



UNISONIC TECHNOLOGIES CO., LTD.

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UTC Product Introduction

Integrated Device Manufacturer



Power & Analog Integrated Circuit
High-quality Semiconductor Device



Site	Capacity	
Taiwan x 2 China x 6	1. Circuit design 2. Pattern layout 3. Process development	Design
(XiaMen) Jaysun Semiconductor Manufacturing	6" CMOS/BiCMOS/DMOS 50k->100k(2019)/ month	Wafer
(FuZhou) Fushun, Heshun Microelectronics	8",6"CMOS/Bipolar/BiCMOS 100k / month	Packaging
(FuZhou) Fushun Semiconductor Manufacturing	Assembly / Final test 400M / month	Sales
Taiwan, China, Korea, Japan, Germany, Turkey, USA		

Vertical Integration



Product Tree

IC (Integrated Circuit)

PWM Controller

Lighting Driver

Photo-Coupler

Voltage Reference

DC Converter

Regulator / LDO

USB Power Switch

Reset / Volt. Detect

Comparator

74- Logic IC

Op Amplifier

Audio IC / Amplifier

RS-232/485 IC

Darlington Driver

Hall IC

Special IC

Discrete Component

FRED Diode

Bridge Rectifier

Schottky Rectifier

Super-junction
MOSFET

Low- V_F Rectifier

Planar MOSFET

Digital Transistor

Trench MOSFET

Power Transistor

JFET

TRIAC

SCR

IGBT

TVS / ESD Array

Power / Lighting Application

Mobile Charger

(cellphone, battery pack, USB powered device...)

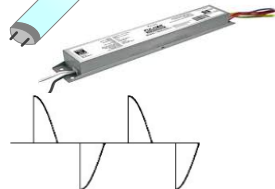
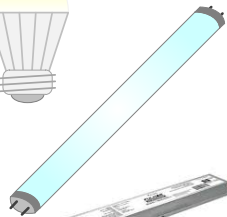


Adaptor

(Laptop, set-top box, WiFi router, monitor...)

Power Module

(Desktop, PoS, server, whitegoods, TV...)



Lighting / Dimming Power Control

(Bulb, tube, ballast, dimmer, power control)

AC-DC PWM
Controller IC

Lighting Driver

2nd-side
supporting IC

High-voltage
Discrete
Component

2nd-side Discrete
Component

Fly-back Green Mode (60W)

Primary-side Regulation (20W)

Isolated PSR driver

Non-isolated buck / linear driver

Photo-Coupler

Volt. Ref. (TL431)

CC/CV Circuit (TL431+Op Amp)

Supervisory IC

Bridge Rectifier (ABS/DFM/MBF/MBS)

Fast-recovery Diode (SMD/THD/Axial)

Depletion MOSFET (UF601Q)

Planar MOSFET (~1500V)

Super-junction MOSFET (500~950V)

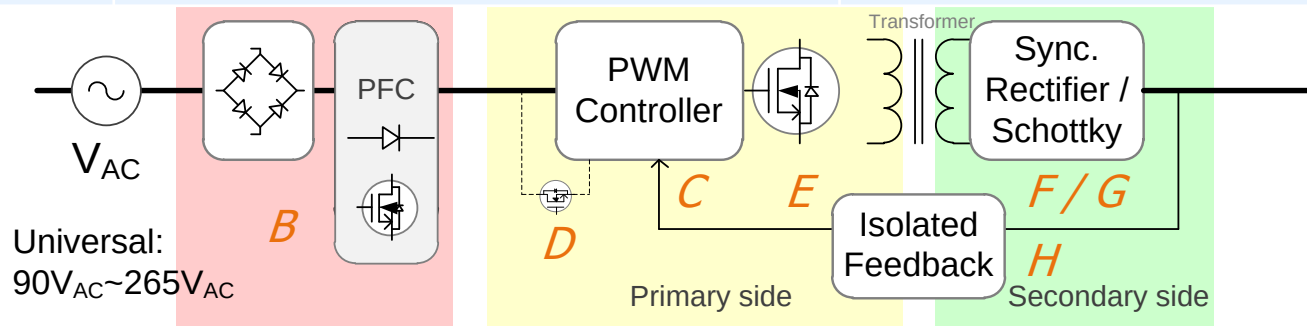
SCR (~1000V)

TRIAC (~900V)

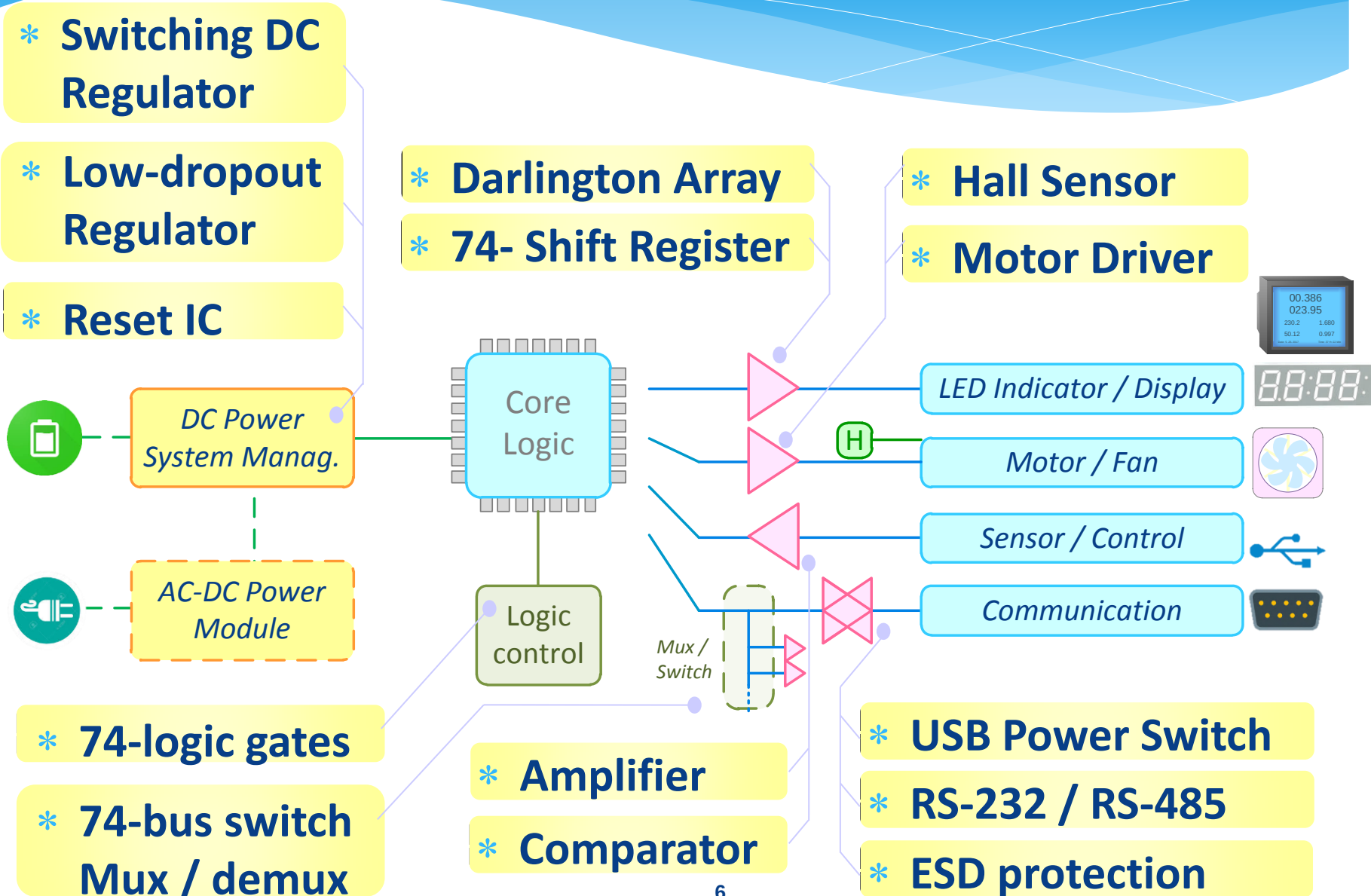
MOSFET (DFN5060 DFN3030)

Schottky/MGBR/TGBR low- V_F

	Product	PN. (for Power Module)	
A	Bridge Rectifier	1~2A for low power application	
B	High-volt. Diode / FRED	600V+, mostly <5A, general/fast/superfast	
C	PWM controller IC (Flyback topology: up to 60W)	PSR: save usage of supporting IC MOSFET integrated: save usage of HV MOSFET	
D	Depletion MOSFET	Optional: only for low-consumption circuit	
E	High-volt. MOSFET (Planar / Super-junction)	PFC: 500~600V 110VAC: 600~700V 220VAC: 800~1000V	Current determined by Output-power
F	Schottky rectifier / MGBR / TGBR	Voltage determined by Output-voltage 40V for 5V _{OUT} , 100V for 12V _{OUT}	Current determined by Output-current
G	Synchronous Rectifier MOSFET		
H	Supporting IC (not in PSR topology)	TL431 + photo-coupler (UPC816/817) or UM60x (V _{REF} + 2*Op Amp) for both CV / CC	
	Thyristor (power-control)	BT169 (SCR), UZ0103 (TRIAC)	
	TVS (snubber/surge)	P6KE, SMDJ	



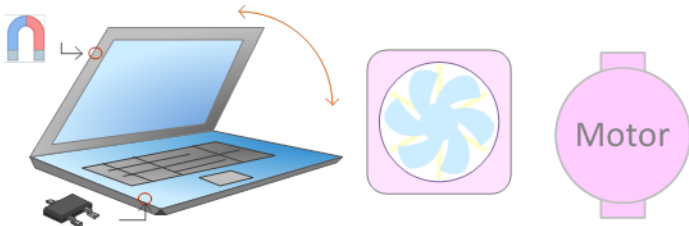
Mainboard Parts



Special Application

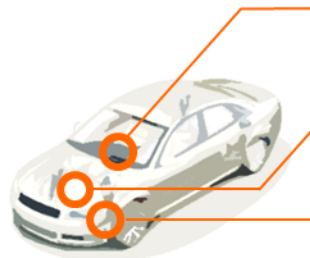
Hall Sensor

- ✓ UH81xx: Magnetic Proximity Sensing
- ✓ SK18xx: Flow Meter / Motor Application



Automotive

- ✓ Mainboard parts: for Navigation / Audio / Infotainment System
- ✓ Power Management IC
- ✓ Ignition / Flasher / Wiper IC



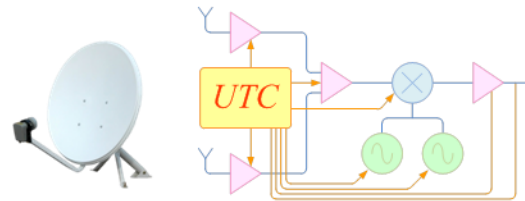
Telecommunication Security

- ✓ Telephone Speech IC
- ✓ Voice Switched Speaker-phone
- ✓ Cordless Phone
- ✓ Ringer Circuit



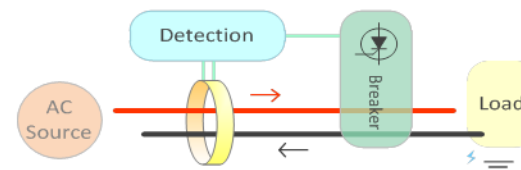
Low-noise Block

- ✓ FET Bias Controller
- ✓ Polarization Switch

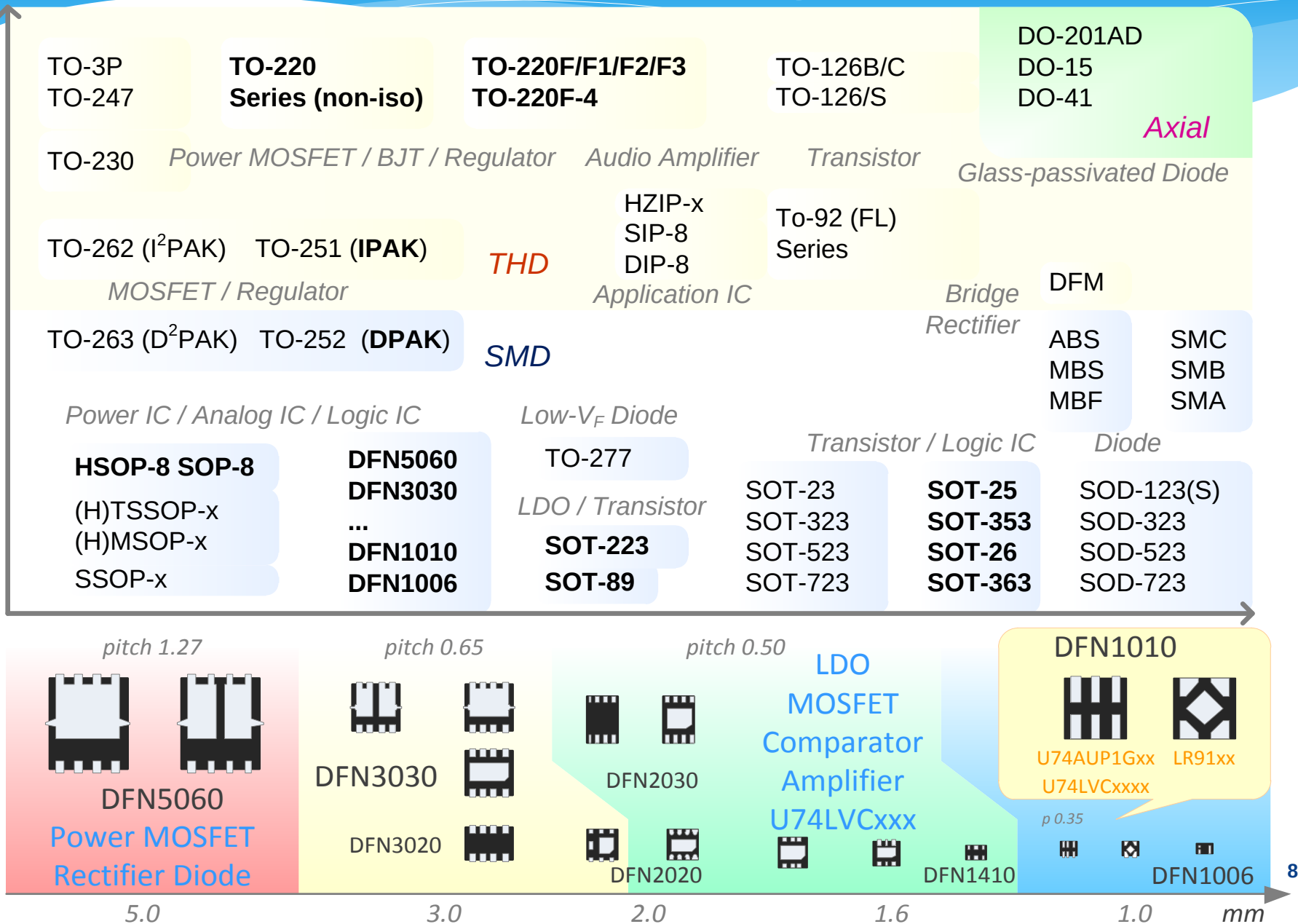


Leakage / Fault Protection

- ✓ Safety Power Socket
- ✓ Water-related Appliance



Package Portfolio



Discrete Component

➤ **Transistor**

➤ **MOSFET**

- Trench MOSFET (~200V)
- Planar MOSFET (~1500V)
- Super-junction MOSFET (500~950V, 0.2~75A)

➤ IGBT (600V/1200V)

➤ JFET

➤ Bipolar junction transistor

➤ Darlington transistor

➤ Digital transistor

➤ **Diode**

➤ FRED (~1200V, ~160A)

➤ Schottky diode (~200V, ~40A)

➤ MGBR/TGBR (Low- V_F , ~300V, ~60A)

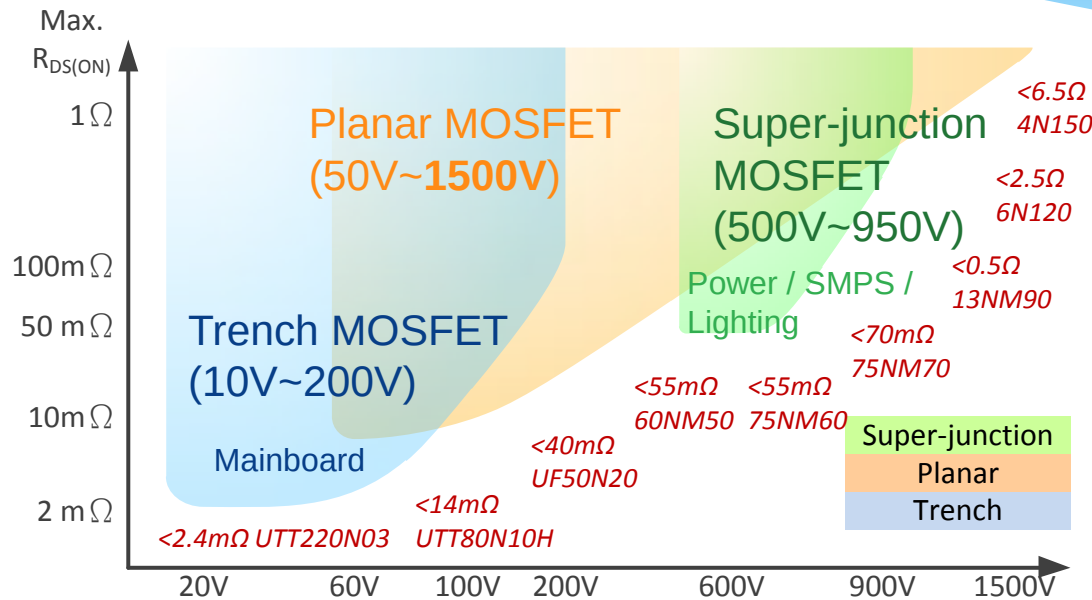
➤ TVS diode / array

➤ **Thyristor**

➤ SCR (200~1000V, ~20A)

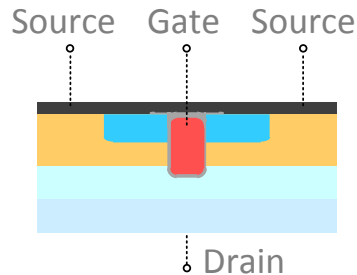
➤ TRIAC (400~900V, ~40A)

UTC Power MOSFET

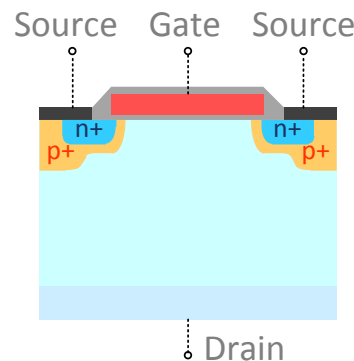


Application

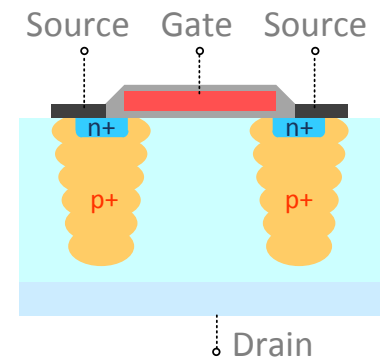
- Low-voltage Trench MOSFET
 - Mainboard application
- 100~400V Planar MOSFET
 - Motor / Industrial application
- High-voltage Super-junction / Planar MOSFET
 - AC-DC power / lighting
 - Up to **1500V**
 - Low $R_{DS(ON)}$ **$<55m\Omega$ (75A)** at 600V



Trench MOSFET
(Low R_{ch})

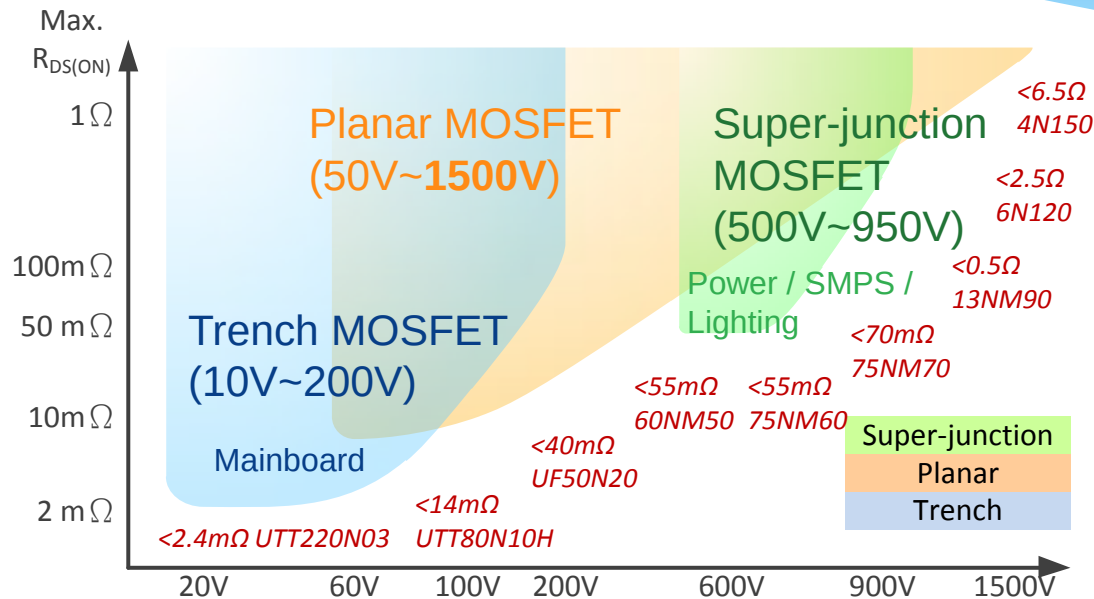


Planar MOSFET
(up to 1500V, high EAS)



Super-junction MOSFET
(Low R_{epi})

UTC Planar MOSFET



Planar Power MOSFET

V_{DSS} : up to 1500 V I_D : up to 110 A

Part No.	Type	V_{DSS}	$I_D (=X)$
UF5305	P-ch	-55V	-31A
UF5210	P-ch	-100V	-40A
UF9640	P-ch	-200V	-11A
7P30	P-ch	-300V	-6A
4P50	P-ch	-500V	-4A
UF3205	N-ch	55V	110A
UF8010	N-ch	100V	80A
UF50N20	N-ch	200V	50A
12N30	N-ch	300V	12A
XN40	N-ch	400V	up to 25A
XN50	N-ch	500V	up to 26A
XN60	N-ch	600V	up to 22A
XN70	N-ch	700V	up to 25A
XN80	N-ch	800V	up to 12A
XN90	N-ch	900V	up to 12A
XN100	N-ch	1000V	up to 9A
XN120	N-ch	1200V	up to 6A
XN150	N-ch	1500V	up to 4A

➤ Planar MOSFET name rule:

Current + N/P + Voltage

e.g. 2N60: 600V, 2A (package/ $R_{DS(ON)}$ related)

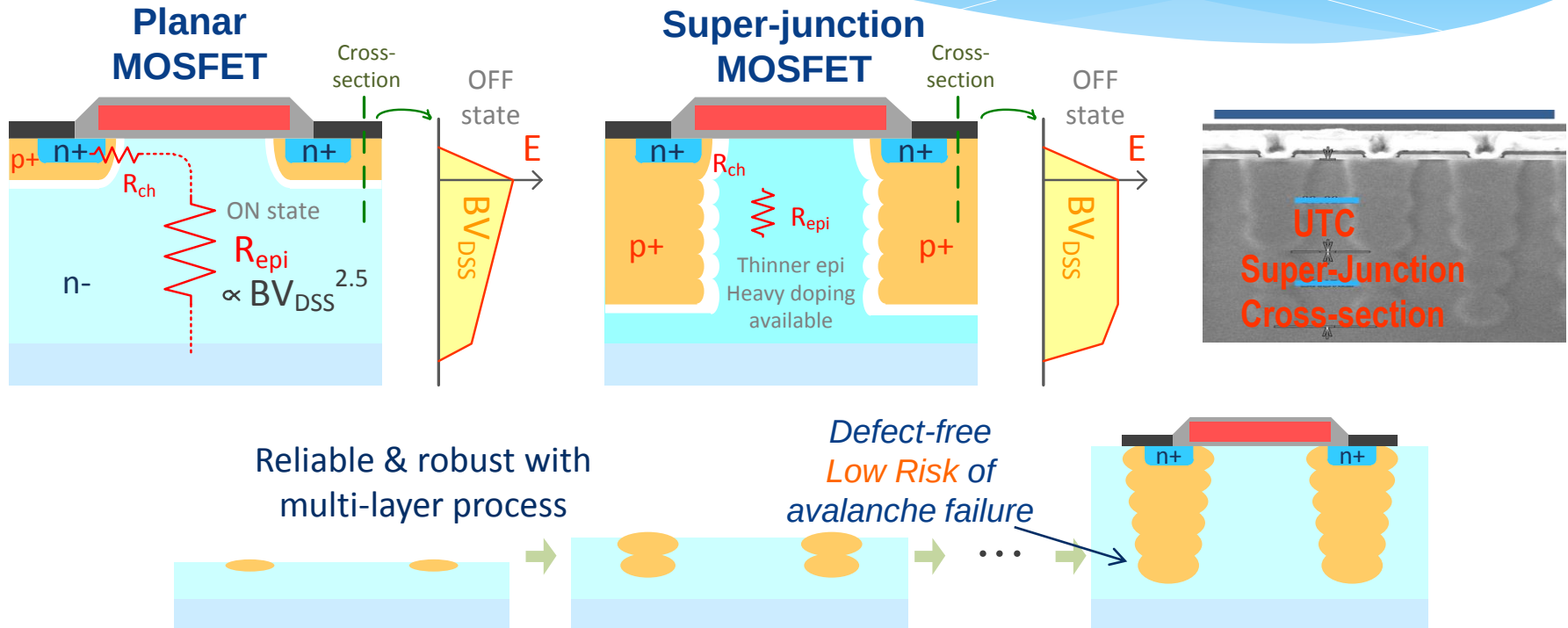
➤ Efficiency:

$R_{DS(ON)}$: smaller->better (higher cost)

Switching speed: EMI related

Super-junction MOSFET

□ Super-junction MOSFET



Comparison	7N65	7NM65
RDS (ON) max.	1.2 Ω	0.9 Ω
Gate Charge	29 nC	21 nC
Die size	100%	35%

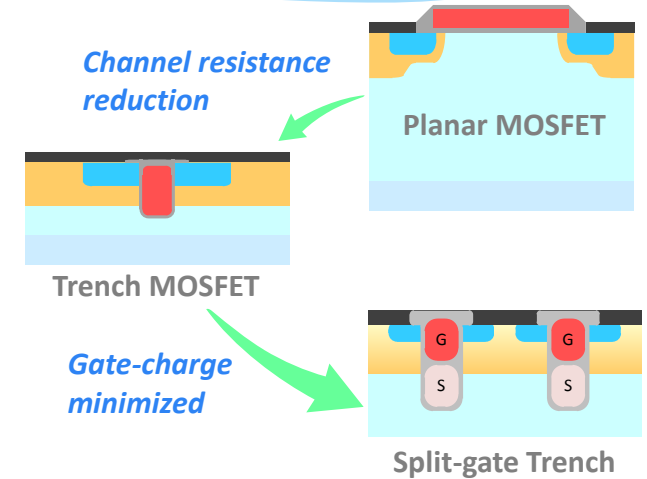
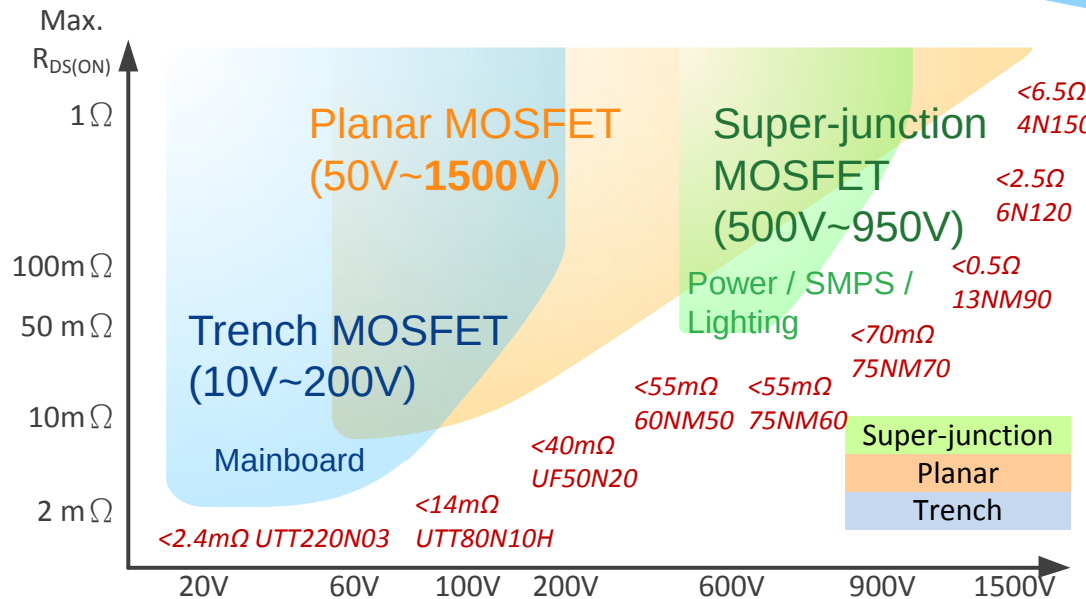
Low $R_{\text{DS(ON)}}$

Fast Switching

Small Package

Part No.	V_{DSS}	$I_{\text{D}} (=X)$	$R_{\text{DS(ON), MAX}}$
XNM50	500V	0.4A~60A	55m Ω
XNM60	600V	0.2A~75A	55m Ω
XNM65	650V	0.2A~60A	65m Ω
XNM70	700V	0.2A~75A	70m Ω
XNM80	800V	2A~13A	0.35 Ω
XNM90	900V	2A~13A	0.50 Ω
XNM95	950V	6A~9A	1.20 Ω

Low-voltage MOSFET



Trench MOSFET structure:

- Reduce conduction resistance or die size
- Various SMD package combo MOSFET available
- Power / signal switching application

Part Number	V_{DSS} (V)	I_D (A)	$R_{DS(ON)}$ (mΩ)		Package
			TYP.	MAX.	
UPD02R095L	-20	-40	7.6	9.5	DFN5x6
UTT50P06	-60	-50	12	15	TO-252
UTT25P10	-100	-25	-	150	TO-252
UTT130N06M	60	80	-	5.9	DFN5x6
UTT60N10M	100	60	15	16	DFN5x6
UFB4321H	150	83	-	13.8	TO-263

Signal switching MOSFET

PN	V _{DSS}	V _{GS(th)} (V)		PN	V _{DSS}	V _{GS(th)} (V)		PN	V _{DSS}	V _{GS(th)} (V)	
	(V)	MIN.	MAX.		(V)	MIN.	MAX.		(V)	MIN.	MAX.
UT6302	-20	-0.7	-1.5	BSS84Z	-50	-0.8	-2.0	UM6K31N	60	1.0	2.5
UT3P01Z	-30	-0.4	-1.4	UK2158	50	0.5	1.1	UMBF170	60	1.0	-
UK3018	30	0.8	1.5	BSS139Z	50	0.5	1.5	2N7002	60	1.0	2.5
UT3N01Z	30	0.4	1.3	UK1398	50	1.0	3.0	2N7002K	60	1.0	2.5

Low V_{GS(TH)} MOSFET

PN	Maximum		V _{GS(th)} (V)		R _{DS(ON)} (mΩ) at V _{GS} =					
	V _{DSS}	I _D			4.5V		2.5V		1.8V	
	(V)	(A)	MIN.	MAX.	TYP.	MAX.	TYP.	MAX.	TYP.	MAX.
UT2340	-20	-2.0	-0.40	-1.50	52	70	78	110	-	210
UT3413	-20	-3.0	-0.30	-1.00	81	97	108	130	146	190
UT2302	20	2.4	0.45	-	-	50	75	95	-	-
UT2308	20	2.7	0.40	1.00	-	80	-	110	-	-
UT3414	20	4.2	0.40	1.00	41	50	52	63	67	87
UT3416	20	6.5	0.40	1.00	18	22	21	26	26	34

DFN package options

Part Number	V _{DSS}	I _D	R _{DS(ON)} (mΩ)		Package
	(V)	(A)	TYP.	MAX.	
UTT130N06M	60	80	-	5.9	DFN5060
UTT60N10M	100	60	15	16	DFN5060
USG80N10*	100	86	6.4	7.7	DFN5060

Combo solutions available

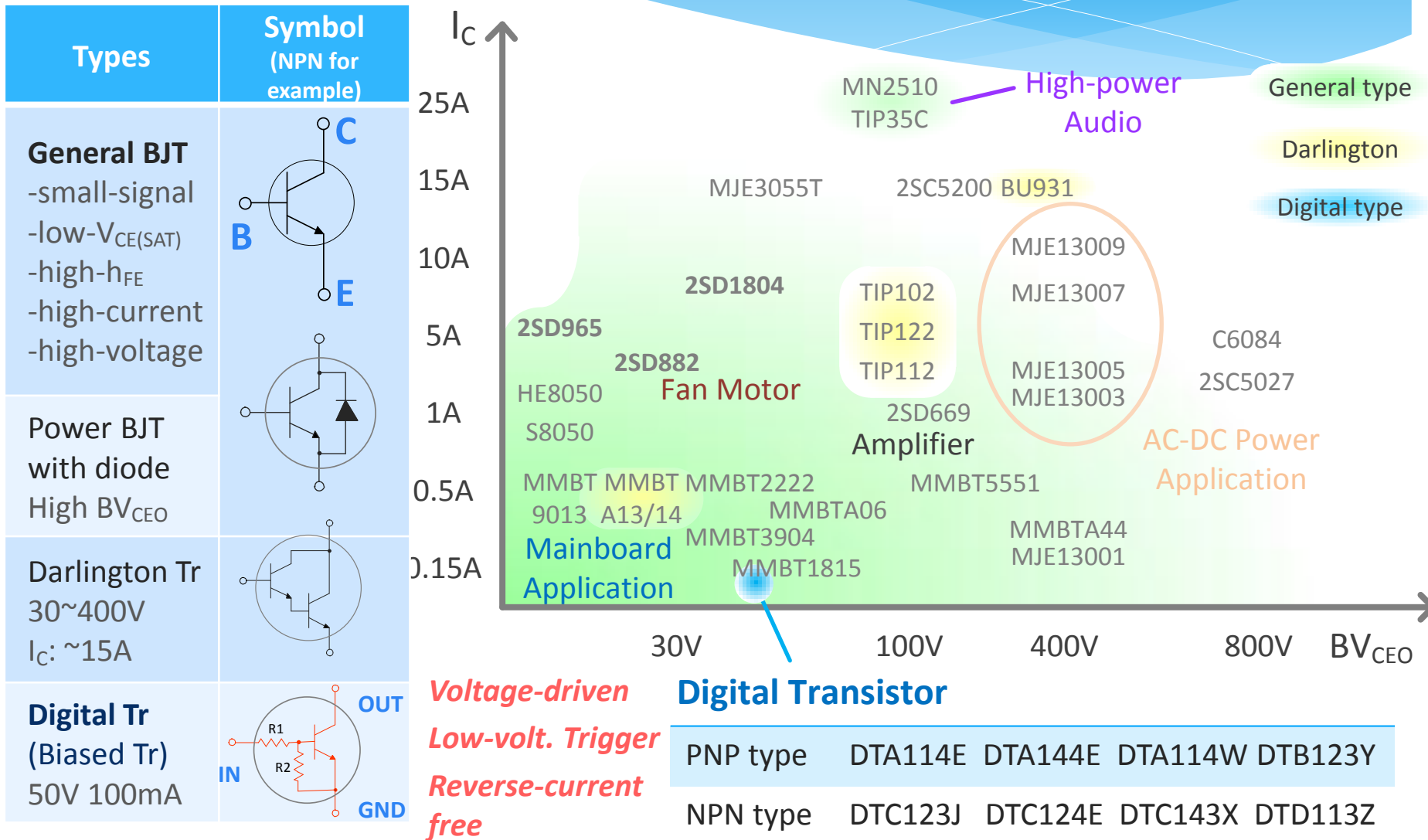
Config.	V _{DSS}	Package
N-ch x2	20V ~ 600V	SOT-26 SOT-363 TSSOP SOP DIP DFN3030 DFN5060
P-ch x2	-20V ~ -50V	SOT-363 SOP-8
N-ch + P-ch	±20V ~ ±100V	SOT-26 TO-252-4 SOP-8 DIP-8 DFN3030 DFN5060
Nx2 + Px2	±30V ~ ±100V	SOP-8

Cross-Reference

➤ MOSFET

Product Category	UTC Example	Competitor	Competitor PN
Super-junction MOSFET (500~950V)	xNM60 xNM65 xNM80 xNM90	Infineon ST Toshiba	STD7NM64N IPI90R500C3
Planar MOSFET (up to 1200V)	12P10 UF9640 4P50 UF3205 UF630 UF830 15N20 xN40 xN60 xN65 xN80 xN100	Vishay IR (Infineon) Fairchild (On-semi)	IRF9640 IRF3205 IRFP22N60K FQP10N80C
Low Voltage Trench MOSFET (10 ~ 200V)	UT4101 UT3419 UM6K1N UTT50N06	On-semi AoS Rohm Toshiba	NTR4101P AO3419
Signal Switching MOSFET	BSS84ZT BSS139Z 2N7002K BSS127	NXP Diodes Rohm	BSS84 2N7002K
Combo MOSFET (N-ch x 2, P-ch x2, N+P)	UD9926 QS8M11 UD4606 1NNPP10	Fairchild (On-semi) Rohm AoS Diodes	FDS9926A ZXMHC10A07N8

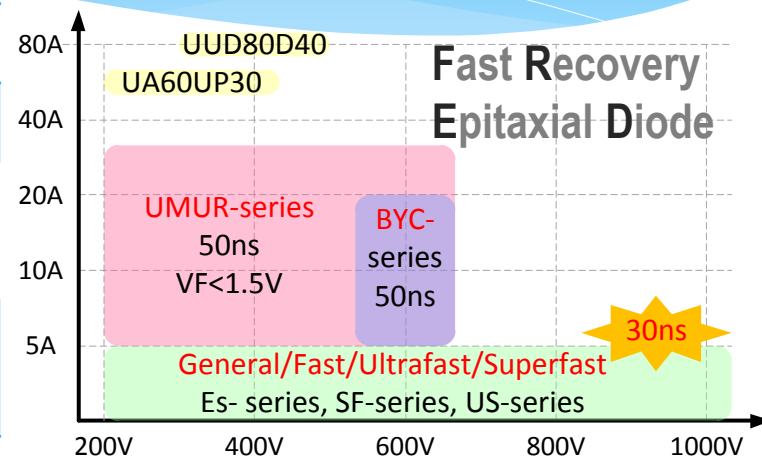
Bipolar Junction Transistor



Rectifier Diode

➤ Rectifier

Category	Spec. Coverage
Bridge Rectifier	1000V, DFM, ABS, MBS, MBF package
FRED rectifier	1200V (UHRP15120), 80A (UUD80D40) Ultrafast / Superfast grade available
Low- V_F Schottky rectifier	Schottky (SB / MBR series): 200V, 40A MGBR / TGBR: 300V, 60A

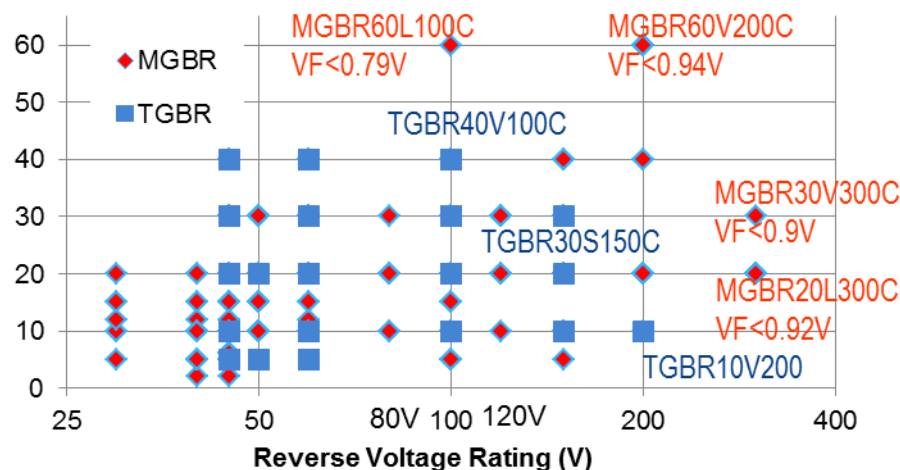


➤ High-efficiency Schottky

	Schottky SB / MBR	MGBR	TGBR
V_F	Low	Very Low	Very Low
I_{RM}	High	Low	Low
V_{RM}	Medium (~200V)	High (~300V)	Medium (~200V)
T_j	Low	Very High (~ 200°C)	High (~ 175°C)

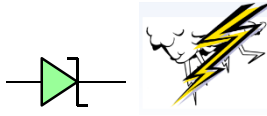
Current
Rating (A)

UTC Low- V_F Schottky Portfolio



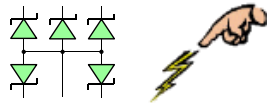
UTC TVS Diode & Array

➤ Surge Protection Diode



TVS Series	Power Rating (10/1000μs)	Package
P6KExxx	600W	DO-15
SMDJxxx	3000W	SMC
SMCJxxx	1500W	SMC
SMBJxxx	600W	SMB
SMAJxxx	400W	SMA

➤ ESD Protection Array



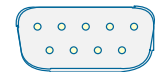
Part Number	power rating (8/20μs)	Package
SMA5V	50W	SOD-523
SOT05C	140W	SOT-23
UESDA6V1W5	150W	SOT-353
USMS05	350W	SOT-26
UZ5C056	150W	SOT-26

➤ High-speed-signal ESD



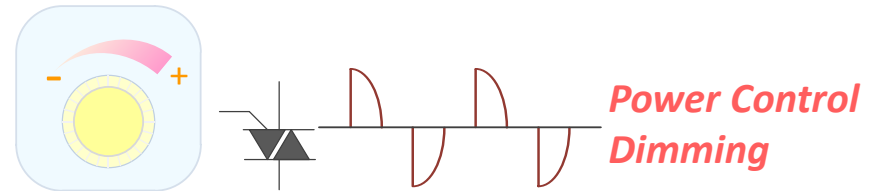
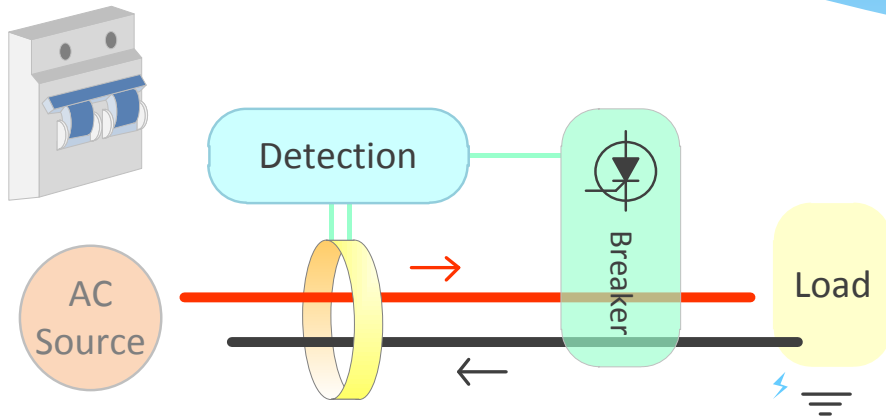
Application	Part Number
USB 2.0 Charger, USB OTG	USB4S012
Firewire , DVI and Ethernet	SRV05-4
DVI, Ethernet and USB2.0	UPRTR5V0U4D
DVI, Ethernet and USB2.0	PUSB220
HDMI LVDS SATA Ethernet	TVS4S009

➤ ESD-proof I/O Circuit



Application	Part Number	Protection
1284 Port	URCZ1284-xx	8 ESD+EMI array
VGA port	CCVGA7C5	RGB matching
	CCVGA7C9	RGB matching + DDC level-shift
	VGA7S019	RGB matching + DDC level-shift

Thyristor



SCR ($V_{\text{DRM}}=200\text{V}\sim 1000\text{V}$, $I_{\text{T(RMS)}}=0.47\text{A}\sim 20\text{A}$)

Part Number	V_{DRM}	$I_{\text{T(RMS)}}$	I_{GTMAX}	Package
CR03AM-12	600	0.47	0.1	TO-92
X0202/A	600 800	1.25	0.2	SOT-223 TO-92
ML1225 / XL1225 PCR406	300 400	0.8	0.2	SOT-23 TO-92
MCR100	200~600	0.8	0.2	SOT-89 SOT-23 TO-92
US112	400~600	12	0.2~15	TO-251 TO-252 TO-220

TRIAC (3-Q/4-Q)

($V_{\text{DRM}}=400\text{V}\sim 900\text{V}$, $I_{\text{T(RMS)}}=0.6\text{A}\sim 40\text{A}$)

Part Number	V_{DRM}	$I_{\text{T(RMS)}}$	$I_{\text{MAX,GT}}$	Package
MAC97A	400~600	0.6	5	TO-92 SOT-223
UT131	500~800	1.0	3	TO-92 SOT-223
UT136	500~800	6.0	10~50	TO-220 TO-220F TO-252
BTA312 BTB312	600~800	12.0	5~50	TO-220 TO-220F
UCR316CM	600	16.0	20~30	TO-220 TO-220F

Cross-Reference Example

➤ Discrete Components

Product Category	UTC Example	Competitor	Competitor PN
High Power BJT / Darlington	2SC5200 2SA1943 (230V 15A) 2SC4467 2SA1694 (120V 8A) UN2488 UP1620 (10A hFE 5k~30k)	ST Toshiba Sxxxxxx	2SC5200 2SC4467 MN2488
Digital Transistor	DTA114E DTB123Y DTC143X DTD113Z	Rohm NXP	DTA114E
FRED Rectifier up to 1200V ultrafast / superfast	UFR75120 (1200V 75A super-fast) BYC20 ES1J FR107G UFR8060C	Fairchild NXP Diodes	RHRG75120 BYC20 ES1J
Schottky Diode / Low- V_F Rectifier	SR26 RB751V40 MBR20150C TGBR40U100C MGBR40V300C	Vishay Diodes	TMBS series SBR series
Surge Protection	P6KE SMDJxxxxx SMAJxxxxx	ST Littlefuse	P6KE SMDJ
ESD Protection (for I/O port)	TVS4S009 PUSB220 SRV05-4 UZ18C6V8 SOT05C USMS05	TI NXP On-semi	TPD4S009 BZA100
SCR (200~1000V)	BT151 US650 MCR100	NXP ST	BT151 TYN840
TRIAC (400~900V)	4Q: BTA12 UT136 3Q: BTA312A	NXP ST	BTA12 UT136

AC-DC Power Supply Part

- AC-DC PWM controller IC
 - Fly-back PWM controller of 60W
 - Primary-side Regulation (PSR) PWM solution
 - Super-junction MOSFET built-in solution
 - Lighting Solution
- 2nd-side control IC
 - Photo-coupler UPC816 / UPC817
 - Shunt-voltage reference TL431 series
 - CC/CV control IC:
TL431 + amplifiers
 - Supervisory IC

UTC AC-DC PWM Controller IC

◆ PWM IC Portfolio

**Fly-back PWM
Controller**

UC3863 SOT-26 Freq. programmable

UC3873 SOT-26 OTP programmable

HV-start

UC3869A SOP-8 OTP programmable

PSR Switcher
(Built-in MOSFET)
SOP-8 / DIP-8

US3651
(Plannar-type)
600V 11 Ω

HV-start
UCSR3652S
(Super-junction)
650V 2.4 Ω

HV-start
UCSR3654S
(Super-junction)
650V 1.6 Ω

*Support
cable-drop
compensation*

PSR Controller
SOT-26

UPSRB01
+external BJT

Power Rating

6W

12W

18W

60W

Application

Mobile phone Charger

Adaptor

Tablet Charger / STB Adaptor

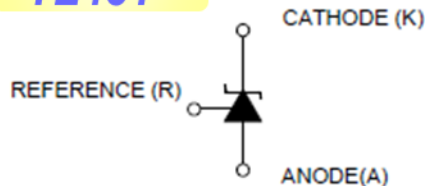
UTC Lighting Solution

Topology	Application	Part Number	Feature
AC-DC Isolated PSR	60W Lighting	UPSL101 UCL5811	High PF, high Efficiency
AC-DC Non-isolated Buck	10~30W Indoor Lighting	UPSL304 USL3533 UL98, UL82	High-PF, Ind. ballast comp. Wide-range buck with built-in MOSFET
AC-DC Linear Solution	<25W Indoor Lighting	UL51 UL52 UL66 UL68 UL67 UL69 UL23	High-PF, bulk-cap-free Single string CC output Dimmer compatible Switching-controlled
DC Boost	20~70W DC Lighting	L5107 ULC6001	6V~45V driving
	Flashlight	L5030	Battery-driven lighting
DC Buck	Flashlight	L3010 L3012	MOSFET built-in
Ripple Removing	Illumination	ULD5131	Adapt. 100/120Hz removing
Display Driver	Sign Board	UL316	LED control with keyscan

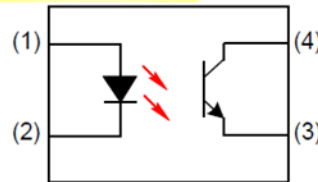
2nd-side Feedback & Monitor

- * Shunt Voltage Reference (TL431 series 0.8/1.25/2.495/2.5V)
- * Photo-coupler (UPC816/UPC817)
- * CC/CV circuit (V_{REF} + op amp)
- * Supervisory Circuit

TL431



UPC817



Ref. Voltage	Part Number
0.8 V	TL432D
1.233~1.25 V	TL432, TL432C, LM4041, M385
2.495~2.5 V	TL431, LL431, TL431L

TL431: high precision **0.5%**

LL431, ULVH431: **low** $I_{K(MIN)}$ ($< 100\mu A$)

Various options of packages and pin-assignment

CC / CV Control IC

Part No.	Configuration	V_{REF}
UM601A UM609	Vref x 1 OP x 2	1.24 V 2.5 V
UM602/A UM603/A	Vref x 1 OP x 2 Comp x 2	2.5V
UM604A	Vref x 1 OP x 4	2.5 V
UM605A/B UM606/D UM607B/D	Vref x 1 OP x 2	2.5 / 1.25 1.21 / 1.24
UM608	Vref x 1 OP x 2 for CC/CV Comp x 2 for Charge Status	2.5 V

Supervisory Circuit

12V 5V 3.3V	3513 3520 3521
CV / CC	S3515 S3525 S3527
5V 3.3V	3510 3511

DC Power Management

- Linear Voltage Regulator
 - 78-series / 79-series / LM317 series
 - Various package options
- LDO Regulator
 - Small package LDO (DFN)
 - Low-input-voltage LDO
 - Low-quiescent LDO (μA -consumption)
- DC Converter
 - Buck converter up to 65V
- Shunt Voltage Reference
 - TL431 series
 - High-precision (0.5%)
 - Low- I_{K_MIN} ($<100\mu\text{A}$)
 - Low consumption (sub- μA)
- Voltage Detection Reset IC
 - 0.9~6.2V detection
 - Open-drain / push-pull
 - Manual reset
 - Delay adjustable

Linear Voltage Regulator

Linear Voltage Regulator

Regulator Controller

Dual-output LDO

Standalone Regulator

Standard
Linear Regulator

Low-dropout
(LDO) Regulator

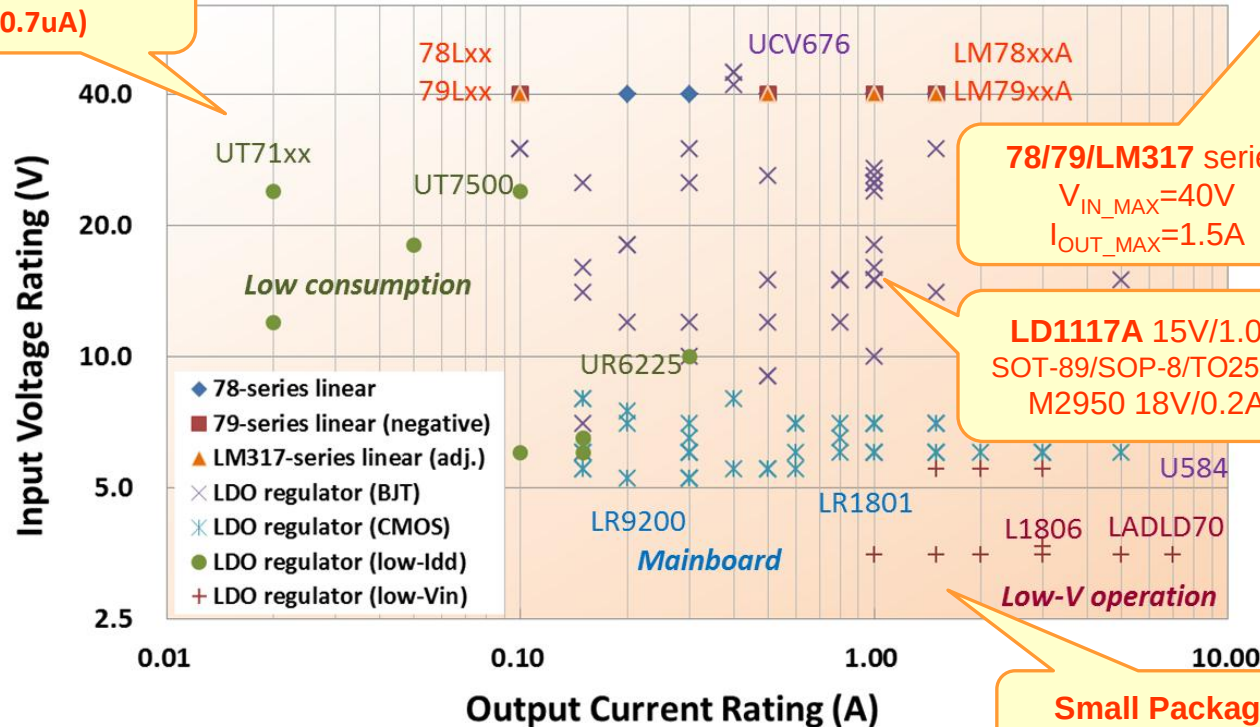
Low-voltage CMOS
LDO Regulator

CMOS Ultra-low
LDO Regulator

Low- I_Q High- V_{IN}
CMOS LDO

Low- I_Q LDO
 $I_Q < 20\mu A$
($\rightarrow 0.7\mu A$)

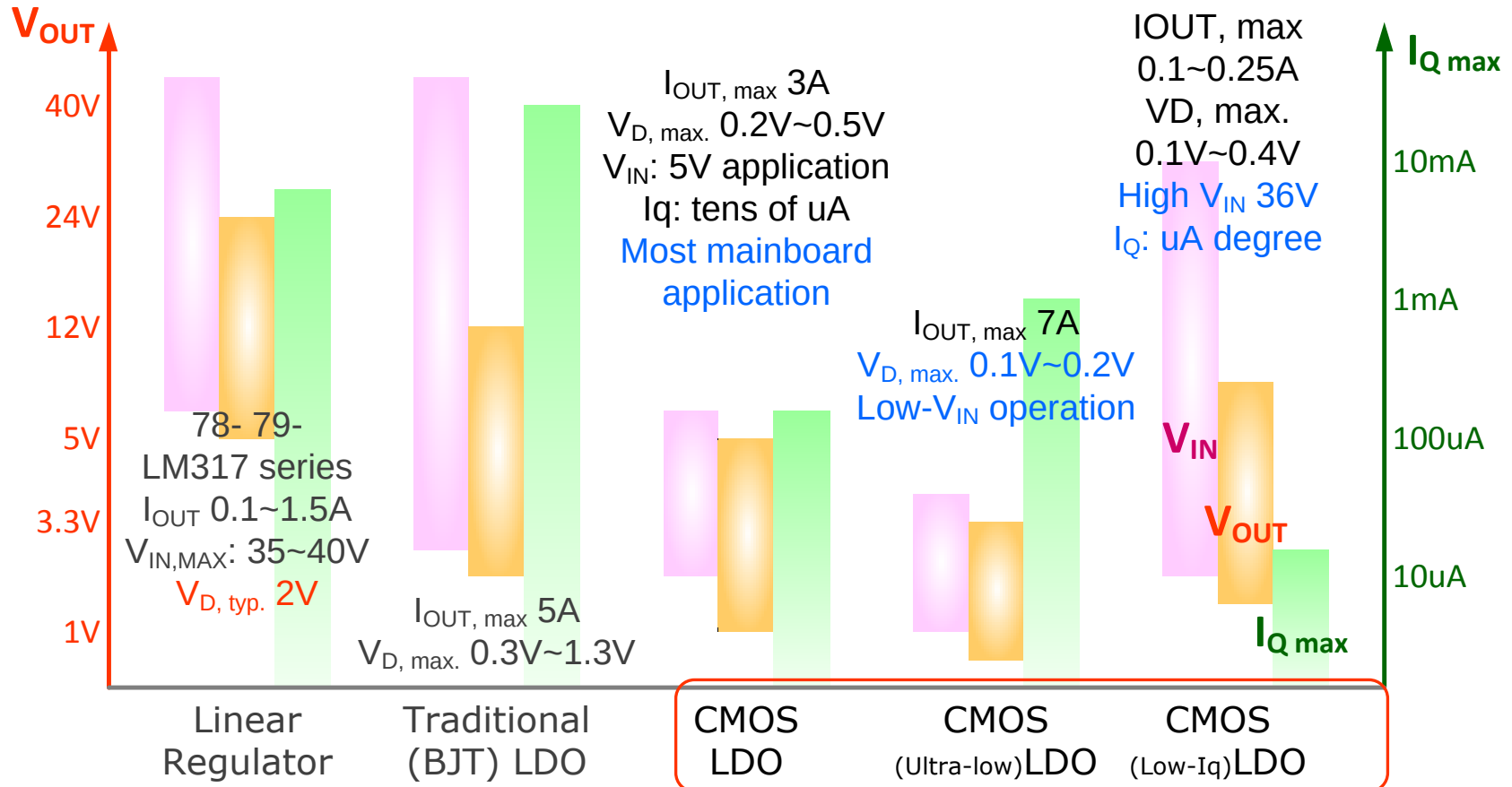
LDO / Linear Voltage Regulator Input Rating



CMOS Low-dropout Regulator

LDO development trend:

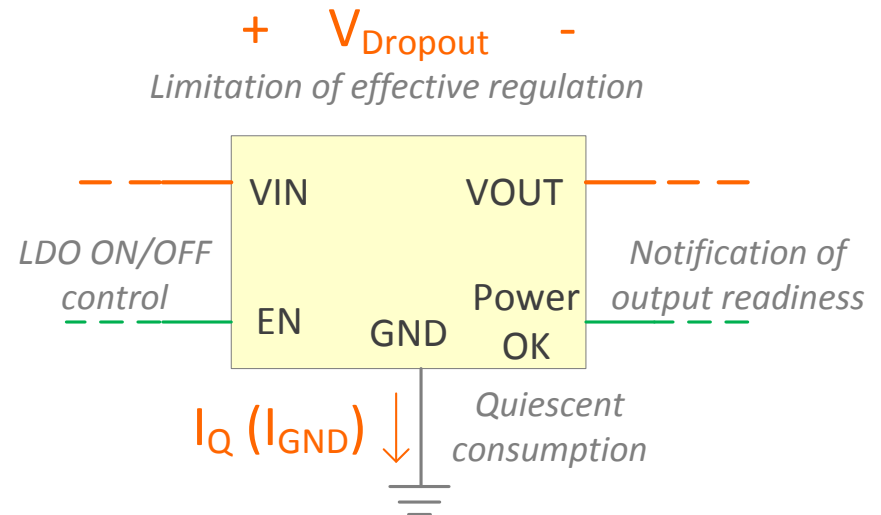
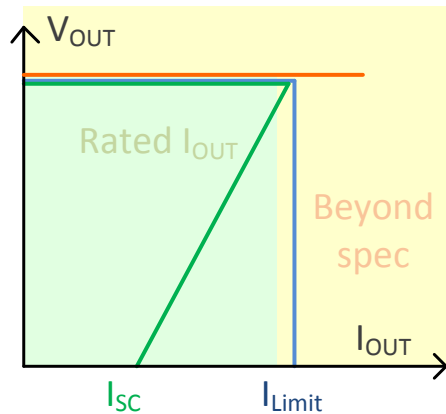
- **Low V_{IN} & low V_{OUT}**
- **Low I_Q / ground current**
- **Tiny package / high integration**
- **Soft-start, OCP, SCP**
- **System flexibility: power-on reset / auto-discharge / output SET**



CMOS Low-dropout Regulator

CMOS LDO advantage

- Less dropout voltage and quiescent current
- More protection / function



➤ CMOS LDO variants

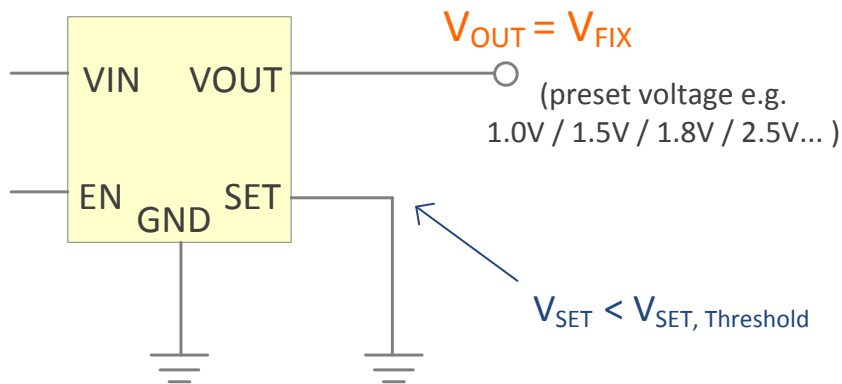
Type	Spec coverage	Example	Package
Ultralow- V_D CMOS LDO	I_{O_max} : 7A, V_{in_min} =1V, Soft Start Power-on Reset (PowerOK),	LR18120 LxxLD30	HSOP-8 HSOP-8
Low- I_Q LDO	V_{in_max} :36V, I_Q <20uA ($\rightarrow$ 0.7uA)	UR9280, UR7500	SOT-23 / SOT-89

Output FIX/ADJ LDO

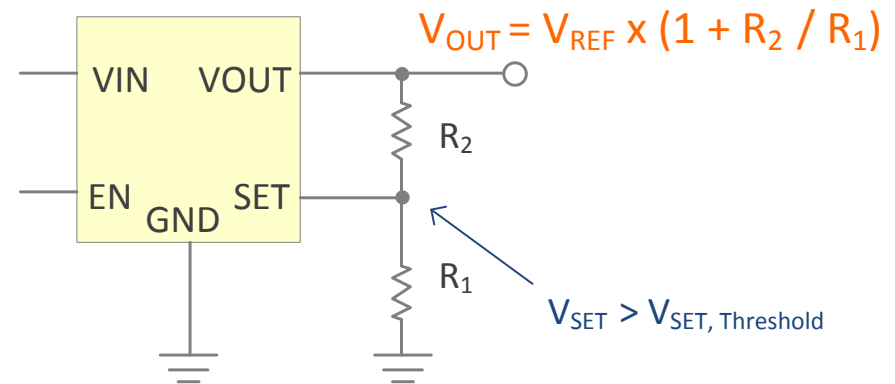
Output FIX/ADJ mode selectable LDO

➤ Provide flexibility for circuit design

LDO works in **FIX** mode



LDO works in **ADJ** mode



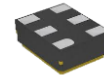
Part Number	Current	Additional features
LR2125, LR2128	0.3A	Auto discharge, soft start
LR3965, LR3865	1.5A, 2.0A	Soft-start, PowerOk
LR5966	5.0A	
LR18120, L11831	2.0A, 3.0A	Ultralow- V_D (0.3V), PowerOk Auto discharge, soft start

CMOS Low-dropout Regulator

➤ CMOS LDO variants

Type	Part Number
High PSRR CMOS LDO	LR9102 LR9500 UR6223 (PSRR 75dB~85dB)
High-accuracy CMOS LDO	LR9101 LR9102 LR9103 LR9107 LR9113 UR6223 (1%) L1806 L11831 LR18120 LXXLD series ultralow- V_D (1.5%)
Capacitor-less LDO	LR9107 LR9203
Inrush protection	LR1802 UR6223

➤ Small Package Product



Type	Spec coverage	Example	Package
Small package CMOS LDO	Mainboard 5V application	LR1801	SOT-89 / SOT-223
	Io up to 3A	LR1106	DFN1.8x2.0
	High accuracy / high PSRR /	LR9102	DFN1.6x1.6
	low- V_{IN} / auto-discharge	LR9103	DFN1.0x1.0
Dual-channel	V_{in_max} : 6~16V, I_{o_max} : 1A * 2	LR6401, LR3xxyyB	DFN1.8x2.0, SOT-26

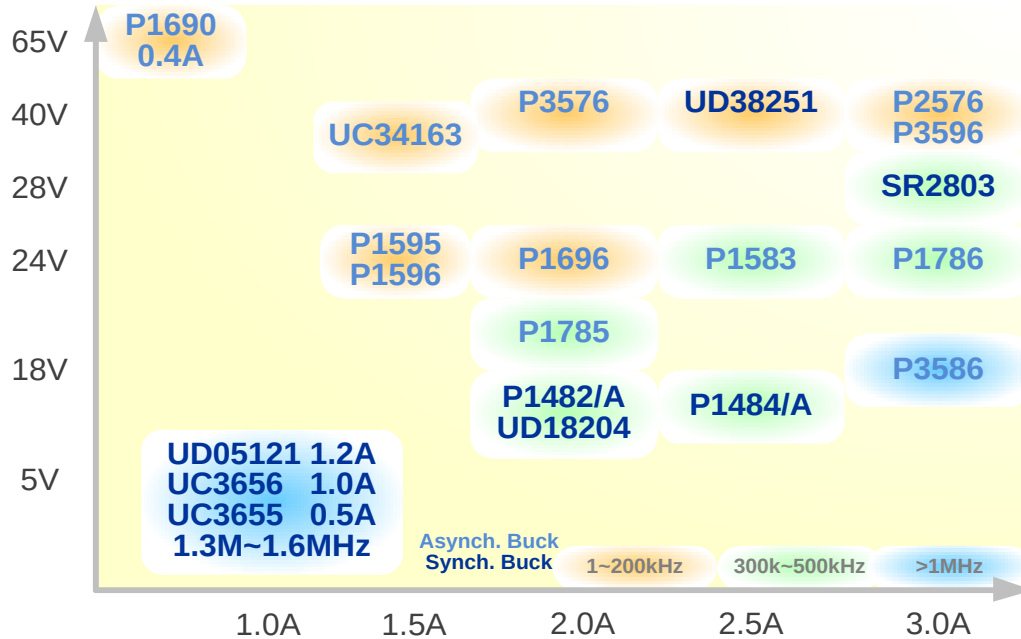
Cross-Reference

➤ Voltage Regulator

Product Category	UTC Example	Competitor	Competitor PN
Linear Regulator -- Positive / Adjustable/ Negative DFN / SOT-89 / SOT-223 / SOP-8 / TO-252 (DPAK) / TO-263 (D2PAK) / TO-251 (IPAK) / TO-262 (I2PAK) / TO-92 / TO-126 / TO-220 / TO-220F	78Lxx LM78xx 78Dxx LM78xxA LM317 LM317A 79Lxx LM79xxA	TI (Texas Instrument) ST Fairchild (On-semi)	78L05 LM7805 78D12 LM7824 LM317 LM317A 79L05 LM7912
LDO (Low-dropout) Regulator	LD1117 LP2950 78R05 UZ1084	ST On-semi Rohm	LD1117 LP2950 78R05 UZ1084
CMOS LDO Regulator 5.5~10V input, consump. 20~200μA Enable function, small package	LR1801 (1A SOT-89) LR9103 (DFN1010)	TI Rohm On-semi	TLV733xx BuxxTD NCP702xx
<i>Special CMOS LDO:</i> Ultralow-dropout ($V_D < 0.35V$) Low-quiescent (μA-level) Dual-channel LDO	LR18120 LxxLD30 LR9280 UR75xx LR6401 LR3xxyyB	Rohm Axxxx Rxxxx Txxxx Hxxxxx Gxx	R1180x HT75xx AP6401 R5323

Power Management IC

➤ Step-down Buck Converter



➤ Reset IC (0.9~6.2V)

PN	Delay	Misc
81xx	-	
82xx	5 ranks (30ms~1.2s)	Manual Reset
81Nxx/81Cxx	3 ranks (1~400ms)	
82Nxx/82Cxx	-	
83Cxx	310ms	Manual Reset
88Nxx/88Cxx	T _{REC} adjustable	

➤ Shunt Voltage Reference

Ref. Voltage	Part Number
0.8 V	TL432D
1.233~1.25 V	TL432, TL432C, LM4041, M385
2.495~2.5 V	TL431, LL431, TL431L

High precision **0.5%**

LL431, ULVH431: **low** $I_{K(MIN)}$ ($< 100\mu A$)

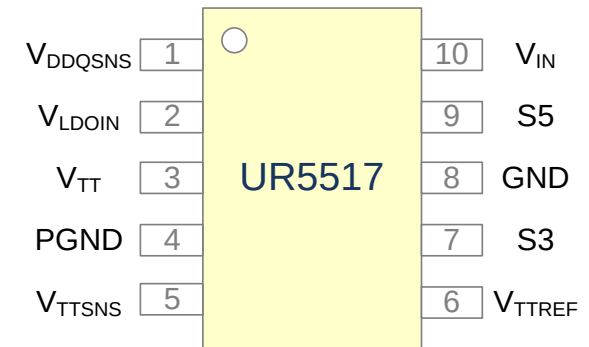
Options of package and pin-assignment

DDR Termination & Power Switch

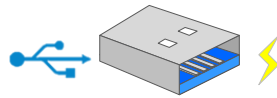


➤ DDR RAM Bus Termination Voltage Regulator

Support DDR	Part Number
DDR1(2.5V) / DDR2(1.8V) / DDR3(1.5V)	UR5596 UR6512, UR5517
DDR3L (1.35V) / LPDDR3, DDR4 (1.2V)	UR6517 (1.8A)



➤ USB Power Switch



- Different ranks of current-limit
- Active-low / active-high logic
- Single / dual channel
- UVLO, OVP, OCP, OTP, fold-back, reverse-current-free, output discharge
- Low- $R_{DS(ON)}$, soft-start, deglitched FLAG
- Application: powered USB port

Part Number	# of ch	I_Limit
US222 (85mΩ)	1	I_{OUT} 0.5~2.0 A
US107 (70mΩ)	1	I_{OUT} 1.2~2.5A
US210AD*	1	Adjustable
US2175	2	I_{OUT} 1.3A

- Operational Amplifier
 - 1-ch / 2-ch / 4-ch operational amplifier
 - Popular p2p part LM321 LM358 LM324 MC4558
 - CMOS-processed rail-to-rail operational amplifier
- Voltage Comparator
 - 1-ch / 2-ch / 4-ch voltage comparator
 - Popular p2p part LM393 LM339
 - Low-consumption comparator
 - Push-pull output comparator
- Logic IC
 - 74-series, 40-series
logic gate / bus control
 - Analog switch / multiplexer
Digital switch / multiplexer
 - Data latch / register
 - AHC/AHCT/LVC/AUP/AUC
 - DIP, SMD, leadless DFN pkg.

Amplifiers & Comparator

➤ Operational Amplifier

Popular p2p operational amplifier

Category	Part Number
1-ch Op Amp	M2125 LM318 LM321 LV321
2-ch Op Amp	MC4580 LM358 MC34072 TL072
4-ch Op Amp	LM324 MC34074

Low-consumption rail-to-rail

Category	Part Number
Output Rail-to-Rail Amplifier	LMH358 LV358 LV324
Input & Output Rail-to-Rail Amplifier	LV2460 LV2461 ULV8542

➤ Voltage Comparator

Popular p2p item

Category	Part Number
1-ch Comparator	LMV331
2-ch Comparator	LM393 LMV393
4-ch Comparator	LM339

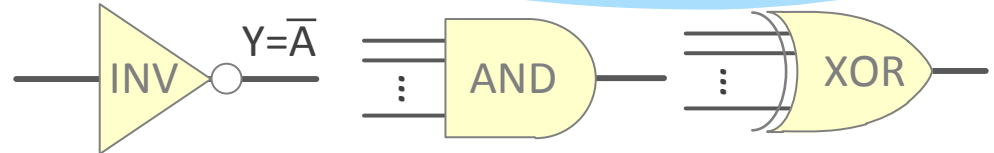
Low-consumption alternative

Part Number	Description
ULC393	Low-consumption 18V voltage comparator
ULC831	Voltage comparator with push-pull output

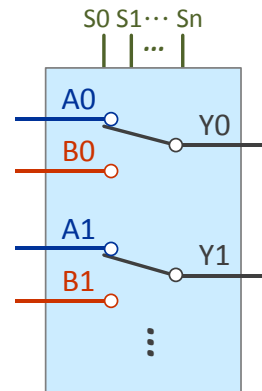
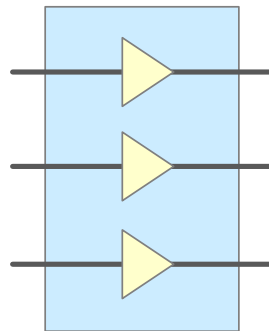
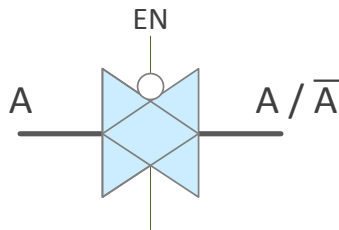
Logic Family

* Functions

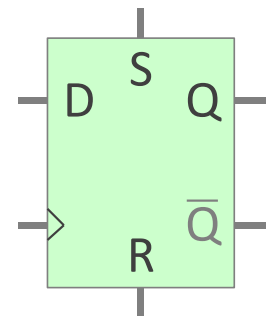
Logic Gate: inverter, buffer, AND/OR/XOR/NAND/NOR gate, Multifunction gate



**Bus Tranceiver
Switch / Multiplexer**



**Shift Register
Flip-flop
Latch**



Timer, vibrator, oscillator, encoder, counter...

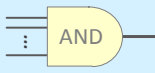
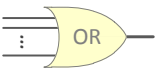
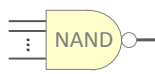
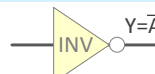
* Circuit Technology

Low-voltage: AUP/AUC/LVC/AHC...
15-V application: CD4000 logic

TTL compatible: AHCT/HCT...

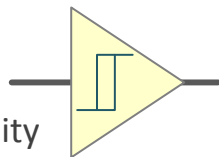
Logic Gate

- Logic Function

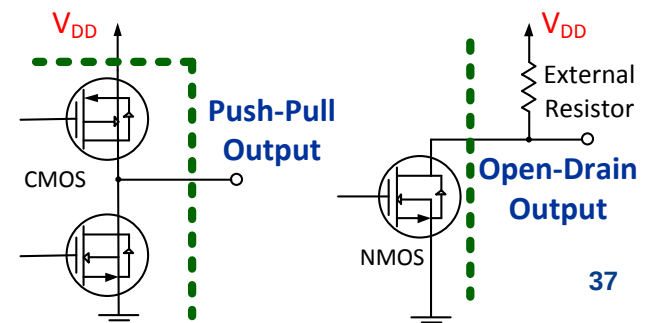
Function	Symbol	Logic gate (example)			High-V logic
AND		U74AUC1G08	U74AHC1G09	U74AHC21	UCD4081B
OR		U74AHCT32	U74AUP1G32	U74LVC2G32	UCD4071B
XOR		U74LVC86A	U74AHCT86	U74AUC1G86	UCD4070B
NAND		U74AUP1G00	U74LVC1G10	U74LVC2G132	UCD4011B
NOR		U74LVC02A	U74AUC1G02	U74AUP1G02	UCD4001B
Inverter		U74AUP1G04	U74AUP1G06	U74LVC2G240	UCD40106B
Buffer		U74LVC1G125	U74AUC1G126	U74LVC2G241	UCD4050B
Multi-function gate		U74LVC1G57 / U74LVC1G58 / U74LVC1G97 / U74LVC1G99			

- Gate numbers (1G/2G/3G...)
- Input numbers
- Normal / Schmitt trigger input

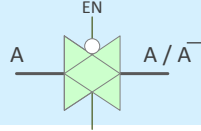
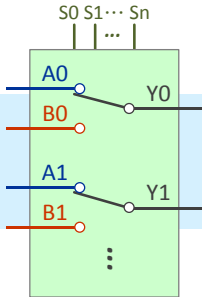
Schmitt trigger:
better noise immunity



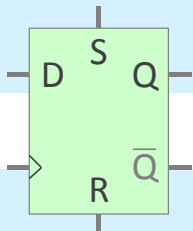
- Output type:
Push-pull /
Open-drain /
Tri-state



- Bus switch / Mux

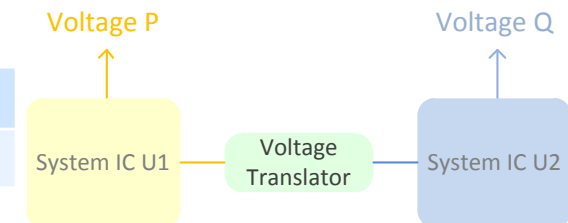
Function	Symbol	Example		High-V logic
Bus Switch		U74LVC2G66 U74CBTLV3125	U74CBT1G384 U74CBT3306	UCD4066
Line Decoder / Mux / Demux		U74LVC1G19 U74AUP1T157	U74HCT138 U74LVC258	
Analog Multiplexer		U7SB3157 74LVX4051	US5C3257 U74LVX4053	4051 4052
(Non-74 series)		UMX4215	UMX2215	

- Data register

Function	Symbol	Example		High-V logic
Flip-flop		U74AUP1G74 U74LVC574	U74AHC374 U74HCT73 (J-K)	UTC4013
Latch		U74LVC373	U74LVC573	
Register		U74AHC164	U74AHC595	UCD4015B

- Voltage Translator

UVXS0102	SOP-8	2-bit bidirectional voltage level translator
UCA9617	SPO-8	Level translating fast-mode+ I2C-bus repeater

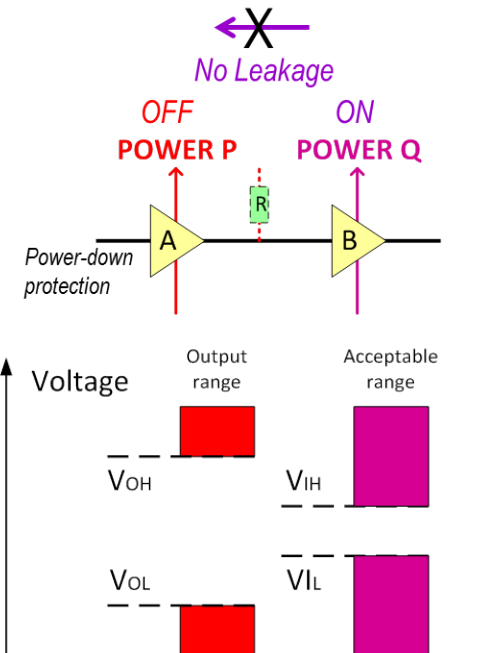


Logic IC Development

UTC circuit technology in logic IC provides

- Low operating voltage
- Fast speed
- Power-down protection
- Low leakage
- TTL compatibility

Product Prefix Cross Reference		Prefix	V_{DD}	Partial Power-Down	TTL comp.
UTC	U74-	U74AUP/AUC	0.8V~3.6V	V	
		U74LVC	1.65V~3.6V/5.5V	(V)	
TI	SN74-	U74LVX	2V~6V	V	
		U74CBTLV	2.3V~3.6V	V	
On semi	MC7-, NL-	U74CBT	4~5.5V	(V)	V
		U74AHC	2V~5.5V		
STM, NXP	74-	U74AHCT	4.5V~5.5V		V
Toshiba	TC7-				



Package miniaturization for modern electronic devices



Driver / Interface

- Darlington Driver Array
 - 7-ch / 8-ch popular ULN2003 ULN2004 ULN2803 ULN2804
- RS-485 / RS-232 Line Driver
 - RS-232 driver / single voltage driver
 - Force ON/OFF function
 - RS-485 hot-swap glitch-free driver
 - Max 256 transceiver on bus with R_{IN} 96k Ω
 - Half-duplex / Full-duplex
- Hall Sensor IC
 - CMOS-processed Hall sensor switch
 - Bipolar type Hall latch
 - Manifold options include omni-directional operation curve
 - Various sensitivity level

Driver / Hall IC

➤ Interface Driver

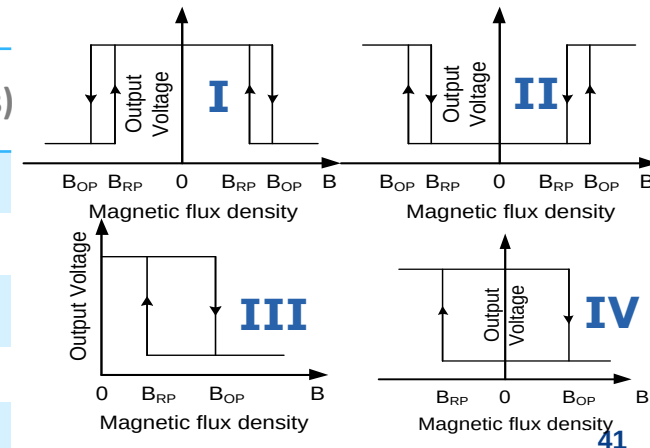
Protocol	Part Number	Application
RS-485 / RS-422	UTRS485 UTRS458 UTRS3082 UTRS3085 UTRS3088 UTRS3080	1-driver 1-receiver
	75323	5-driver 3-receiver
RS-232	75185 75232 UT3243	3-driver 5-receiver
	UT3223 UT3222 UT3232 UT232A UT232E	2-driver 2-receiver
	UT3221	1-driver 1-receiver
	URCZ1284	Printer application
1284 VGA	CCVGA7C5 CCVGA7C9	D-sub VGA

➤ Darlington Driver Array

Part No.	Number of Driver	Max. Voltage / Max. Current
ULN2003	7	50V / 0.5A
ULN2003R	7	50V / 0.5A
ULN2004	7	50V / 0.5A
ULN2803	8	50V / 0.5A
ULN2804	8	50V / 0.5A
62783	8	50V / 0.5A
62784	8	50V / 0.5A

➤ Hall IC

Curve	Part Number	Output Type	B _{OP} (Gauss)	Curve	Part Number	Output Type	B _{OP} (Gauss)
I	UH8106-x	N/I/C	18	II	SK8552	I	>20
	UH8105	C	30	IV	SK1816A	I	50
	UH8102B-x	N	8~70		SK1812	N	50
II	UH8102A-x	N	8~70	III	SK1901	N	<100
III	UH8100x	N	40		U3144	N	70~350



Output type: N: Open-drain I: Internal Pull-up C: Push-pull

Cross-Reference

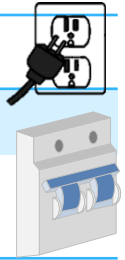
➤ Popular Integrated Circuit

Product Category	UTC Example	Competitor	Competitor PN
Shunt Voltage Reference	TL431 ULVH431	TI Diodes	TLVH431
Voltage Detection Reset	89N09 UIC809 81Nxx 88Cxx	Rohm Mxxxx Txxxx Sxxxx	BU4209 MAX809 XC61CN S-809
Voltage Comparator	LM393 LM339 ULC393	TI ST	LM393 LM339
Operational Amplifier	LM358 MC4580 LM324	TI ST JRC	LM358 MC4580 LM324
Audio Amplifier	TDA2030A MC34119	ST NXP	TDA2030A MC34119
74-series 40-series Logic Gate / Register / Bus Switch / Multiplexer	U74AHCTxxx U74LVCxxx U74AUPxxx UCD40xx	TI NXP On-semi	SN74AHCT86 74LVC373 74AUP1G04 CD4052
RS-485 / RS-232	UTRS485 UT232A	TI Maxim	MAX485 SP232A
Darlington Driver	ULN2003 ULN2803	Rohm	ULN2003 ULN2803

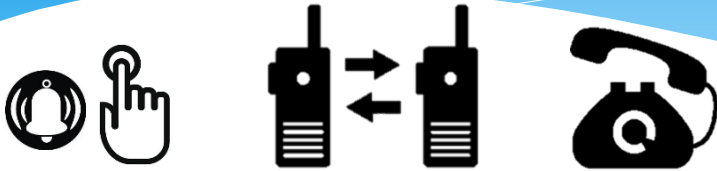
Special Application

Automotive IC	Package	Function
UU6043B	SOP-8 DIP-8	Flasher IC 
UU6032B	SOP-8 DIP-8	Automotive Toggle Switch IC
UU642	SOP-8 DIP-8	Wiper Controller Wipe; Wash; Interval modes
UU6046B	DIP-8 SOP-8	Rear Window Heating Timer
UL497	SOP-16	Hall Effect Pickup Ignition Controller
UGV3040	TO-220 TO-220F TO-263	21A, 300mJ, 400V N-CHANNEL IGNITION IGBT

LNB IC	Package	Function
L8401	SSOP-16	FET BIAS CONTROLLER x4 
L8312	SSOP-16	DUAL POLARIZATION AND TONE SWITCH CONTROLLER
L8200	HTSSOP-20/ QFN3x3-16	SINGLE LNB-BIAS, CONTROL AND POWER MANAGEMENT SOLUTION

Leakage Detection IC	Package	Function
GF2140 GM1851 GV4145A	DIP-8 SOP-8	Ground Fault Interrupter 
M54133 M54133A M54134 M54123L M54223	DIP-16 SOP-16 SOP-16N DIP-8 SOP-8 SIP-8	Earth Leakage Current Detector

Telecommunication



Telecommunication Circuit

Ringer

LS1240A	Electronic Tone Ringer with Built-in Bridge Rectifier
31002A	Telephone Tone Ringer
TA31001	Telephone Tone Ringer
TA31002	Telephone Tone Ringer

Telephone Speech IC

TEA1098/A	Speech and Handsfree IC
TEA1062N/AN	Low Voltage Transmission Circuit with Dialler Interface
TEA1110A	Low Voltage Versatile Telephone Transmission Circuit with Dialler Interface
L6726	Universal Speech Circuit

Telecommunication Circuit

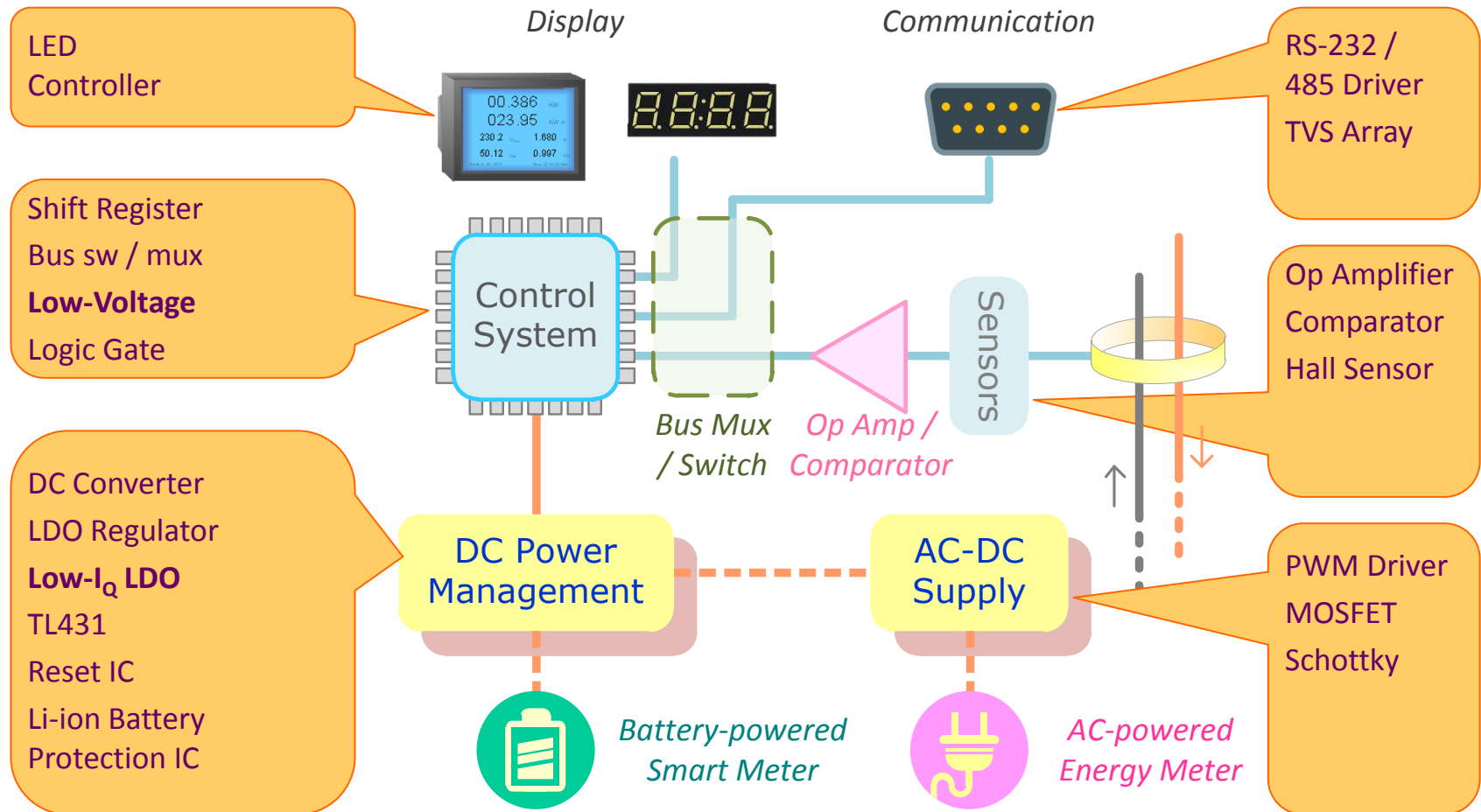
Voice Switched Speaker-phone IC

L38812	Voice Switch Circuit for Handsfree Speakerphone TAM
MC34118	Voice Switched Speaker-Phone Circuit
MC33218	Voice Switched Speaker-Phone with Microprocessor Interface
MC34018	Voice Switched Speaker-Phone Circuit

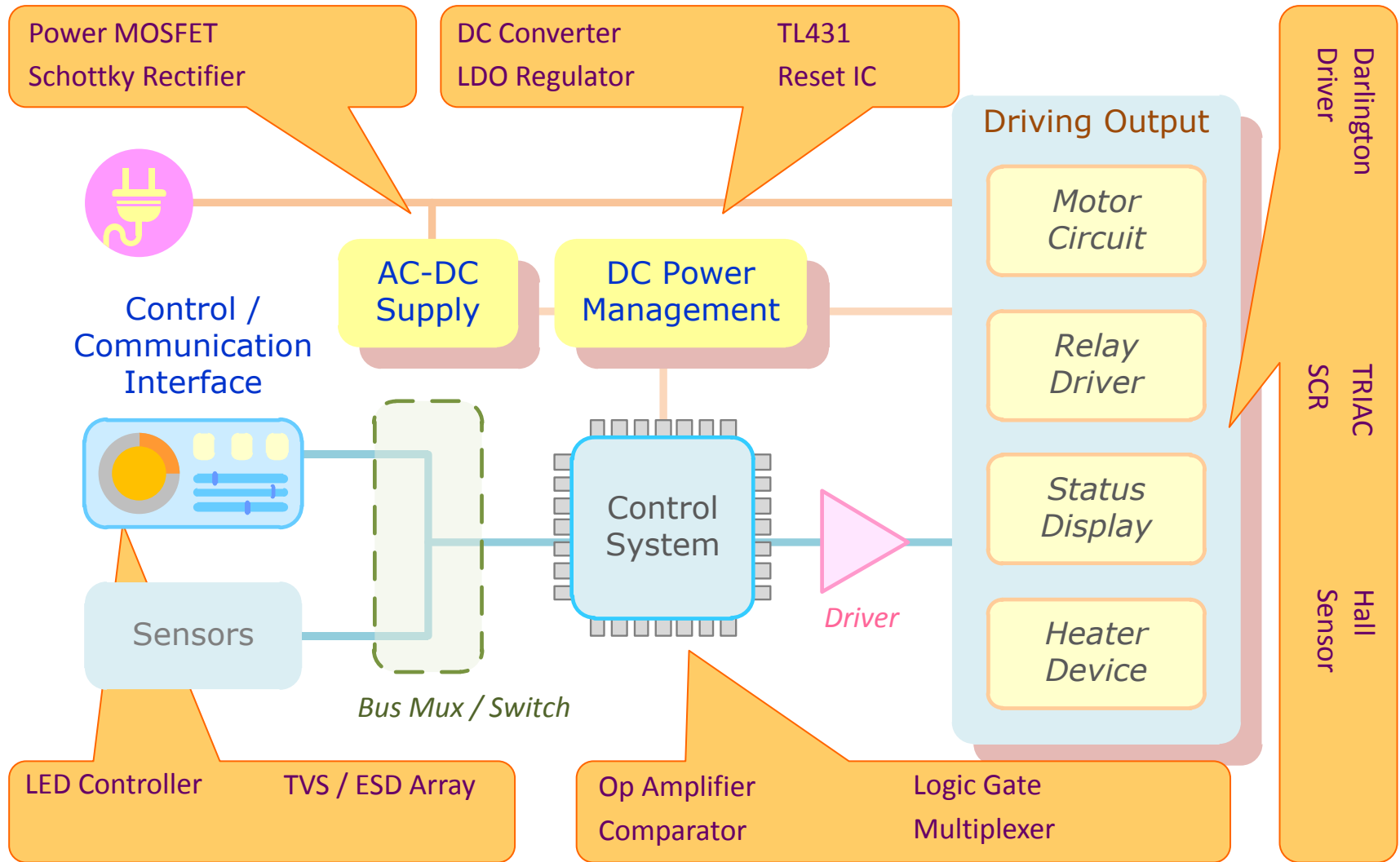
Cordless Phone

UA31136	FM IF Detector IC for Cordless Telephone
MC3361BP	Low Voltage/Power Narrow Band FM IF
3362	Low Power FSK IF IC
8507	Compander

Energy Meter Application



White Goods Application



TV Application

Front-end

FET Bias Controller / Pol. Switch

RF Transistor



DC Power

DC Converter

Linear Regulator

DDR Termination

Volt. Detection Reset

Power MOSFET

Mainboard

74- Logic Gate

Bus Switch / Mux

Volt. Comparator

Op. Amplifier

Digital Transistor

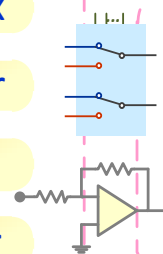


I/O Interface

Video / Audio

USB / RS-232

TVS / ESD Protect.



AC-DC Power Module / Adaptor

High-voltage MOSFET

Photo-Coupler

Low-voltage MOSFET

High-voltage Diode

Shunt Reference

Low-VF Schottky



Automotive Application

Automotive IC	Function
UU6043B	Flasher IC
UU642	Wiper Controller
UU6046B	Heating Timer
UH4921	Hall Sensor
93334	Ignition Controller
BU941	Ignition Transistor
UL497	Ignition Controller
UGV3040	Ignition IGBT

System Management

Comparator

Op Amp

Reset IC

Logic IC

Infotainment System

System MCU / Codec

DC Regulator / Converter

Video Switch / Buffer IC

TVS Array

Headphone Driver Audio Amplifier

USB Power Switch

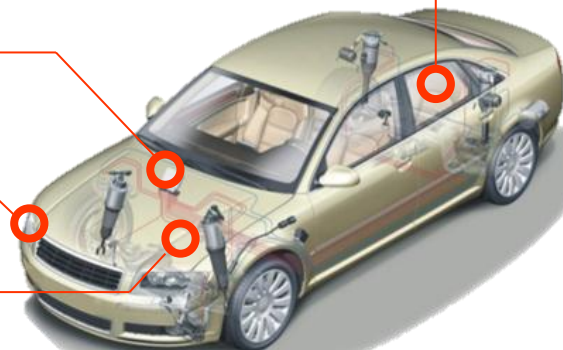


Driving Control

Wiper

Flasher / Lighting

Ignition



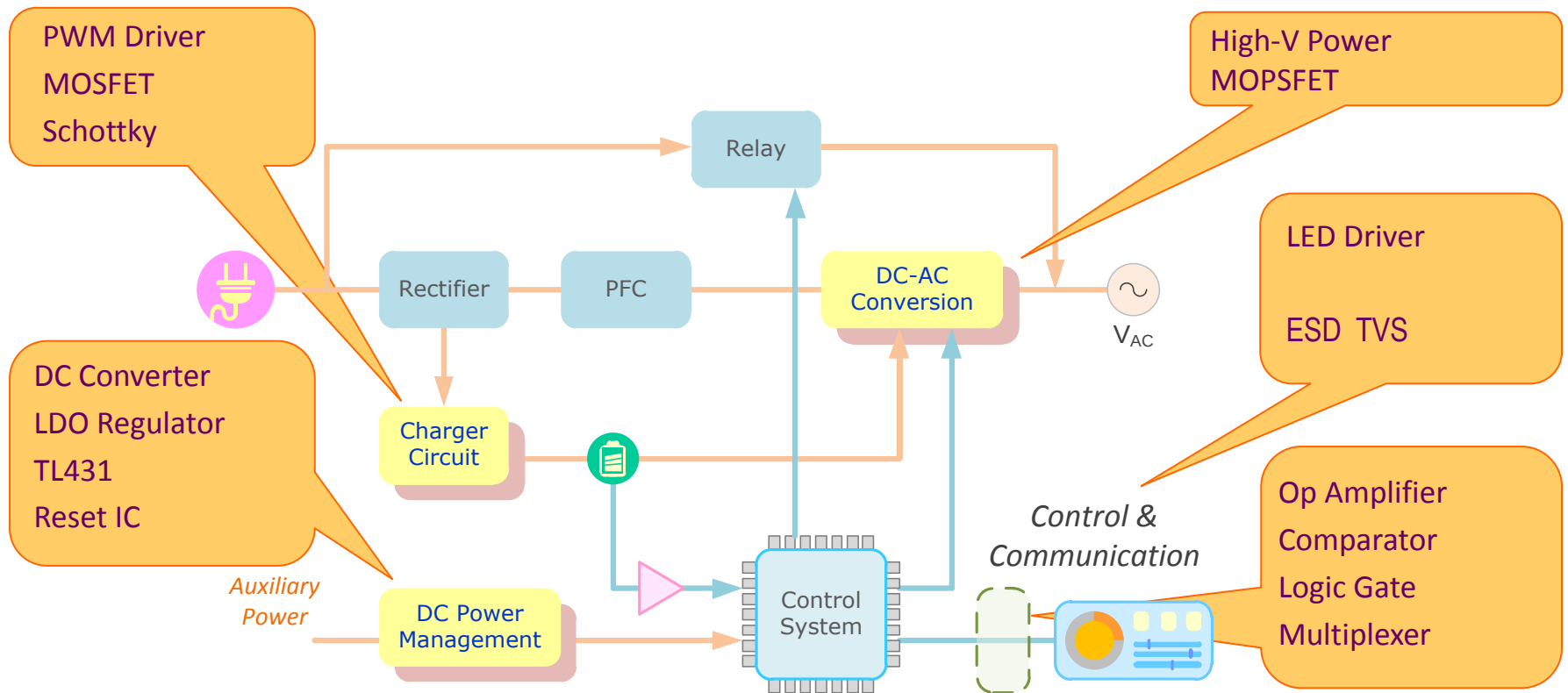
Power Semiconductor

MOSFET

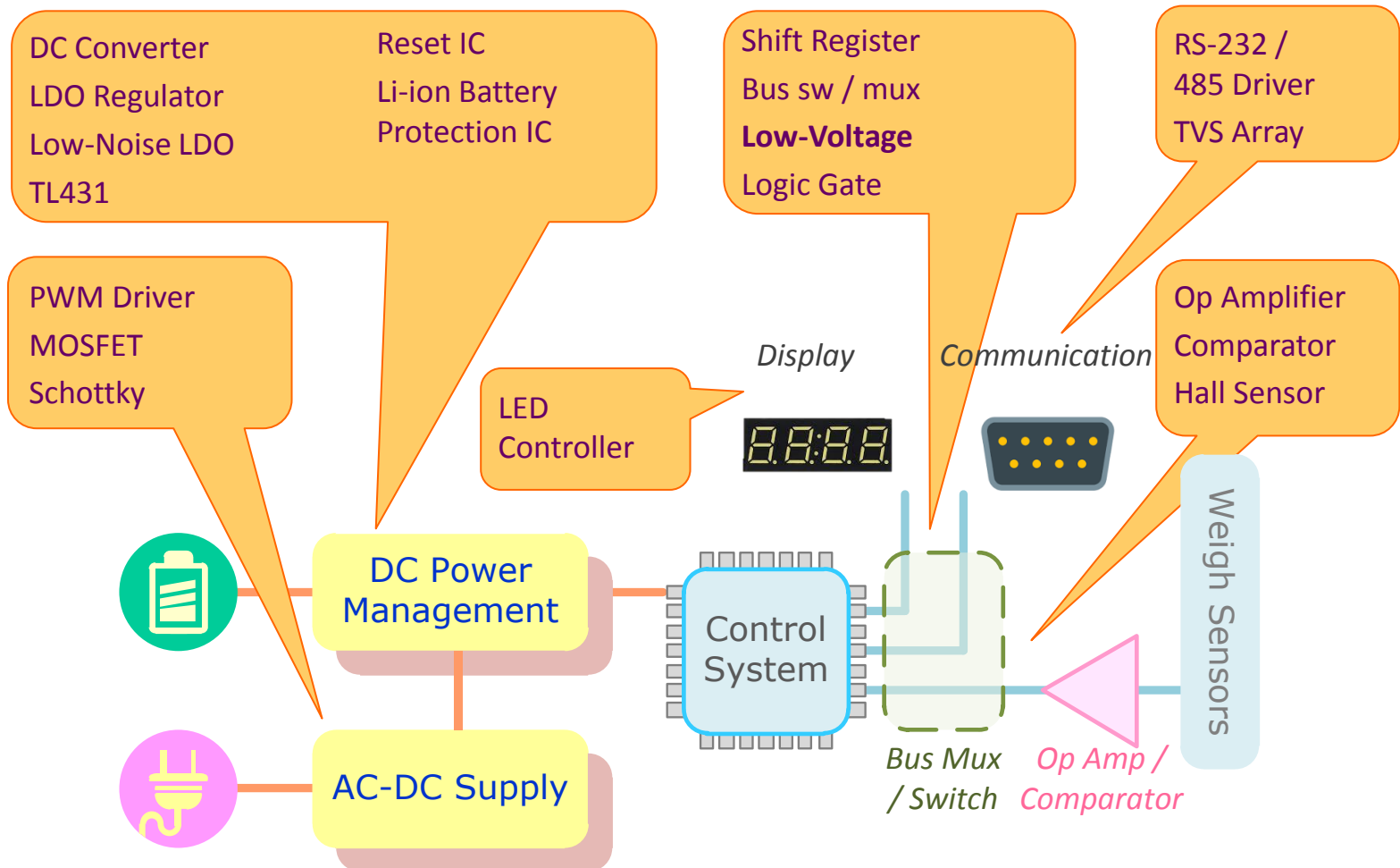
BJT

DIODE

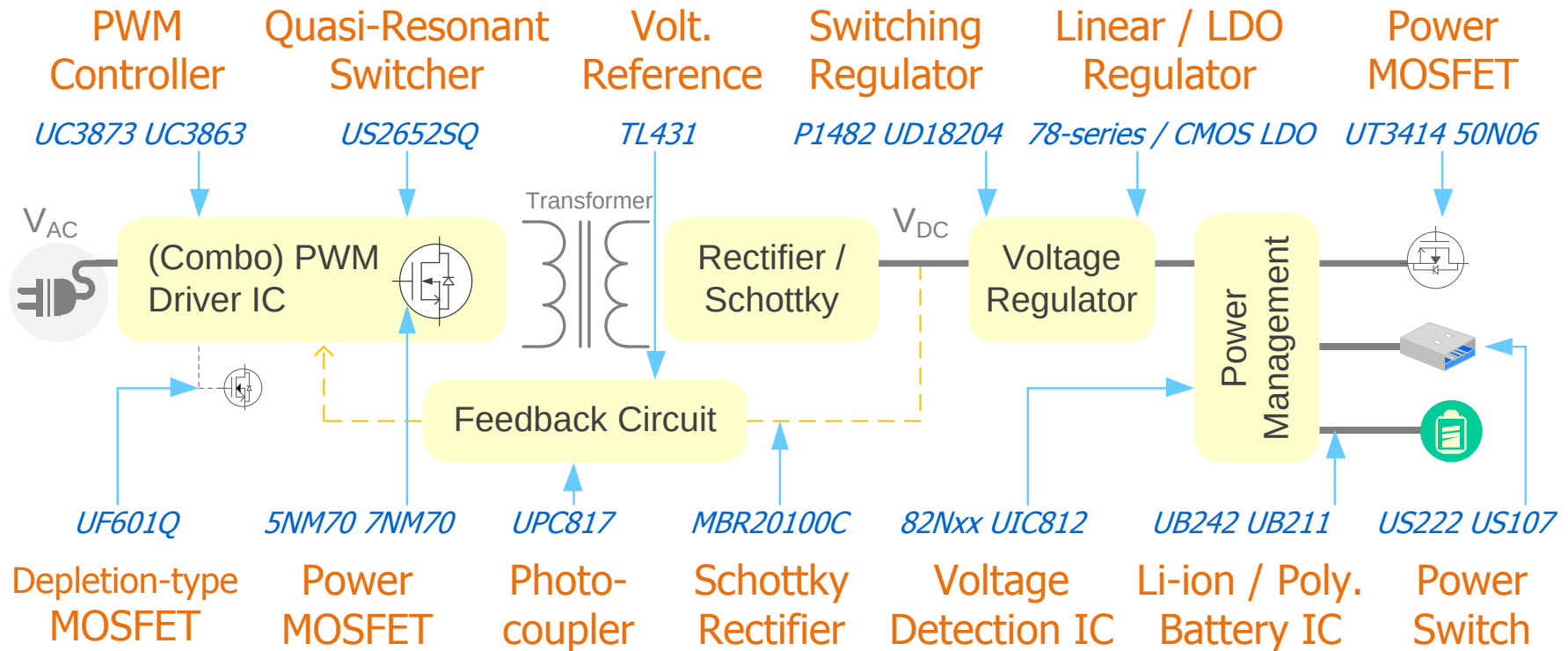
UPS / Inverter / Energy Storage



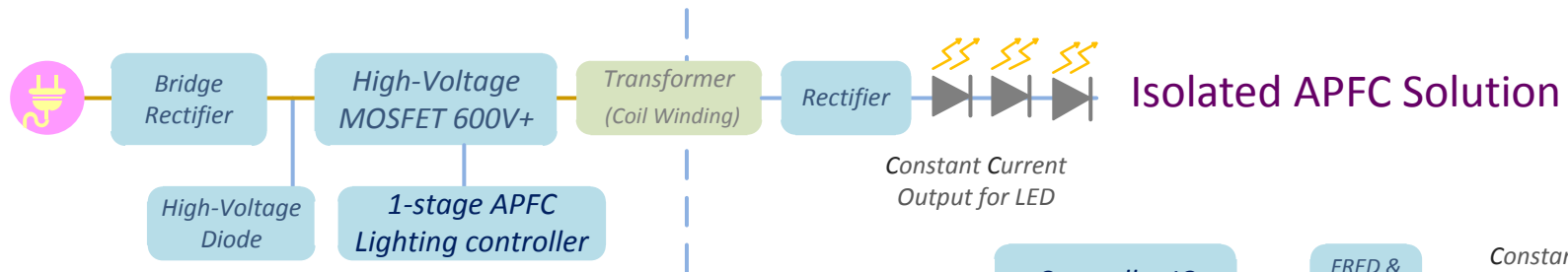
Weigh Scale Application



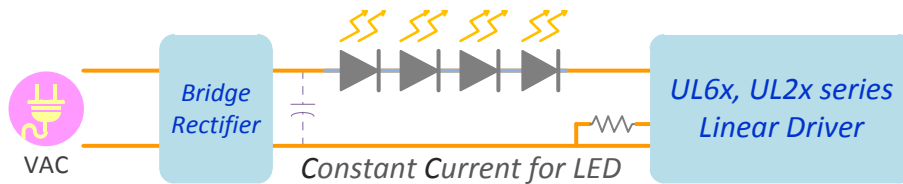
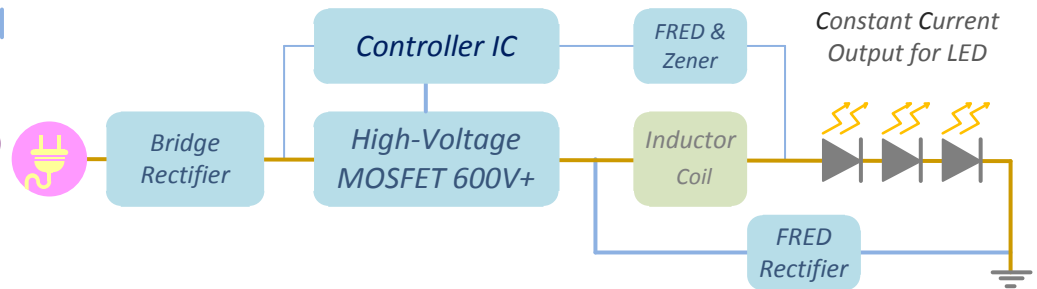
Power Application



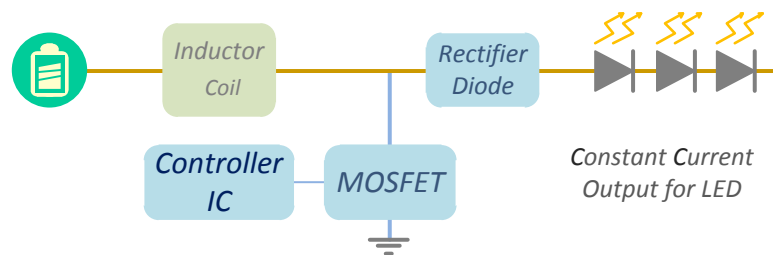
Lighting Application



Non-isolated wide-range LED Lighting Solution



DC Boost / DC Buck LED Lighting Solution



THANK YOU

IC (Integrated Circuit)

PWM Controller	Lighting Driver
Photo-Coupler	Voltage Reference
DC Converter	Regulator / LDO
USB Power Switch	Reset / Volt. Detect
Comparator	74- Logic IC
Op Amplifier	Audio IC / Amplifier
RS-232/485 IC	Darlington Driver
Hall IC	Special IC

Discrete Component

FRED Diode	Bridge Rectifier
Schottky Rectifier	Super-junction MOSFET
Low- V_F Rectifier	Planar MOSFET
Digital Transistor	Trench MOSFET
Power Transistor	JFET
TRIAC	SCR
IGBT	TVS / ESD Array