TPSMC Series

AUTOMOTIVE GRADE HF RoHS UL Pb e3

Uni-directional

Bi-directional

Agency Approvals

AGENCY	AGENCY FILE NUMBER
UL	E230531

Maximum Ratings and Thermal Characteristics (T_A=25°C unless otherwise noted)

Parameter	Symbol	Value	Unit
Peak Pulse Power Dissipation at T_A=25°C by 10/1000μs Waveform (Fig.2)(Note 1), (Note 2)	P_{PPM}	1500	W
Power Dissipation on Infinite Heat Sink at T_A=50°C	$P_{M(AV)}$	6.5	W
Peak Forward Surge Current, 8.3ms Single Half Sine Wave (Note 3)	I_{FSM}	200	A
Maximum Instantaneous Forward Voltage at 100A for Unidirectional Only	V_F	3.5	V
Operating Junction and Storage Temperature Range	T_J, T_{STG}	-65 to 150	°C
Typical Thermal Resistance Junction to Lead	R_{uJL}	15	°C/W
Typical Thermal Resistance Junction to Ambient	R_{uJA}	75	°C/W

Notes:

1. Non-repetitive current pulse , per Fig. 4 and derated above T_A = 25°C per Fig. 3.

2. Mounted on copper pad area of 0.31x0.31″ (8.0 x 8.0mm) to each terminal.

3. Measured on 8.3ms single half sine wave or equivalent square wave for unidirectional device only, duty cycle=4 per minute maximum.

Functional Diagram

Bi-directional

Cathode — Anode

Uni-directional
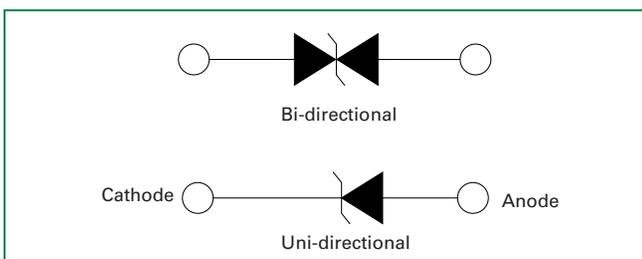
Description

The TPSMC series is designed specifically to protect sensitive electronic equipment from voltage transients induced by lightning and other transient voltage events.

Features

- Hi reliability application and automotive grade AEC-Q101 qualified
- For surface mounted applications to optimize board space
- Low profile package.
- Typical failure mode is short from over-specified voltage or current
- Whisker test is conducted based on JEDEC JESD201A per its table 4a and 4c
- IEC-61000-4-2 ESD 30kV(Air), 30kV (Contact)
- ESD protection of data lines in accordance with IEC 61000-4-2
- EFT protection of data lines in accordance with IEC 61000-4-4
- Built-in strain relief
- V_{BR} @T_J= V_{BR}@25°C x (1+ α T x (T_J - 25))
  (α T:Temperature Coefficient)
- Glass passivated chip junction
- 1500W peak pulse power capability at 10/1000μs waveform, repetition rate (duty cycles):0.01 %
- Fast response time: typically less than 1.0ps from 0V to BV min
- Excellent clamping capability
- Low incremental surge resistance
- Typical I_R less than 1μA above 13V
- High temperature soldering guaranteed: 260°C/10 seconds at terminals
- Plastic package is flammability rated V-0 per Underwriters Laboratories
- Meet MSL level1, per J-STD-020, LF maximun peak of 260°C
- Matte tin lead–free plated
- Halogen free and RoHS compliant
- Pb-free E3 means 2nd level interconnect is Pb-free and the terminal finish material is tin(Sn) (IPC/JEDEC J-STD-609A.01)

Applications

TVS devices are ideal for the protection of I/O Interfaces, V_{CC} bus and other vulnerable circuits used in Telecom, Computer, Industrial and Consumer electronic applications.

Electrical Characteristics

Part Number (Uni)	Part Number (Bi)	Marking		Reverse Stand off Voltage V_R (Volts)	Breakdown Voltage V_{BR} (Volts) @ I_T		Test Current I_T (mA)	Maximum Clamping Voltage V_C @ I_{pp} (V)	Maximum Peak Pulse Current I_{pp} (A)	Maximum Reverse Leakage I_R @ V_R (µA)	Agency Approval U
		UNI	BI		MIN	MAX					
TPSMC12A	TPSMC12CA	12AA	12CA	10.20	11.40	12.60	1	16.7	91.0	5	X
TPSMC13A	TPSMC13CA	13AA	13CA	11.10	12.40	13.70	1	18.2	83.5	1	X
TPSMC15A	TPSMC15CA	15AA	15CA	12.80	14.30	15.80	1	21.2	71.7	1	X
TPSMC16A	TPSMC16CA	16AA	16CA	13.60	15.20	16.80	1	22.5	67.6	1	X
TPSMC18A	TPSMC18CA	18AA	18CA	15.30	17.10	18.90	1	25.2	60.3	1	X
TPSMC20A	TPSMC20CA	20AA	20CA	17.10	19.00	21.00	1	27.7	54.9	1	X
TPSMC22A	TPSMC22CA	22AA	22CA	18.80	20.90	23.10	1	30.6	49.7	1	X
TPSMC24A	TPSMC24CA	24AA	24CA	20.50	22.80	25.20	1	33.2	45.8	1	X
TPSMC27A	TPSMC27CA	27AA	27CA	23.10	25.70	28.40	1	37.5	40.5	1	X
TPSMC30A	TPSMC30CA	30AA	30CA	25.60	28.50	31.50	1	41.4	36.7	1	X
TPSMC33A	TPSMC33CA	33AA	33CA	28.20	31.40	34.70	1	45.7	33.3	1	X
TPSMC36A	TPSMC36CA	36AA	36CA	30.80	34.20	37.80	1	49.9	30.5	1	X
TPSMC39A	TPSMC39CA	39AA	39CA	33.30	37.10	41.00	1	53.9	28.2	1	X
TPSMC43A	TPSMC43CA	43AA	43CA	36.80	40.90	45.20	1	59.3	25.6	1	X
TPSMC47A	TPSMC47CA	47AA	47CA	40.20	44.70	49.40	1	64.8	23.5	1	X
TPSMC51A	TPSMC51CA	51AA	51CA	43.60	48.50	53.60	1	70.1	21.7	1	X
TPSMC56A	TPSMC56CA	56AA	56CA	47.80	53.20	58.80	1	77.0	19.7	1	X
TPSMC62A	TPSMC62CA	62AA	62CA	53.00	58.90	65.10	1	85.0	17.9	1	X
TPSMC68A	TPSMC68CA	68AA	68CA	58.10	64.60	71.40	1	92.0	16.5	1	X
TPSMC75A	TPSMC75CA	75AA	75CA	64.10	71.30	78.80	1	103.0	14.8	1	X
TPSMC82A	TPSMC82CA	82AA	82CA	70.10	77.90	86.10	1	113.0	13.5	1	X
TPSMC91A	TPSMC91CA	91AA	91CA	77.80	86.50	95.50	1	125.0	12.2	1	X

For bidirectional type having V_R of 10 volts and less, the I_R limit is double.

I-V Curve Characteristics

Uni-directional

Bi-directional
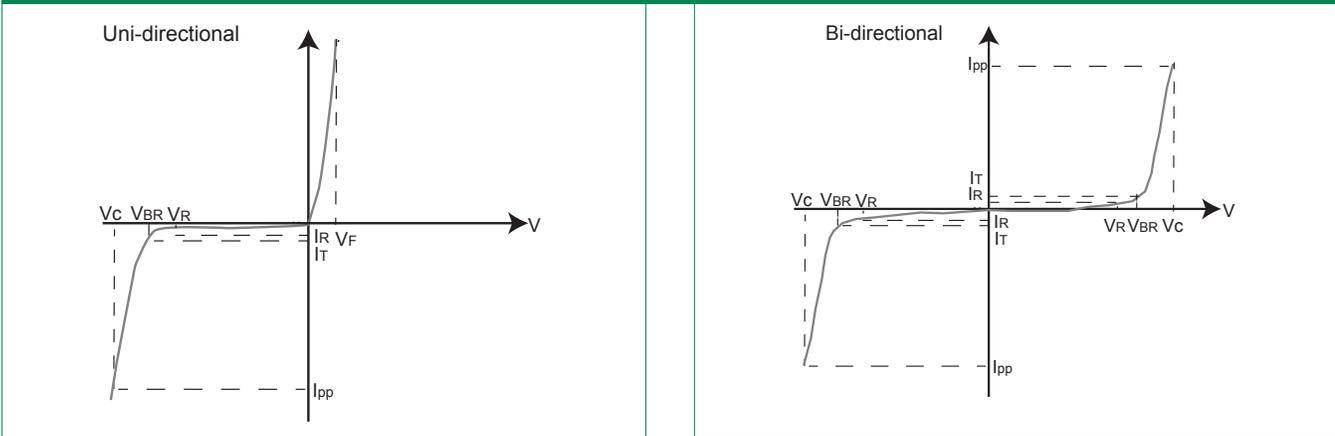
P_{PPM} **Peak Pulse Power Dissipation** – Max power dissipation

V_R **Stand-off Voltage** -- Maximum voltage that can be applied to the TVS without operation

V_{BR} **Breakdown Voltage** -- Maximum voltage that flows though the TVS at a specified test current (I_T)

V_c **Clamping Voltage** -- Peak voltage measured across the TVS at a specified Ippm (peak impulse current)

I_R **Reverse Leakage Current** -- Current measured at V_R

V_F **Forward Voltage Drop for Uni-directional**

Ratings and Characteristic Curves (T$_A$=25°C unless otherwise noted)

Figure 1 - TVS Transients Clamping Waveform
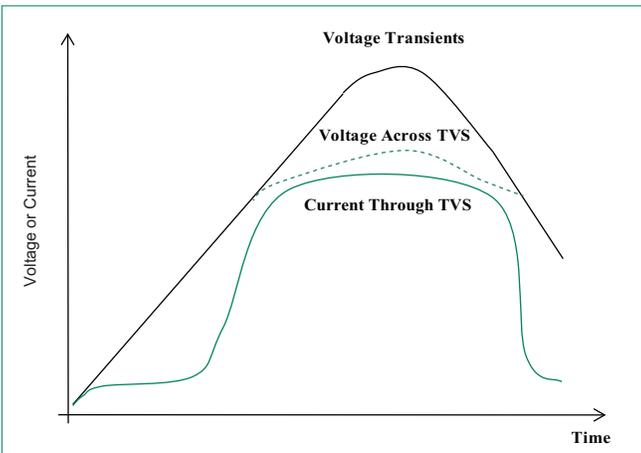
Figure 2 - Peak Pulse Power Rating
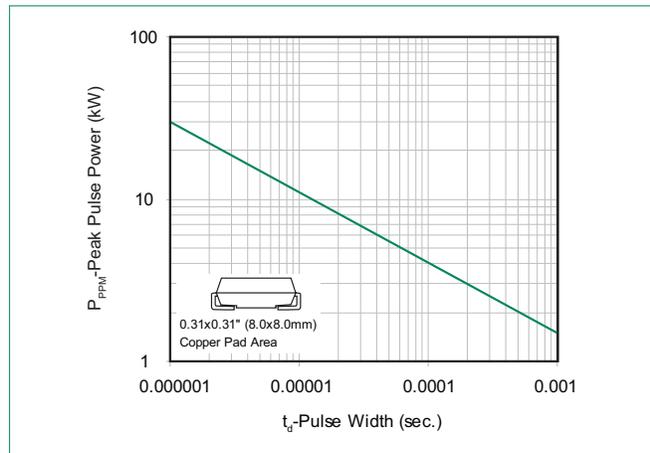
Ratings and Characteristic Curves (T$_A$=25°C unless otherwise noted) (Continued)

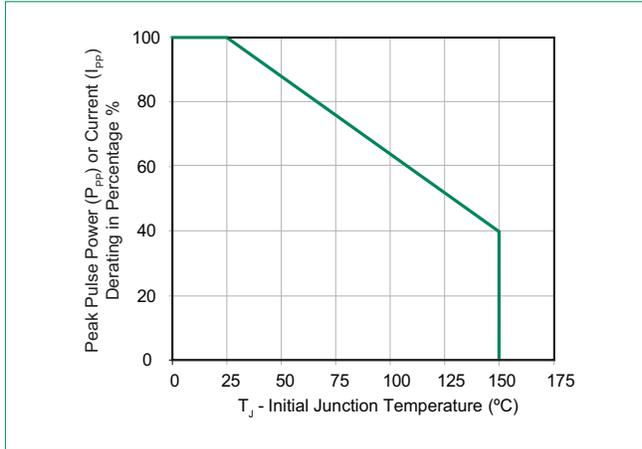## Figure 3 - Peak Pulse Power Derating Curve
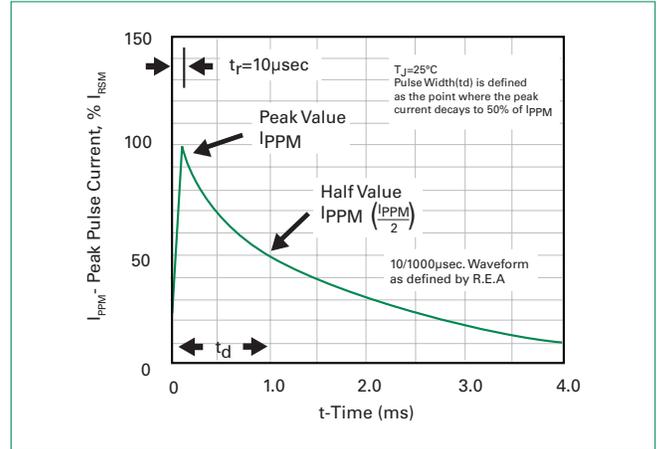
Figure 4 - Pulse Waveform
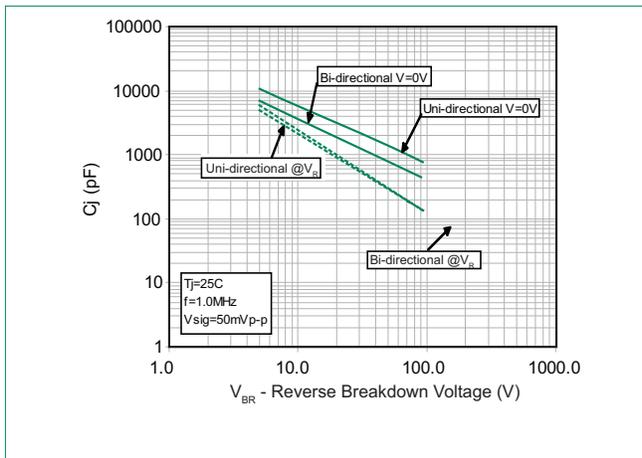
Figure 5 - Typical Junction Capacitance

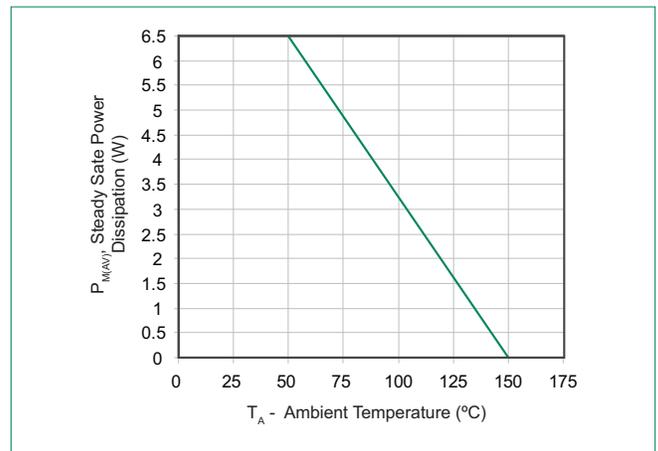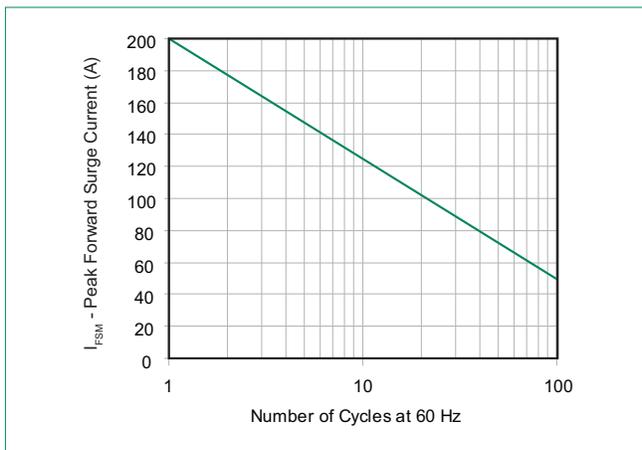## Figure 6 - Steady State Power Dissipation Derating Curve

Figure 7 - Maximum Non-Repetitive Peak Forward Surge Current Uni-Directional Only

Soldering Parameters

| Reflow Condition		Lead–free assembly
Pre Heat	- Temperature Min ($T_{s(min)}$)	150°C
	- Temperature Max ($T_{s(max)}$)	200°C
	- Time (min to max) (t_s)	60 – 120 secs
Average ramp up rate (Liquidus Temp (T_L) to peak		3°C/second max
$T_{S(max)}$ to T_L - Ramp-up Rate		3°C/second max
Reflow	- Temperature (T_L) (Liquidus)	217°C
	- Time (min to max) (t_s)	60 – 150 seconds
Peak Temperature (T_P)		260$^{+0/-5}$ °C
Time within 5°C of actual peak Temperature (t_p)		30 seconds max
Ramp-down Rate		6°C/second max
Time 25°C to peak Temperature (T_P)		8 minutes max.
Do not exceed		260°C
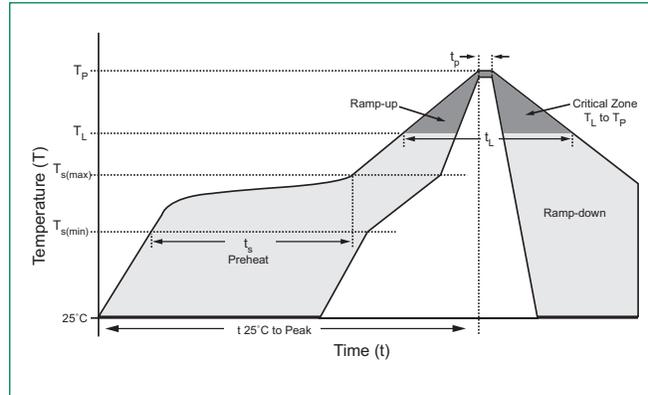
Physical Specifications

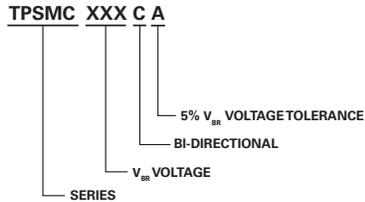| Weight	0.007 ounce, 0.21 grams
Case	JEDEC DO214AB. Molded plastic body over glass passivated junction
Polarity	Color band denotes positive end (cathode) except Bidirectional.
Terminal	Matte Tin-plated leads, Solderable per JESD22-B102

Environmental Specifications

High Temp. Storage	JESD22-A103
HTRB	JESD22-A108
Temperature Cycling	JESD22-A104
MSL	JEDEC-J-STD-020, Level 1
H3TRB	JESD22-A101
RSH	JESD22–A111

Dimensions

DO-214AB (SMC J-Bend)
Cathode Band
(for Uni-directional products only)
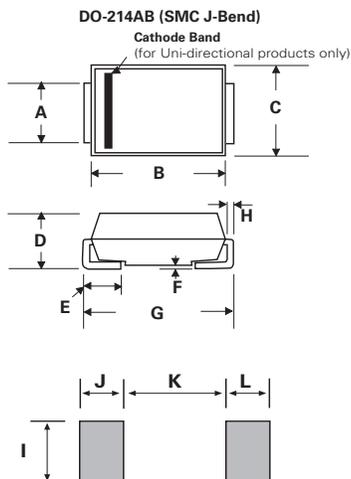
Dimensions	Inches		Millimeters	
	Min	Max	Min	Max
A	0.114	0.126	2.900	3.200
B	0.260	0.280	6.600	7.110
C	0.220	0.245	5.590	6.220
D	0.079	0.103	2.060	2.620
E	0.030	0.060	0.760	1.520
F	-	0.008	-	0.203
G	0.305	0.320	7.750	8.130
H	0.006	0.012	0.152	0.305
I	0.129	-	3.300	-
J	0.094	-	2.400	-
K	-	0.165	-	4.200
L	0.094	-	2.400	-

Part Numbering System

TPSMC XXX C A

- 5% V_{BR} VOLTAGE TOLERANCE
- BI-DIRECTIONAL
- V_{BR} VOLTAGE
- SERIES

Part Marking System

- Cathode Band
- Littelfuse Logo
- Marking Code

XXXX
YMXXX

- Trace Code Marking
  Y:Year Code
  M: Month Code
  XXX: Lot Code
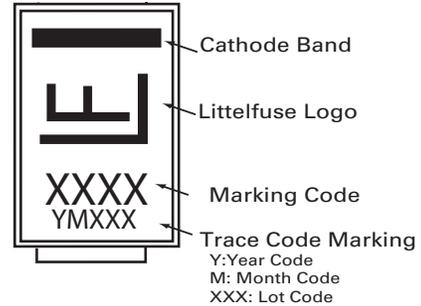
Packaging

Part number	Component Package	Quantity	Packaging Option	Packaging Specification
TPSMCxxxXX	DO-214AB	3000	Tape & Reel - 16mm tape/13″ reel	EIA STD RS-481

Tape and Reel Specification

0.157 (4.0)
0.63 (16.0)
0.315 (8.0)
0.059 (1.5) DIA
Cover tape

Cathode

13.0 (330)
0.80 (20.2) Arbor Hole Dia.
0.65 (16.4)
Dimensions are in inches (and millimeters).
Direction of Feed
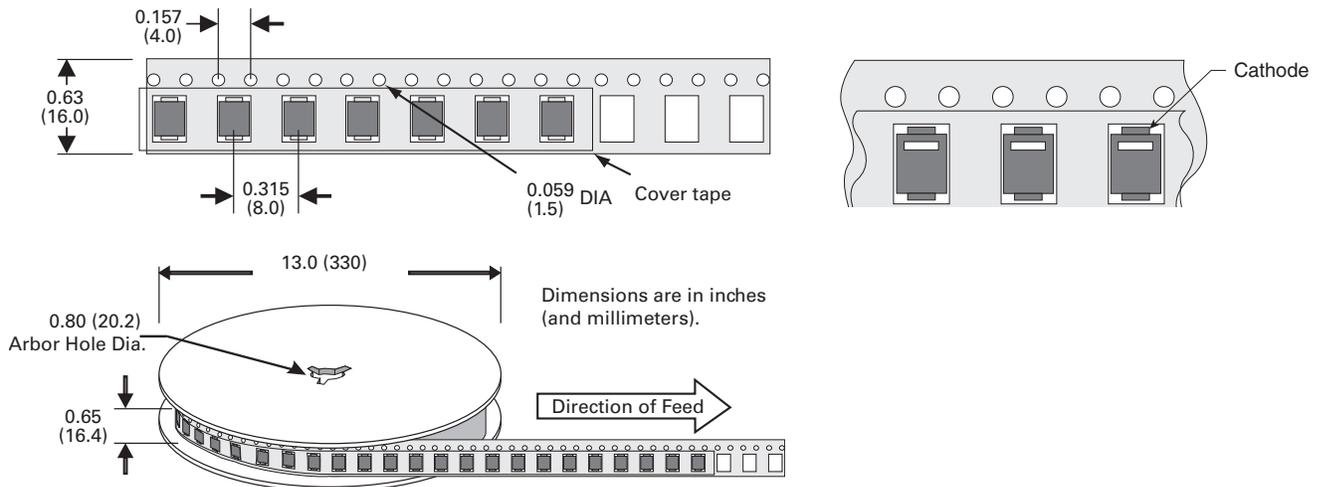
Mouser Electronics

Authorized Distributor

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TPSMC24A TPSMC24CA TPSMC27A TPSMC27CA TPSMC30A TPSMC30CA TPSMC33A TPSMC33CA
TPSMC36A TPSMC36CA TPSMC39A TPSMC51A TPSMC51CA TPSMC91A TPSMC75CA TPSMC56CA
TPSMC13CA TPSMC13A TPSMC16A TPSMC56A TPSMC68A TPSMC82CA TPSMC20CA TPSMC22CA
TPSMC82A TPSMC62A TPSMC68CA TPSMC43CA TPSMC91CA TPSMC16CA TPSMC43A TPSMC47CA
TPSMC62CA TPSMC39CA TPSMC75A TPSMC47A TPSMC12A TPSMC12CA TPSMC15A TPSMC15CA
TPSMC18A TPSMC18CA TPSMC20A TPSMC22A