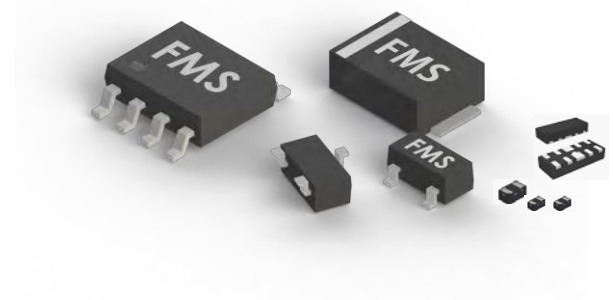




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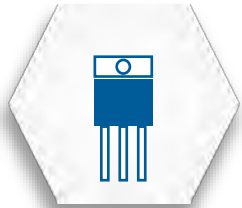
保護元件 Protective Components





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Product

MOSFET



Planar MOSFET

Trench MOSFET

Super Junction
MOSFET

FRED MOSFET

SGT MOSFET

SiC MOSFET

Transistor

Digital Transistor

Rectifying Devices



Bridge

General Diode

Fast Diode

Schottky Diode

Small Signal Diod

SiC Diode

Protection Devices



TVS

ESD

TSS

GDT

Thyristor



SCR

TRIAC

DIAC



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ESD、TVS、TSS、GDT、ZENER Protection Component

ESD、TVS	VRWM(V)	IR(uA)	Cj(pF)	Ppk(W)	Channel
ESD (IEC 61000-4-2)	1~70	0.01~40	0.13~1245	6.9~6500	1~8
TVS (10/1000uS)	5~595	-	-	200~30000	-
TSS	VS(V)	VT(V)	Co(pF)	Surge(KV)	
TSS (10/700uS)	15~520	4	40~150	4~6	
GDT	DC SPARK VOL	INSULATION	CAPACITANCE	IPP(KA)	
GDT (IEC 61000-4-5)	600~1500V	1GΩ	0.5~1pF	2~5	
Zener	VZ (V)	IR(uA)	IZT(mA)	Power(W)	
Zener	1.8~330	-	0.2~91	0.125~5	



ESD/lightning Protection

- ★Support USB 2.0~USB 4.0
- ★IEC 61000-4-2 ±30KV
- ★Lightning 8/20uS 6000W
- ★Multi channel ESD Protection



High Absorption/Surge Elements

- Ethernet
- Spec: 48~54V PPP=200~6600W
- ★TVS Surge Protection
 - ★TSS Ethernet cable protection
 - ★ESD Solve I/O static interference
 - ★Zener Over voltage Protection



- phone or portable product
- ★Power in :Surge Protection TVS
 - ★Data Line ESD Protection
 - ★headset and antenna ESD Protection



- PC & NB & Server
- ★Digital video ESD Protection
 - ★keyboard mouse headset microphone ESD Protection
 - ★RJ-45,TVS Protection



- monitor Surge Protection
- ★lightning TVS: VRWM 3.3~512V
 - ★lightning TSS: VRWM:15~2300V
 - ★ESD: VRWM 2.5~70V ±30KV



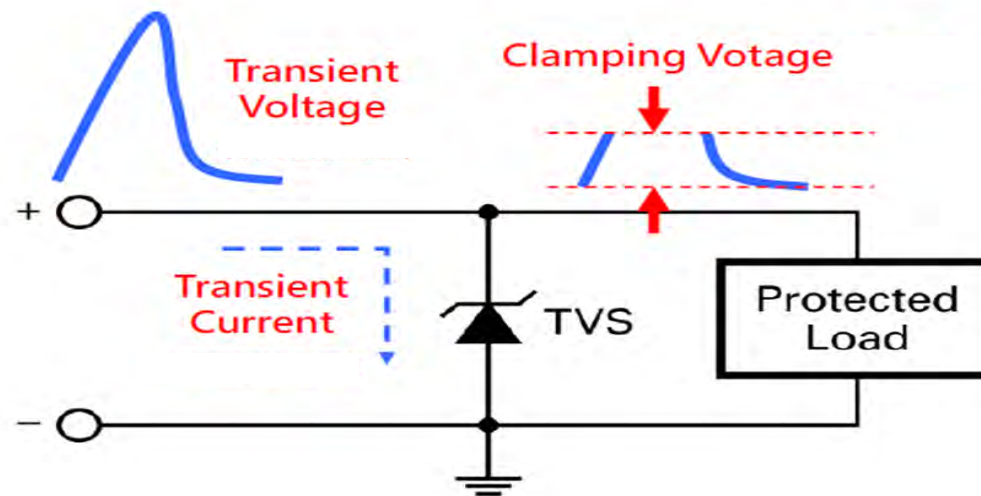
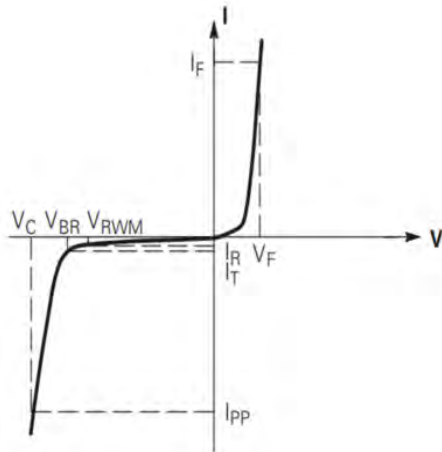
ISO 16750

- Vehicle Surge Protection
- Spec: ISO 16750
- VRwm=15~72V
- ★Other Vehicle TVS
 - ★CAN BUS TVS VRWM:3.3~512V
 - ★ESD VRWM: 2.5~70V



Power TVS Diode

- **Transient Voltage Suppressor diode** (also known as a TVS Diode) is a protection diode designed to protect electronic circuits against transients and overvoltage threats such as EFT (electrically fast transients) and ESD (electrostatic discharge). TVS diodes are available in both uni-directional (uni-polar) or bi-directional (bi-polar) diode circuit configurations.





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Series	SM6NT22	SMAK5NT	SMB15FL	5.0SMCJ	SM8S	ASM7.5KP
Drawing						
Package	SOD-123NT	DO-214AC SMA-NT	DO-214AA SMB-FL	DO-214AB SMC	DO-218	ASM-10A
V_{RWM}	22~440V	40~800V	5~440V	11~170V	10~43V	10~48V
P_{PP}	600W	1500W	1500W	5000w	6600w	7500W

Series	P4KE	P6KE	1.5KE	30KPA
Drawing				
Package	DO-41	DO-15	DO-201AE	P600
V_{RWM}	5.8~378V	5.8~510V	5.8~376V	28~288V
P_{PP}	400W	600W	1500W	30000W



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The new special structure package for TVS SOD-123NT / SMA-NT

AEC Q101 Available

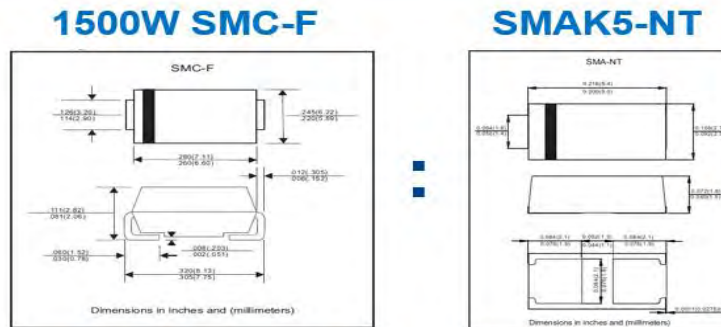


- Thin
- Small volume
- Low stress floating copper structure
- Suitable for bi-directional and high voltage TVS.

Effects of thermal stress

Down L/F + upper floating Cu plate	Up L/F with plus angle	Up L/F with minus angle
No upward stress / solder distributed uniformly. → Improving O/S & poor contact.	Upward stress pulls/breaks weld face apart.	Upward stress plus down stress cause the solder broken.

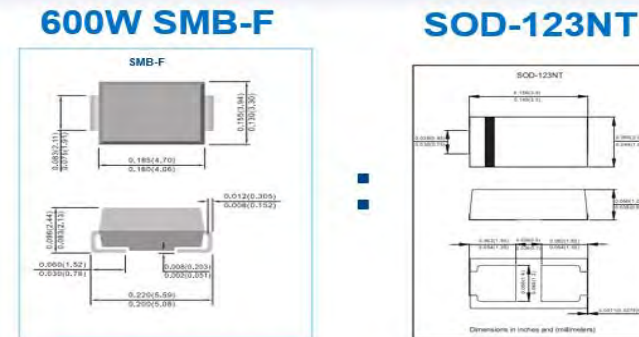
Volume Ratio: 1500W SMC-F VS SMAK5-NT



$$= \frac{5.4}{100\%} : \frac{1.0}{18.64\%}$$

$$(7.98 \times 5.91 \times 2.44) / (5.2 \times 2.5 \times 1.65) = 5.4$$

Volume Ratio: 600W SMB-F VS SOD-123NT



$$= \frac{5.4}{100\%} : \frac{1.0}{18.64\%}$$

$$(5.30 \times 3.62 \times 2.26) / (3.7 \times 1.8 \times 1.2) = 5.4$$



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New products

ASM7.5KP10(C)A~48(C)A-Q1-H



Formosa's new 7500W TVS Series is available from 10V~48V in both uni-directional and bi-directional construction. Encased in a low profile surface mount package ASM-10A. AEC-Q101 Qualified. Meets automotive load dump standards ISO 7637-2 and ISO 16750-2.



33% Profile size reduced

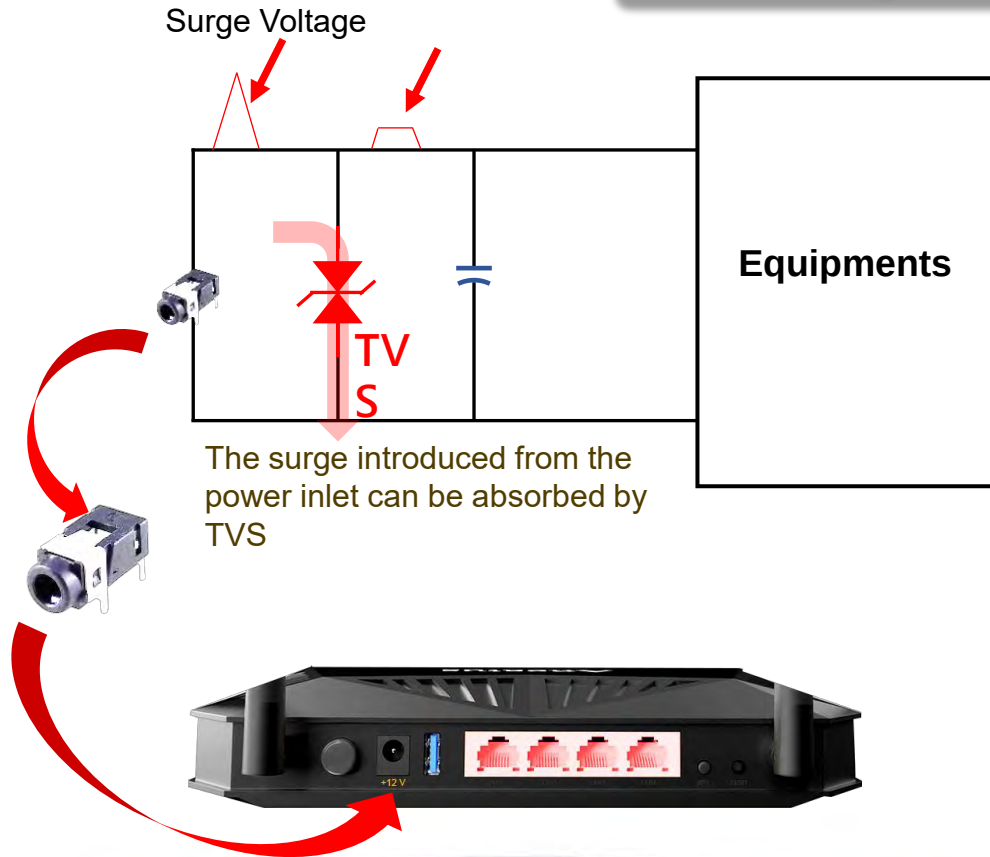
Part No. (Uni)	Part No. (Bi)	Reverse Stand-off Voltage	Breakdown Voltage @1tr		Test Current	Maximum Clamping Voltage @1tr		Maximum Reverse Leakage Current	Marking Code	
		V _{RM}	V _{BR} Min	V _{BR} Max	tr	V _C	I _{sc}	I _{le@V_{RM}}		
		Volts	Volts	Volts	mA	Volts	A	μA	Uni	Bi
ASM7.5KP10A	ASM7.5KP10CA	10	11.1	12.3	5.0	17.0	441.1	15	ASM7.5KP10A	ASM7.5KP10CA
ASM7.5KP11A	ASM7.5KP11CA	11	12.2	13.5	5.0	18.2	412.0	10	ASM7.5KP11A	ASM7.5KP11CA
ASM7.5KP12A	ASM7.5KP12CA	12	13.3	14.7	5.0	19.9	376.8	10	ASM7.5KP12A	ASM7.5KP12CA
ASM7.5KP13A	ASM7.5KP13CA	13	14.4	15.9	5.0	21.5	348.8	10	ASM7.5KP13A	ASM7.5KP13CA
ASM7.5KP14A	ASM7.5KP14CA	14	15.6	17.2	5.0	23.2	323.2	10	ASM7.5KP14A	ASM7.5KP14CA
ASM7.5KP15A	ASM7.5KP15CA	15	16.7	18.5	5.0	24.4	307.3	10	ASM7.5KP15A	ASM7.5KP15CA
ASM7.5KP16A	ASM7.5KP16CA	16	17.8	19.7	5.0	26.0	288.4	10	ASM7.5KP16A	ASM7.5KP16CA
ASM7.5KP17A	ASM7.5KP17CA	17	18.9	20.9	5.0	27.6	271.7	10	ASM7.5KP17A	ASM7.5KP17CA
ASM7.5KP18A	ASM7.5KP18CA	18	20.0	22.1	5.0	29.2	256.8	10	ASM7.5KP18A	ASM7.5KP18CA
ASM7.5KP20A	ASM7.5KP20CA	20	22.2	24.5	5.0	32.4	231.4	10	ASM7.5KP20A	ASM7.5KP20CA
ASM7.5KP22A	ASM7.5KP22CA	22	24.4	26.9	5.0	35.5	211.2	10	ASM7.5KP22A	ASM7.5KP22CA
ASM7.5KP24A	ASM7.5KP24CA	24	26.7	29.5	5.0	38.9	192.8	10	ASM7.5KP24A	ASM7.5KP24CA
ASM7.5KP26A	ASM7.5KP26CA	26	28.9	31.9	5.0	42.1	178.1	10	ASM7.5KP26A	ASM7.5KP26CA
ASM7.5KP28A	ASM7.5KP28CA	28	31.1	34.4	5.0	45.4	165.1	10	ASM7.5KP28A	ASM7.5KP28CA
ASM7.5KP30A	ASM7.5KP30CA	30	33.3	36.8	5.0	48.4	154.9	10	ASM7.5KP30A	ASM7.5KP30CA
ASM7.5KP33A	ASM7.5KP33CA	33	36.7	40.6	5.0	53.3	140.7	10	ASM7.5KP33A	ASM7.5KP33CA
ASM7.5KP36A	ASM7.5KP36CA	36	40.0	44.2	5.0	58.1	129.0	10	ASM7.5KP36A	ASM7.5KP36CA
ASM7.5KP40A	ASM7.5KP40CA	40	44.4	49.1	5.0	64.5	116.2	10	ASM7.5KP40A	ASM7.5KP40CA
ASM7.5KP43A	ASM7.5KP43CA	43	47.8	52.8	5.0	69.4	108.0	10	ASM7.5KP43A	ASM7.5KP43CA
ASM7.5KP45A	ASM7.5KP45CA	45	50.0	55.3	5.0	72.7	103.1	10	ASM7.5KP45A	ASM7.5KP45CA
ASM7.5KP48A	ASM7.5KP48CA	48	53.3	58.9	5.0	77.4	96.8	10	ASM7.5KP48A	ASM7.5KP48CA



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Surge voltage protections for DC-JACK



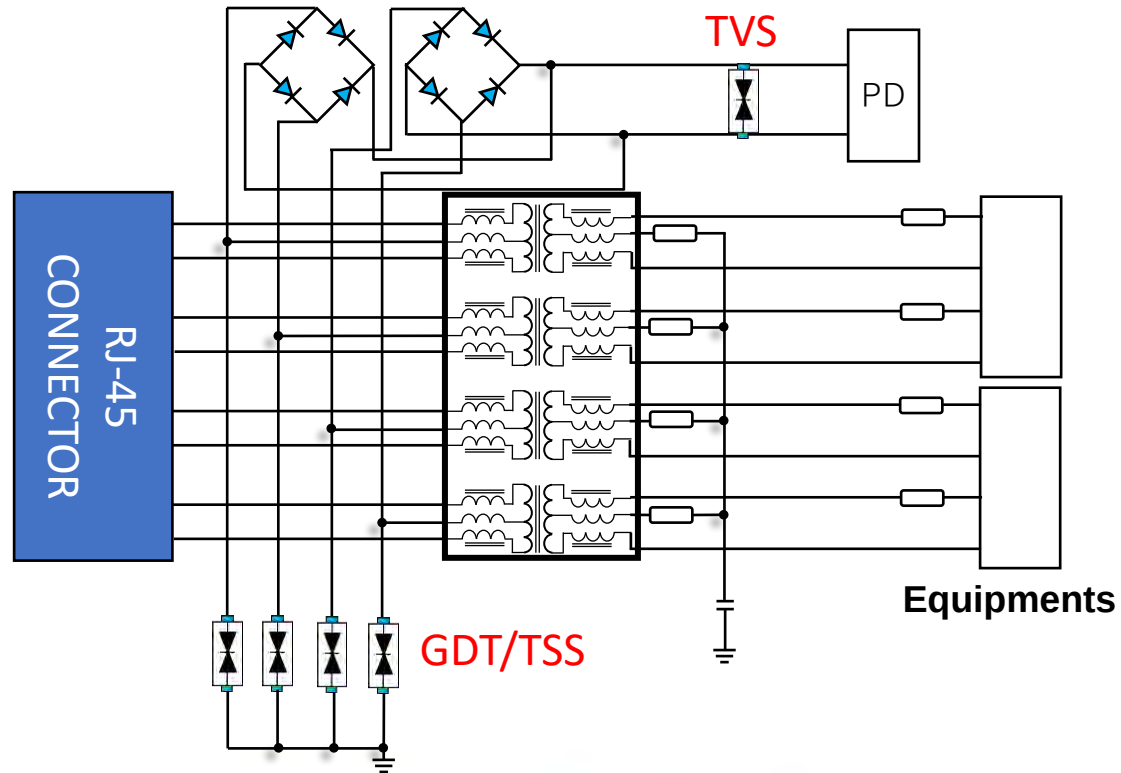
Absorbed power	600W	1500W
Package	SOD-123-NT	SMA-NT
Work Voltage	22~220V	20V~800V

Equipments	Work Voltage	400W	400W	600W	1000W	1500W
		SOD-123-S	SOD-123-NT	SOD-123-NT	SMA-NT	SMA-NT
		10V~170V	22V~440	22V~220	20V~800V	40V~800V
TV	12V	SM4F12CA				
NB	18~20V		SM4NT22CA	SM6NT22CA	SMAKNT20CA	
Router	12V	SM4F12CA				
Hub	9V	SM4F10CA				
POE Switch	52V	SM4F54CA	SM4NT54CA	SM6NT54CA	SMAKNT54CA	SMAK5NT54CA
IP Camara	12V	SM4F12CA				
4G LTE	12V	SM4F12CA				
WEB Camara	12V	SM4F12CA				
Car GPS navigation	12V	SM4F12CA				
Car GPS navigation	24V	SM4F24CA	SM4NT24CA	SM6NT24CA	SMAKNT24CA	SMAK5NT24CA
Car dashcam	12V	SM4F12CA				
Car dashcam	24V	SM4F24CA	SM4NT24CA	SM6NT24CA	SMAKNT24CA	SMAK5NT24CA



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Surge voltage protections for POE Power 48V or Normal RJ-45



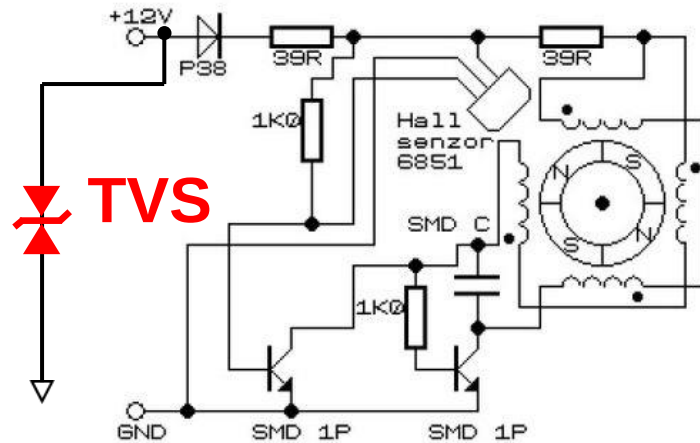
POE Voltage range: 44~57V

Equipments	RJ-45	400W	400W	600W	1000W	1500W
		SOD-123-S	SOD-123-NT	SOD-123-NT	SMA-NT	SMA-NT
		10V~170V	22V~440	22V~220	20V~800V	40V~800V
TV (RJ-45)	48V	SM4F58CA	SM4NT58CA	SM6NT58CA	SMAKNT58CA	SMAK5NT58CA
NB (RJ-45)	48V	SM4F58CA	SM4NT58CA	SM6NT58CA	SMAKNT58CA	SMAK5NT58CA
Router (RJ-45)	48V	SM4F58CA	SM4NT58CA	SM6NT58CA	SMAKNT58CA	SMAK5NT58CA
Hub (RJ-45)	48V	SM4F58CA	SM4NT58CA	SM6NT58CA	SMAKNT58CA	SMAK5NT58CA
POE Switch (RJ-45)	48V	SM4F58CA	SM4NT58CA	SM6NT58CA	SMAKNT58CA	SMAK5NT58CA
IP Camara (RJ-45)	48V	SM4F58CA	SM4NT58CA	SM6NT58CA	SMAKNT58CA	SMAK5NT58CA
4G LTE (RJ-45)	48V	SM4F58CA	SM4NT58CA	SM6NT58CA	SMAKNT58CA	SMAK5NT58CA
WEB Camara (RJ-45)	48V	SM4F58CA	SM4NT58CA	SM6NT58CA	SMAKNT58CA	SMAK5NT58CA
Switch	48V	SM4F58CA	SM4NT58CA	SM6NT58CA	SMAKNT58CA	SMAK5NT58CA



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Surge voltage protections for Car Fan or PC Fan

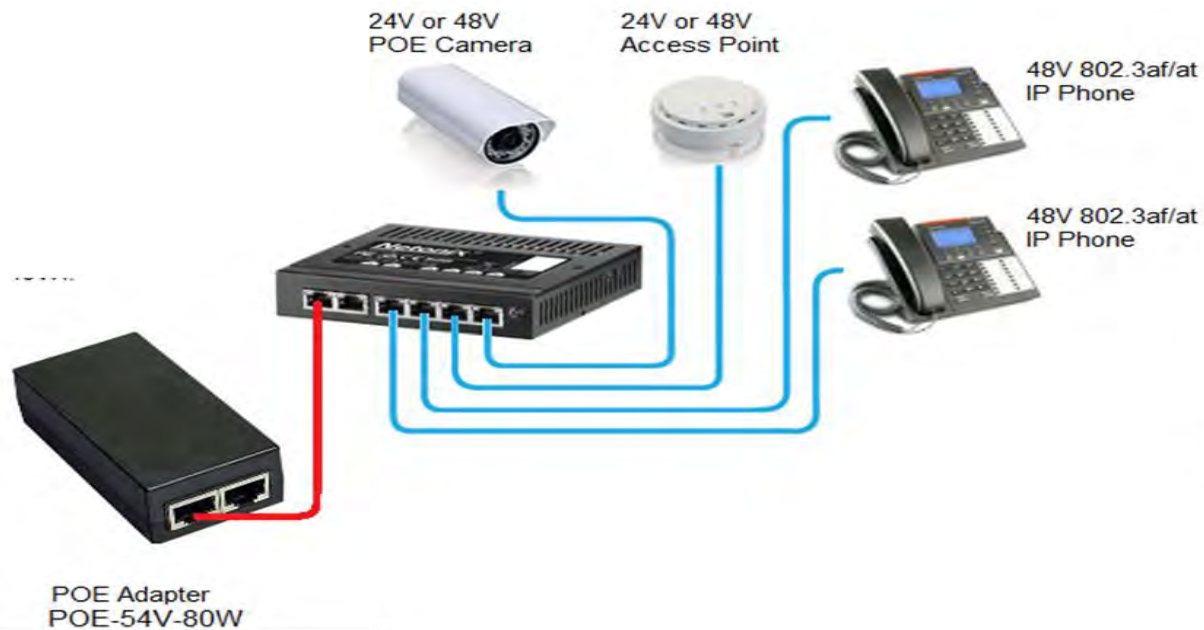


Application	Work Voltage	400W	400W	600W	1000W	1500W
		SOD-123-S	SOD-123-NT	SOD-123-NT	SMA-NT	SMA-NT
		10V~170V	22V~440	22V~220	20V~800V	40V~800V
PC Fan	12V	SM4F12CA				
NB Fan	12V	SM4F12CA				
Car Fan	12V	SM4F12CA				
12V Fan	12V	SM4F12CA				
24V Fan	24V	SM4F24CA	SM4NT24CA	SM6NT24CA	SMAKNT24CA	SMAK5NT24CA
48V Fan	48V	SM4F48CA	SM4NT48CA	SM6NT48CA	SMAKNT48CA	SMAK5NT48CA



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Telecom Application



POE

SMAJ58A
SMBJ58A

IP CAM

SMCJ58A/CA
SMBJ58A/CA

LNB

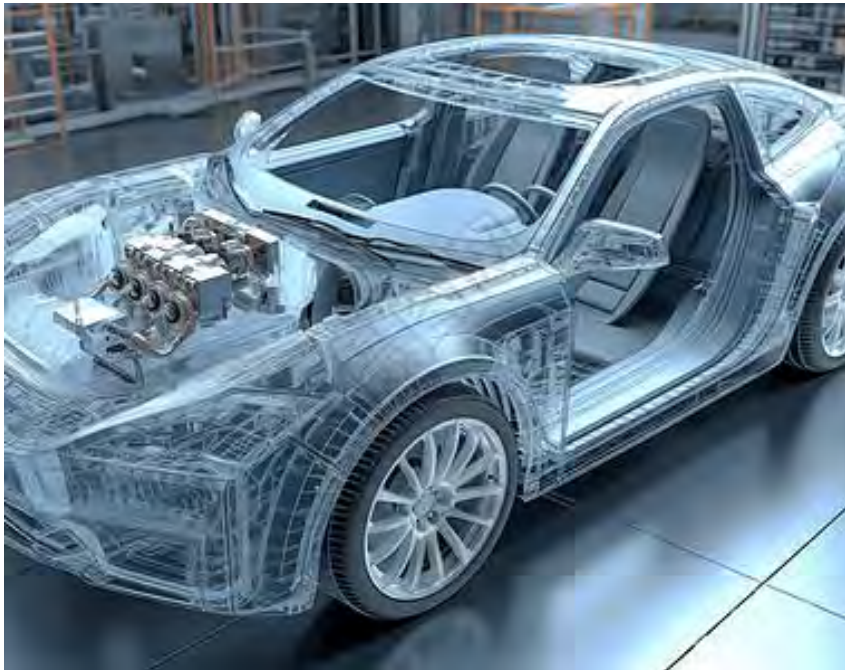
3.0SMCJ20/30A

STB/Router

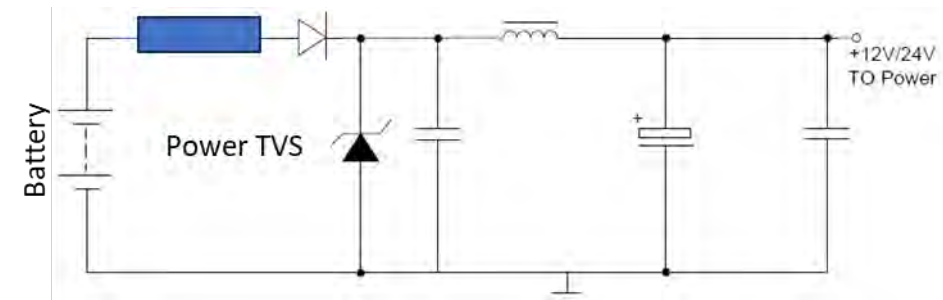
SMCJ15A/CA
SMCJ20A/CA



Applications in Automotive



- Power : 12V/ 24V
- Application: LED Lamp/ECU Sub-system/Air condition /Infotainment



	FMS PN	Package	P _{pp} 10/10000uS	V _{RWM}	I _T	V _c @I _{pp}	I _{pp}
12V	SM8S24A-Q1	DO-218	6600	24	5mA	35.5	186
24V	SM8S36A-Q1	DO-218	6600	36	5mA	58.1	114

Meets ISO7637-2 / ISO16750-2 surge specification



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International Standards for ESD

	規範 Specification	
工業製造上之 ESD Manufacture Process	ANSI/ESD S20.20-1999	
系統設備上之 ESD System device	Body/Finger HBM	IEEE STD C62.38
	Hand/Metal HBM	IEC 61000-4-2
	Furniture Model	ANSI C63.16
IC 上之 ESD IC components	HBM	ESD STM5.1 MIL-STD-883 Method3015 MIL-PRF-38535
	MM	ESD-STM5.2
	CDM	ESD DS5.3.1



ESD & Package

Package	VRWM (Max)V	VRWM (Min)V	CJ Typ.(pF)
SOD-323F	36	3.3	0.6~450
SOD-523FL	36	3.3	0.25~100
SOD-923FL	5	5	0.5~8
SOT-143	70	3.3	0.6~2.5
SOT-23	36	3.3	0.25~200
SOT-23-6	5	3.3	8
SOT-323	24	5	1.5~10
SOT-353	5	5	22
SOT-363	5	5	0.6~90
SOT-523	5	5	0.6~8
SOT-723	5	5	0.7
SOT-553	5	5	8
SOT-563	5	5	0.6~55

Package	VRWM (Max)V	VRWM (Min)V	CJ Typ.(pF)
SOP-8	24	2.8	1
T0603	36	1	0.13~25
T1006P2	36	2.5	0.15~245
T1006P3	5	5	0.45~1
T1210P6	5	5	0.2
T1608P2	24	24	16
T1610P2	36	2.5	125~860
T1610P6	5	5	0.3
T2020P3	24	15	750~1245
T2510P10	5	1.5	0.18~0.7
T2626P10	3.3	3.3	3.8
T3020P10	2.5	2.5	3.6
T35135P14	5	5	0.6

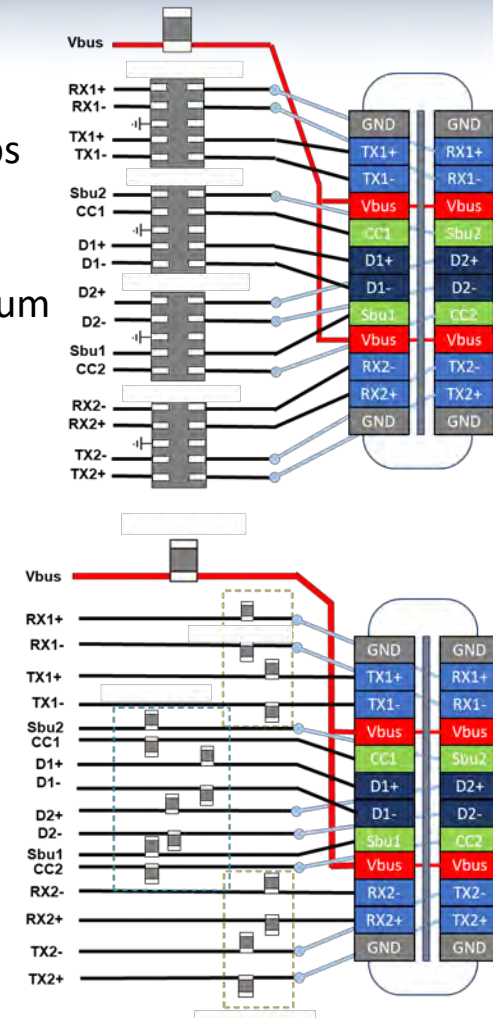


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USB4 advantages

- USB4 fully adopts Type-C
- The USB4 standard transfer rate is at least half-speed 20Gbps (USB 3.2 Gen 2x2). Up to full speed 40Gbps
- USB4 integrates USB, Displayport, PCI Express and other signals
- USB4 Compatibility: Downward compatible with USB 2.0, USB 3.2, Thunderbolt 3.
- USB4 power supply: Supports the PD protocol, which supports at least 7.5W power supply and a maximum of 100W power supply. There will be an updated PD3.1 version in the future, power will be 240W.

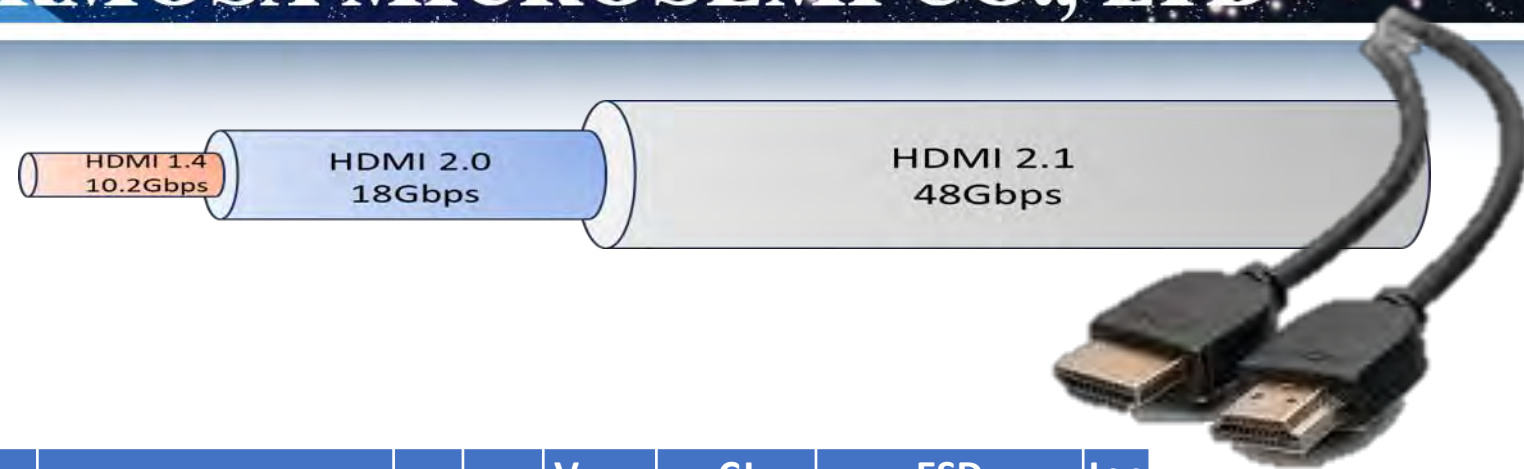
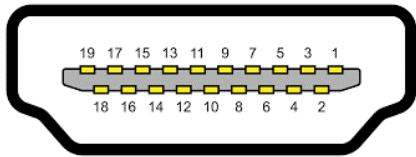
Application	Package	P/N	CH	Dir.	V _{RWM}	C _J	ESD	I _{pp}
					V	TYP(pF)	Cont./Air(KV)	A
Tx/Rx	T0603	LL01V5BTCT0603-H	1	Bi	1.5	0.2	12/15	4
		LL01BT0603-H	1	Bi	1	0.15	10/15	4
	T2510P10	LL034BT2510C-H	4	Uni	3.3	0.18	8/17	6
CC/SUB/ D+/D-	T0603	L24BT0603-H	1	Bi	24	10	20/25	2
	T2510P10	LL054BT2510F-H	4	Uni	5	0.45	20/25	4
	SOT-23-6	LL054BT26L1-H	4	Uni	5	0.6	17/27	5.5
V _{BUS}	T1610P2	N05UT1610-H	1	Uni	5	1000	30/30	130
		N07UT1610-H	1	Uni	7	900	30/30	115
		N15UT1610-H	1	Uni	15	450	30/30	150
		N24UT1610-H	1	Uni	24	260	30/30	80
	T1006P2	N05BT1006I-H	1	Bi	5	20	30/30	10
		N07BT1006-H	1	Bi	7	25	30/30	8
		N15BT1006-H	1	Bi	15	25	30/30	10
		N24BT1006A-H	1	Bi	24	10	30/30	6



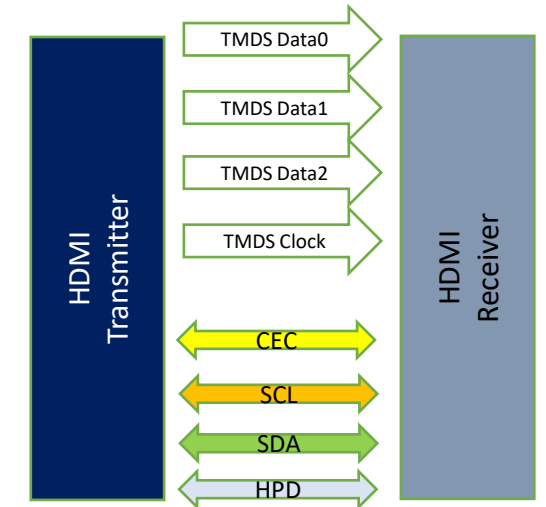


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HDMI



Application		Package	P/N	CH	Dir.	V_{RWM}	CJ	ESD	Ipp
						V	TYP(pF)	Cont./Air(KV)	A
HDMI 1.4/2.0	TMDS Data 0/1/2/Clock	T0603	LL05BT0603E-H	1	Bi	5	0.2	10/15	4.5
			LL03BT0603A-H	1	Bi	3.3	0.18	8/17	6
		T2510P10	LL054BT2510F-H	4	Uni	5	0.45	20/25	6
			LL034BT2510F-H	4	Uni	3.3	0.7	15/15	5
	CEC/SCL/SDA/HPD	T1006	LL05BT1006E-H	1	BI	5	0.2	20/25	4
		SOT-23-6	LL054BT23P6A-H	4	Uni	5	0.45	20/20	4
HDMI 2.1	Lane0/1/2/3	T0603	LL05BT0603E-H	1	Bi	5	0.2	10/15	4.5
			LL03BT0603A-H	1	Bi	3.3	0.18	8/17	6
		T2510P10	LL034BT2510C-H	4	Uni	3.3	0.18	8/17	6
	CEC/SCL/SDA/HPD	T1006	LL05BT1006E-H	1	BI	5	0.2	20/25	4
		SOT-23-6	LL054BT23P6A-H	4	Uni	5	0.45	20/20	4





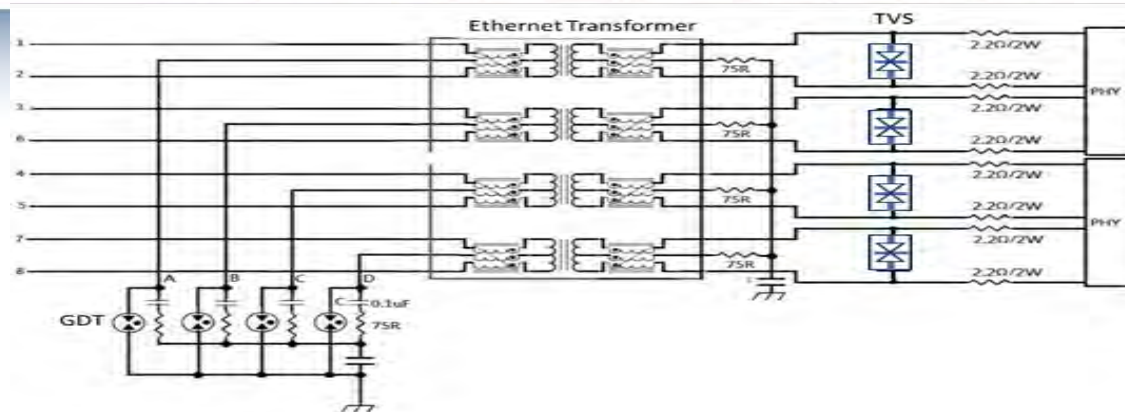
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RJ45



Ethernet 10M/100M/1000M/2.5G/5G/10G



Application	Package	P/N	CH	Dir.	V _{RWM}	CJ	ESD	Ipp
					V	TYP(pF)	Cont./Air(KV)	A
10/100/1000	SOT23-6	LL054BT23P6A-H	4	Uni	5	0.45	20/20	4
	SOD523	ESD5LL5.0CW-H	1	Bi	5	0.4	20/20	15
	DFN2510	LL054BT2510F-H	4	Uni	5	0.45	20/25	4
2.5G/5G/10G	DFN2510	LL034BT2510C-H	4	Uni	3	0.18	8/17	6
	SOT23-6	LL054BT23P6A-H	4	Uni	5	0.45	20/20	4
	DFN1006	LL05BT1006E-H	1	Bi	5	0.2	20/25	4
	DFN0603	LL05BT0603E-H	1	Bi	5	0.2	10/15	4.5

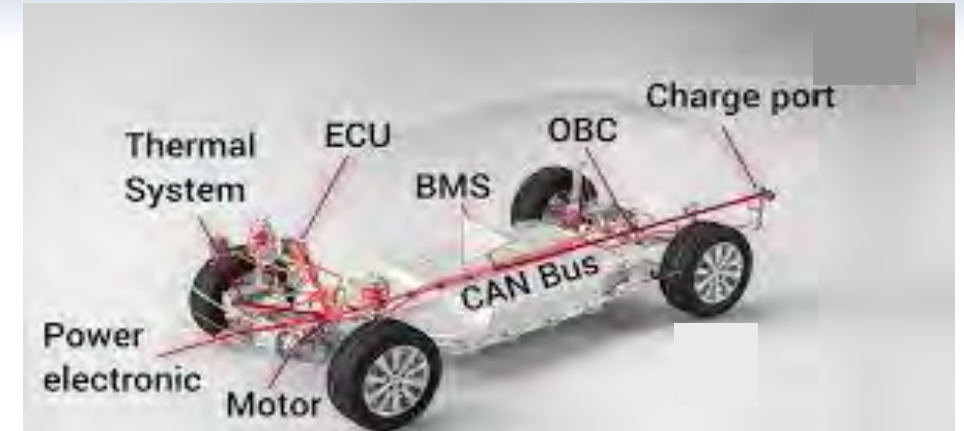
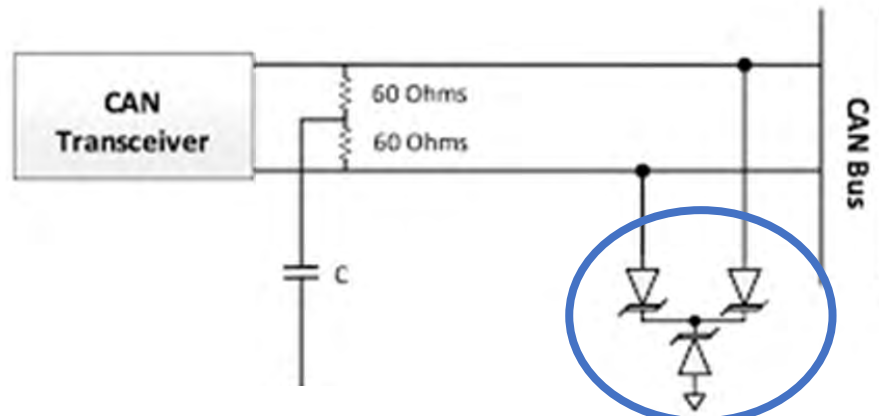


美麗微半導體股份有限公司

FORMOSA MICROSEMI CO., LTD

CAN BUS

AEC Q101



FMS P/N	FMS Package	CH	Bi/Uni	Specification				
				V _{RWM} (V)	CJ (pF)		IEC61000-4-2	
					Typ.	Max.	Contact (KV)	Air (KV)
ESD5Z24CA-Q1-H	SOD-523FL	1	Bi	24	-	30	25	25
ESDH3Z24C-Q1-H	SOD-323F	1	Bi	24	25	30	30	30
NL242BT23-Q1-H	SOT-23	2	Bi	24	15	20	30	30
L242BT23-Q1-H	SOT-23	2	Bi	24	7	-	15	15
N242BT23A-Q1-H	SOT-23	2	Bi	24	12	17	30	30
N242BT23B-Q1-H	SOT-23	2	Bi	24	30	35	30	30



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Thanks for Listening