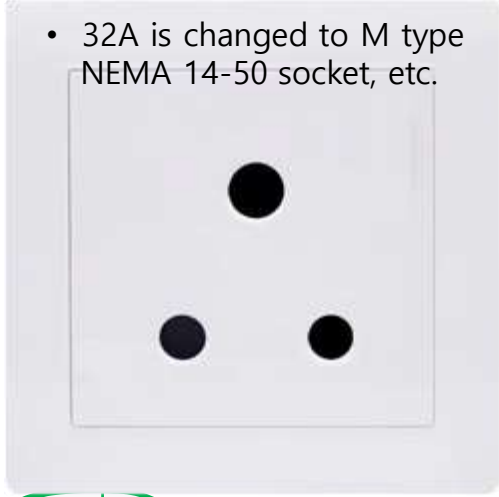


Electric vehicle charging for wall-recessed outlet



Private recurring subsidy: slow charger 24,000 million won on comparison

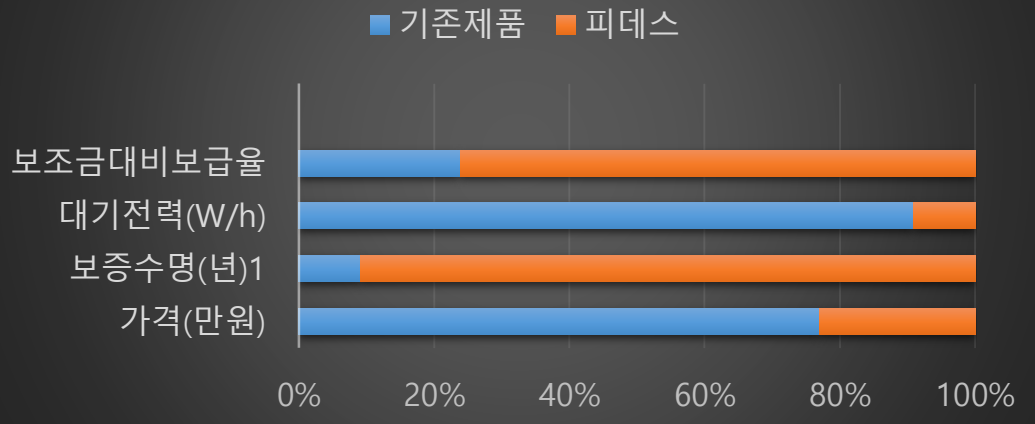
1Y	Warranty	10Y
1W or more	Standby power	Under 50mW
32A	Charging current	16/*32A
Membership	Service form	Public
48,000 units (cost of about 1 million won)	Subsidy of 500,000 won	160,000 units (contribution fee 0 won)



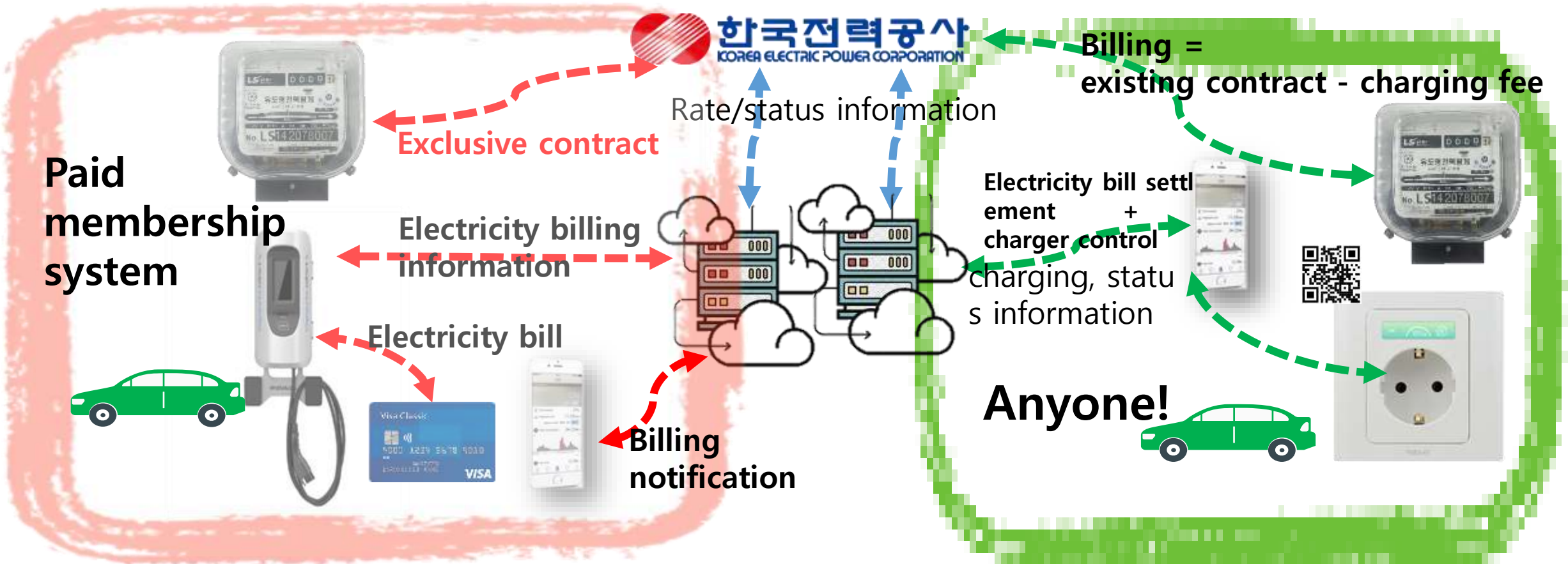
- 32A is changed to M type NEMA 14-50 socket, etc.



Product comparison



Charger installation service difference



When installing the wall-mounted billing outlet, the existing meter information is registered in advance, and when the wall-mounted buffer charger is installed, the electric vehicle charger's integrated wattmeter will automatically notify the charge of the existing watt-hour meter. The charges will be converted and billed, so no dispute will occur. With no membership registration, or membership fees, anyone can use it with just a QR scan wherever the sockets are installed.



How to use the charger

Automatic conversion billing for old-type integrating wattmeters



QR code scan



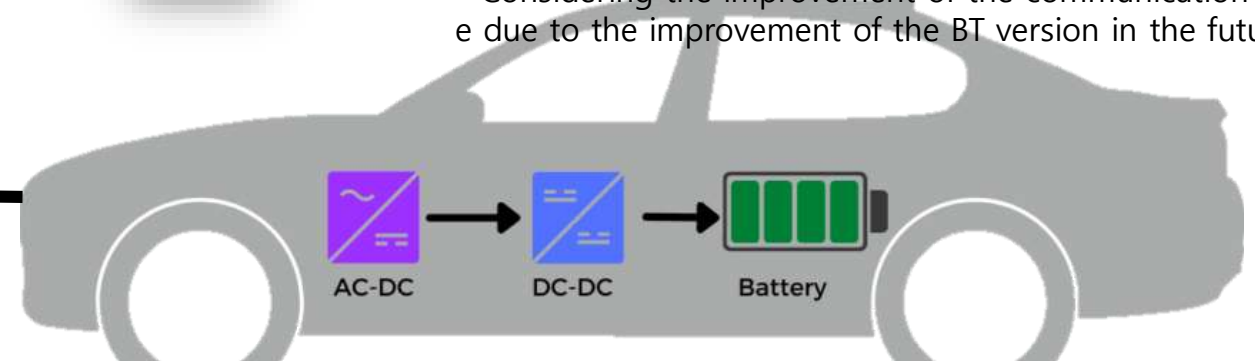
Billing information by LTE network

Authenticated payment



BT4.0 IPv6

* Considering the improvement of the communication distance due to the improvement of the BT version in the future



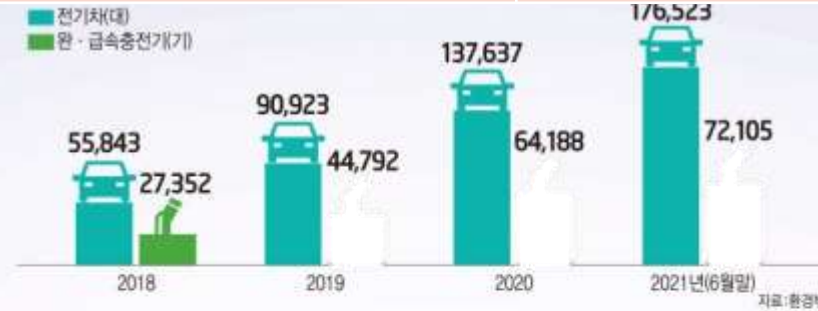
When installing the wall-mounted billing outlet, the existing meter information regarding the charger installation position was previously registered, and the wattage meter of the embedded billing outlet was added even if it was connected to the existing wattmeter wiring and used. As a result, the amount of usage is automatically converted when announcing the charge of the existing electricity meter, and the charge is billed, so that no dispute arises.



EV charger level 2 rechargeable wall outlet



Number of registered electric vehicles nationwide	200,000
一日平均走行距離	39Km
Electricity used per day	7KW
Nationwide Electric Vehicle Monthly Electricity Rate	13 billion won (42GW)



과금형 콘센트 · 완속충전기 비교
 ※ 250kW 충전으로 약 1200km 주행 · 국내 월평균 주행거리(승용차 기준) 1000~1200km

과금형 콘센트(3kW)

완속충전기(7kW)

과금형 콘센트(3kW)

완속충전기(7kW)

과금형 콘센트(3kW)	완속충전기(7kW)	과금형 콘센트(3kW)	완속충전기(7kW)
22~26kW	시간당 충전 속도	109.0원	kWh당 요금
50만원	설치비용 (환경부 보조금 지급 기준)	1만6915원	월 기본료
2021년	보급사업 시작일	60만원 (충전케이블 구매비)	추가 부담금
기존 220V 콘센트 활용한 충전인프라 확대 유리	장점	4만4145원	월 사용료 (250kW 충전 시)
소비자 초기 부담 발생 및 안전성·사용 불편	단점	약 30시간	충전 시간 (현대차 아이오닉5 80%인지 기준)
		3개	충전 업체 수 (보조금 사업자 등록 기준)
			249.8원
			없음
			없음
			6만2548원
			약 10시간
			33개

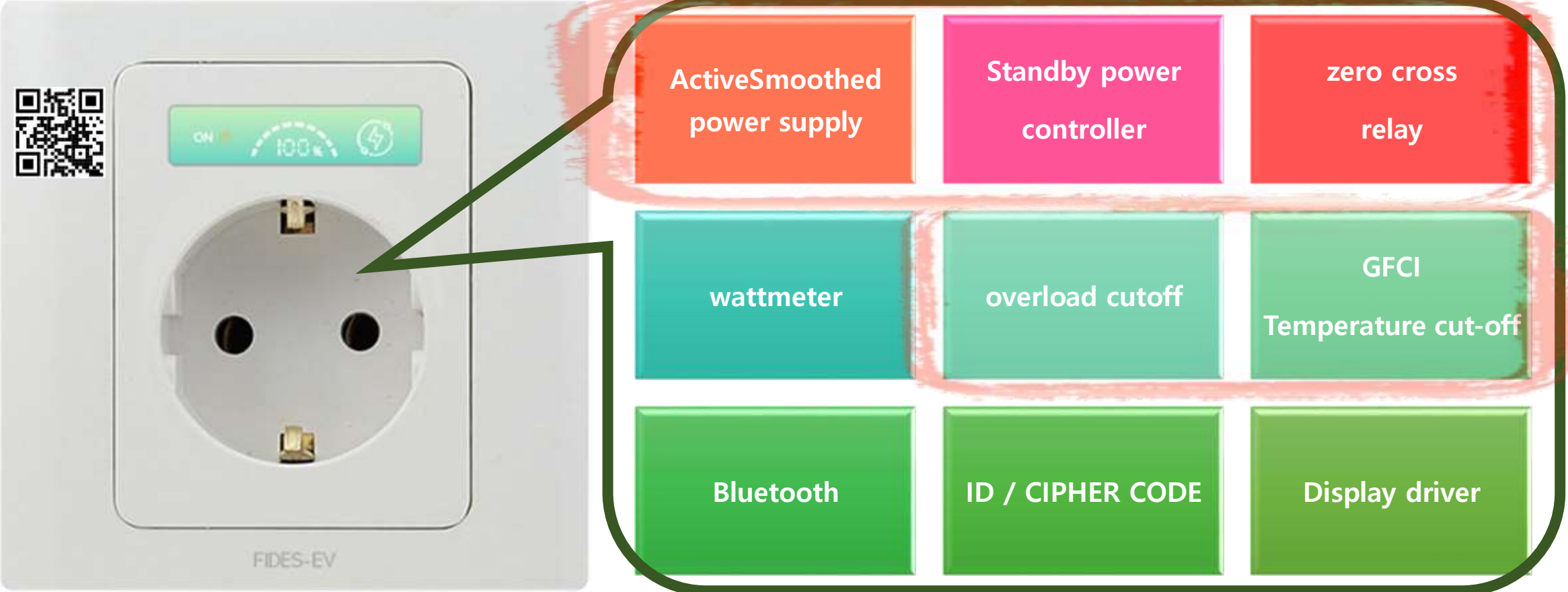
시장점유율 1위 업체
 요금 기준으로 선정
 (부가세 포함)



Rechargeable In-Wall Buffer Charger Circuit Functional Block



Internal circuit function block of wall-embedded charge type slow charger

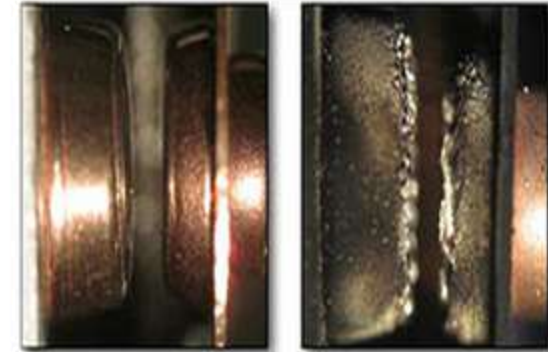


AC contact switch problem



Effects of electrical contacts

Influence	Variable	Effects
Electric	V, I	Heating, melting, material deformation, chemical reaction, electrical discharge, contact resistance
Heat	Arc	Melting of contact material, mass transfer
Mechanism	friction, pressure	deformation, abrasion, cold welding, contact resistance
Surrounding environment	dust, gas	Increased wear, particles, chemical layering and corrosion
chemistry	oxidation	contact resistance, inorganic and organic layers, corrosion



Contact "flutter" causes arcing to occur over high resistance contacts and for long periods of time, causing nitric oxide buildup in sealed relays. Nitrite is formed along with moisture and causes severe corrosion. An inrush current occurs during the contact time of the peak voltage and the contact melts. The contact movement time of general relays is less than 40ms, which cannot be predicted depending on the product, operating temperature, aging state, etc., and the contact OFF time is less than 20ms.

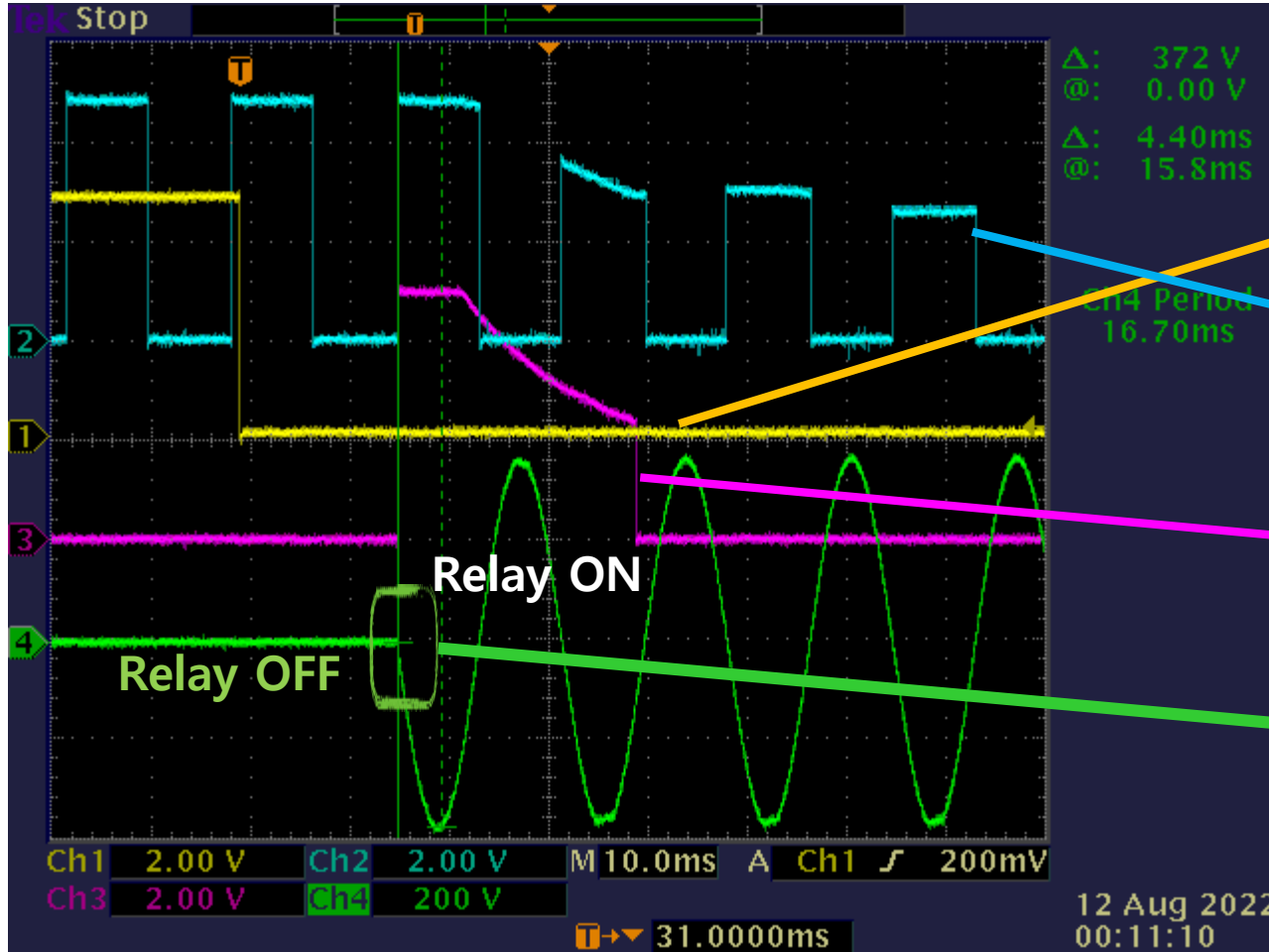
Pic1, lillie contact oxidation, fusion occurren



FIDES zero cross hybrid relay

Super durability FIDES-HEMR

Solves contact problems with MC relays with zero-cross drive

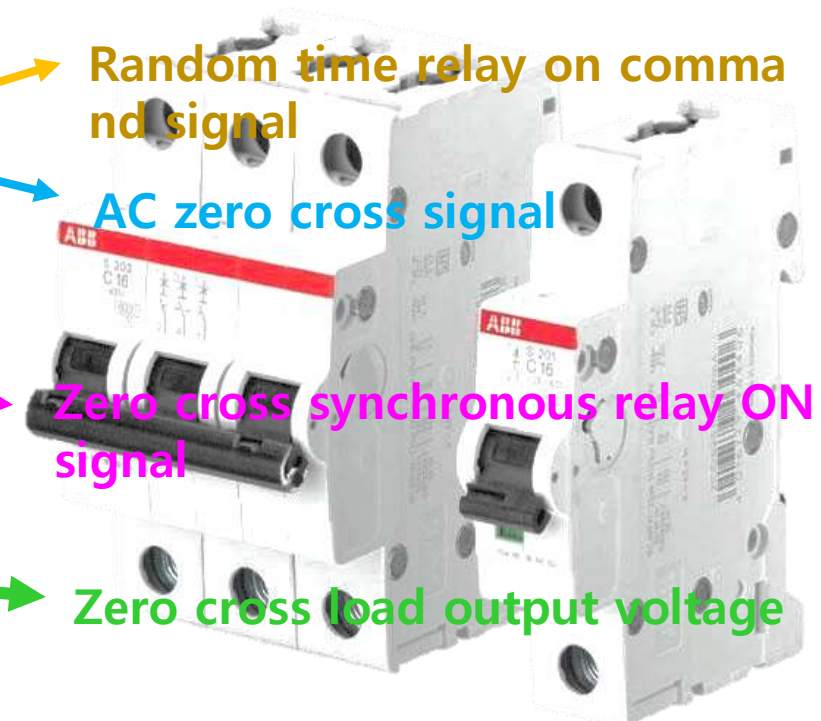


Random time relay on command signal

AC zero cross signal

Zero cross synchronous relay ON signal

Zero cross load output voltage



Test on 270V/60hz 500W load



DC smoothing power supply reliability

Comparison of DC smoothing filters

	Aluminum electrolytic capacitor	FIDES Active CAP	
Service life time	2K	100K	hours
Operating temperature	-20°C ~ 85°C	-40°C~125°C	°C
Power Factor	~0.5	~0.85	PFC
Capacitance efficiency ratio	10μF vs 3μF Reduced 70%		μF
Size compare	100	30	%

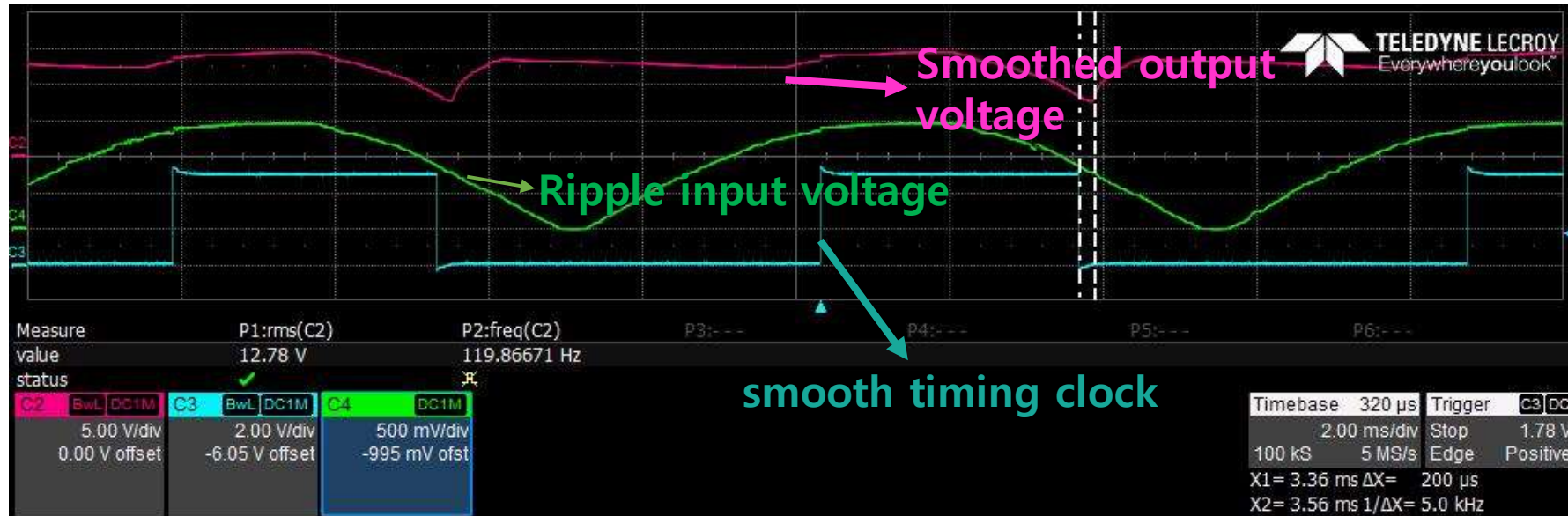


Aluminum electrolytic capacitor failure.

Catastrophic explosive venting of aluminum electrolytic capacitor Fails open or shorted. Aluminum Electrolytic Capacitors are sensitive low or high temperature environment are degradation capacitance with relatively shorter life spans.

Smooth filter

FIDES active DC smooth filter measure



Condition

- 220V/60Hz入力、DC12V/500 Ω Load。 Smooth capacitance 2.8 μ F
- Generally aluminum electrolytic cap 105 $^{\circ}$ C /2000h, 1/2 service life short over 10 $^{\circ}$ C each.
- This solid type smooth filter technology are 100Kh MTBF at -30 $^{\circ}$ C ~105 $^{\circ}$ C 100Kh.

Standby power IEC62301-2

Power control by standby power control based on patented technology



IEC62301-2 standby power comparison

Prior art	patented technology
Over 1W	<50mW
200,000 units standby power 200kW/h	200,000 units standby power 10kW/h

1/20 Savings



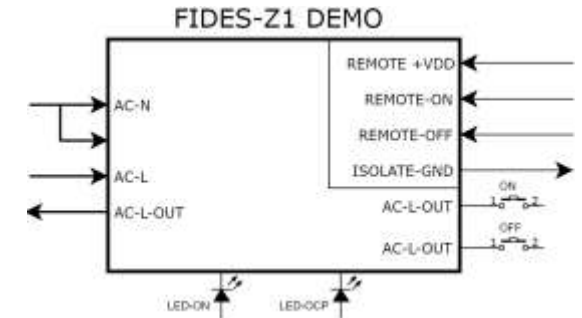
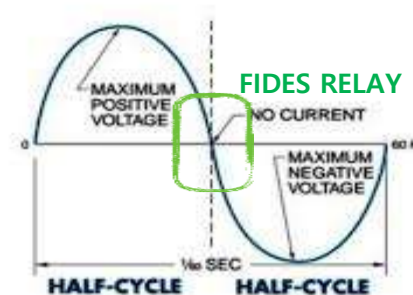
FIDES-ZERO MCCB(HEMR) DEMO

Demonstration video : <https://www.youtube.com/watch?v=8hJlrS-Ofc8>

FIDES-ZERO (HEMR) Hybrid Electro Mechanical Relay advantages.

FIDES remote control relay module are contributes to improved reliability and dramatically driving without contact arcs and melt off.

- Trip time less 200uS
- Surge and noise resistant and EMI free
- No EMI noise and inrush current suppressed
- Contact resistance less 10mΩ
- Electrical life 1×10^5 IEC 60947-2
- Mechanical life (On/Off durability) 1×10^5 IEC 60947-2
- Load current A to 50A (Over 100A(Special order))
- Rapid response(synchronized zero crossing at turn on)
- No leakage current(less 600uA)
- Over load Protection(50A@220V)
- Zero crossing supports (Avoid electric arcs even during vibration)
- Exquisite programmable overload type support
- No contact arcs and contact weld resistance.
- Optical isolation communication On/Off
- Instant setting Class A, B, C, D, K and Z Type or any desired OCP.
- Over temperature detection.
- Wide operating temperature $-40 \sim +85^\circ\text{C}$



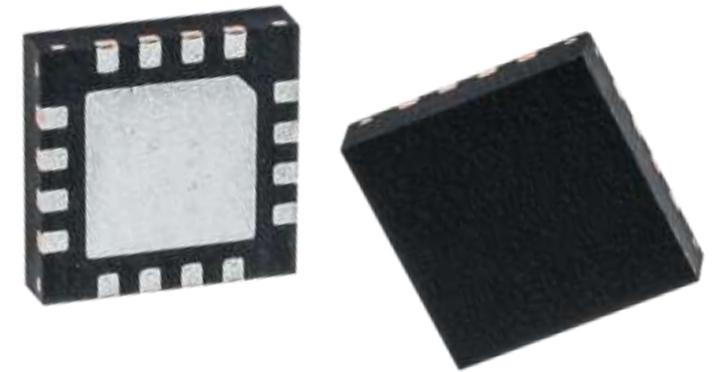
FIDES-Z1 IC

Main applications

- Battery management systems and DC charging stations for e-mobility applications
- Photovoltaic and energy storage systems
- Uninterruptable power supplies
- Building AC distribution management and Industrial electric control breakers

Main features and benefits

- High current capability of up to AC 800A
- Rated operational voltage V_e 42-660 V AC
- Zero crossing contact are high-speed arc extinguishing
- Insulation voltage > 4000 V
- Extremely high speed contact time (less 100uS)
- EMI free
- Long service life
- Very low self power consumption
- All inside AC-DC, OCP, Temperature sensing, Isolation remote control
- Instantly adjustable OCP, Temp condition.



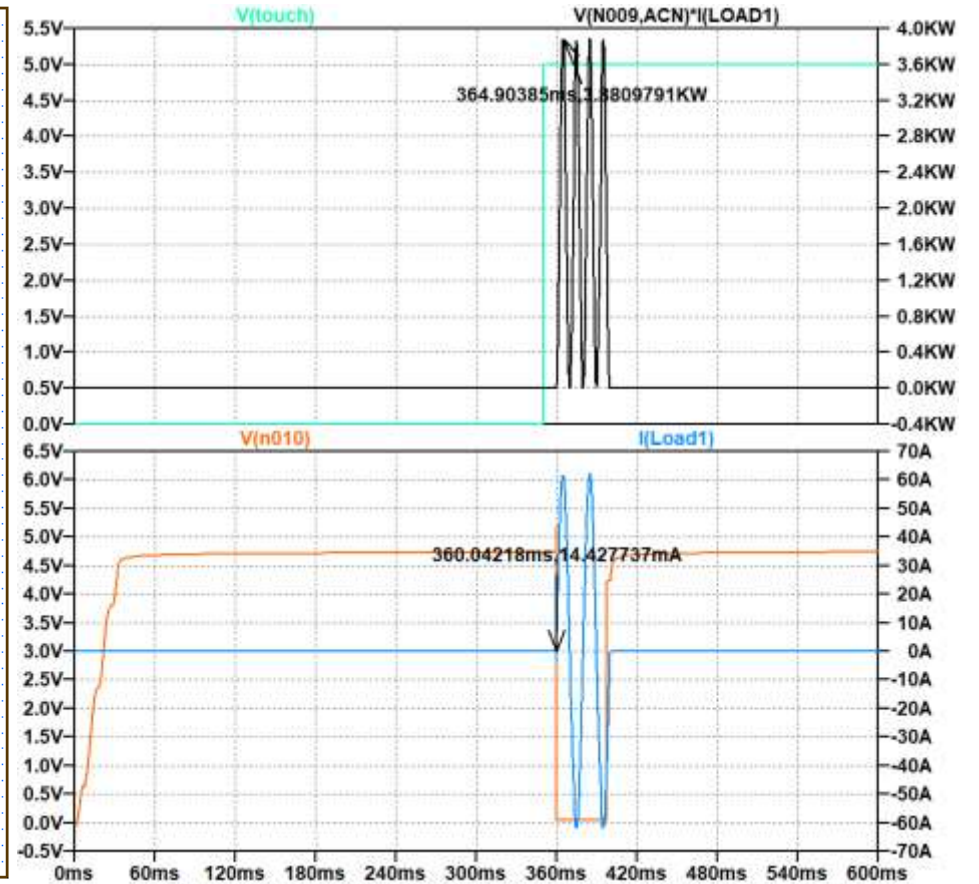
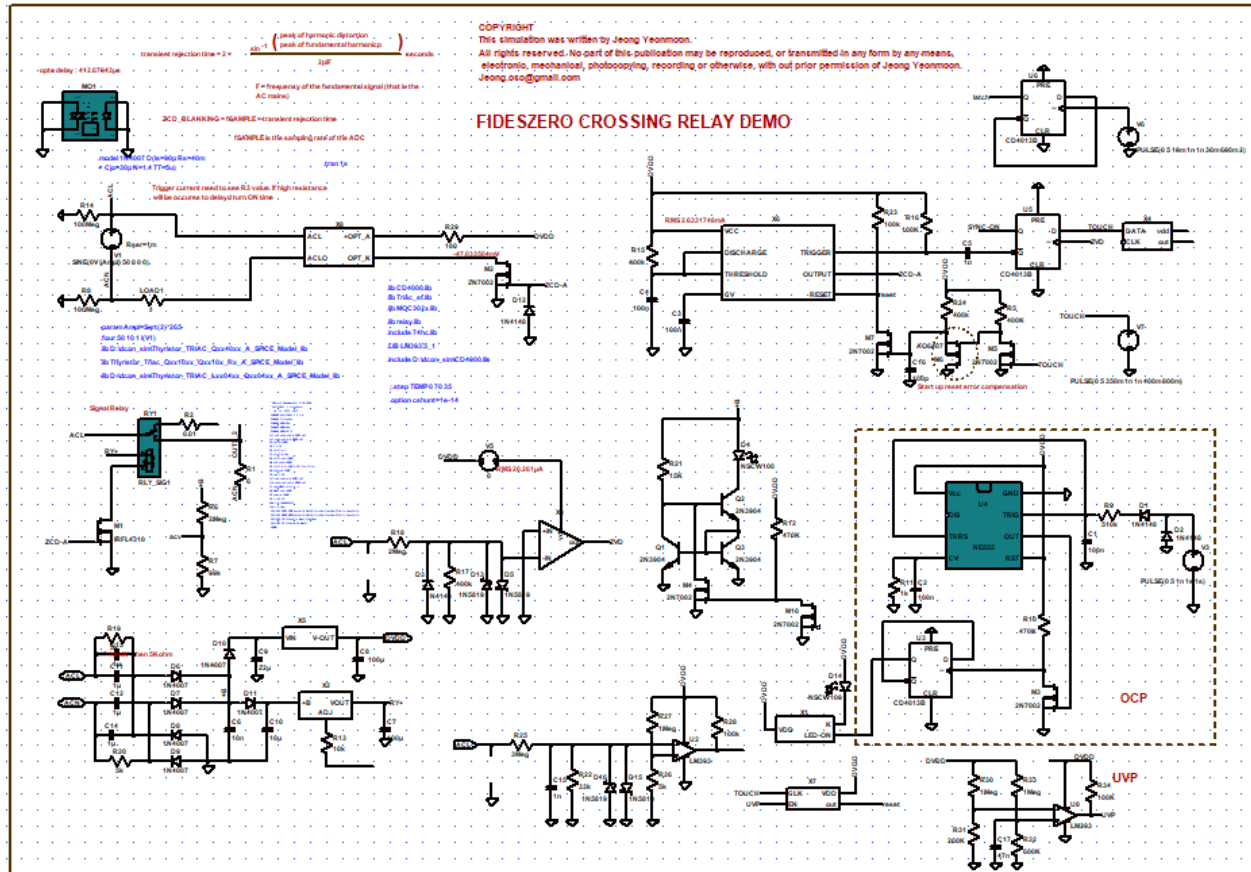
FIDES-Z1

Zero crossing MCB driver IC

Preordination



Zero-crossing magnetic relay simulation

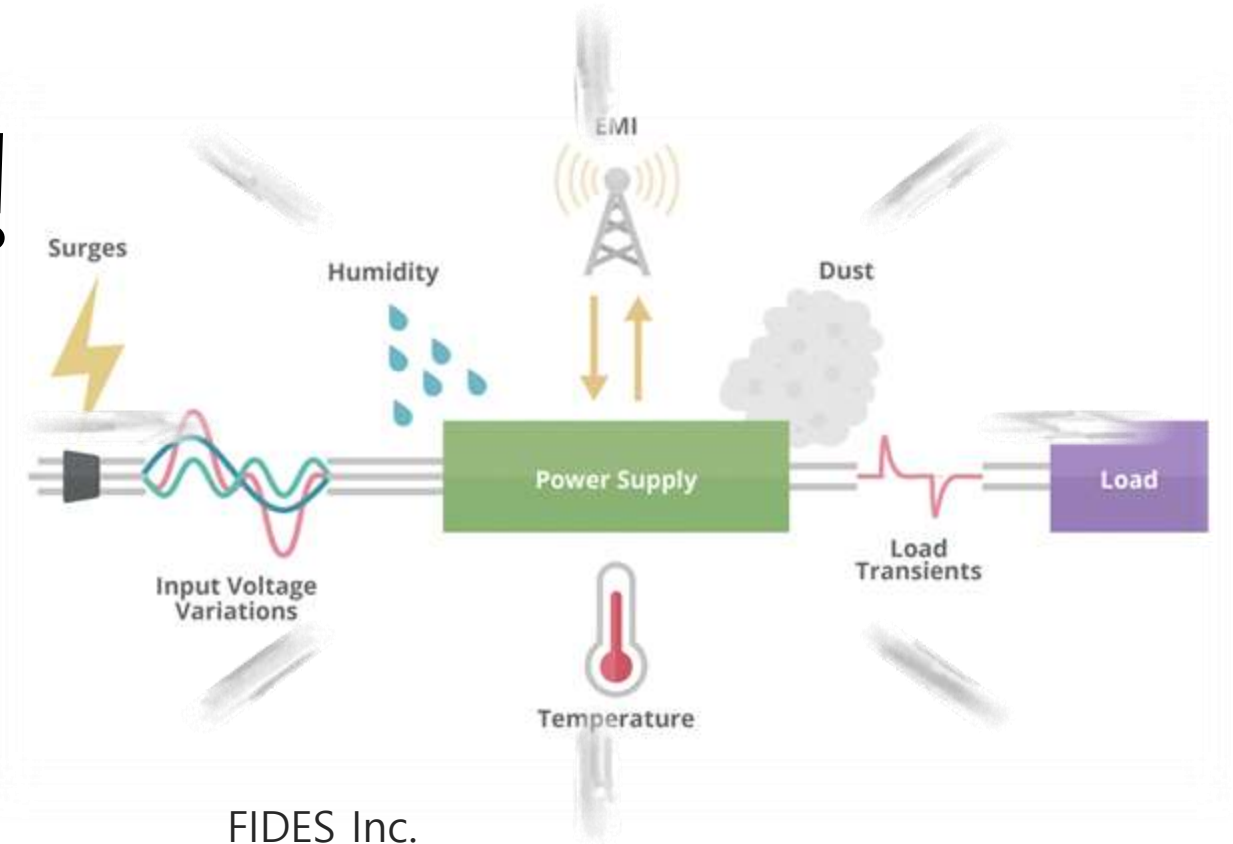


Thank you!

Do you have any questions?

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