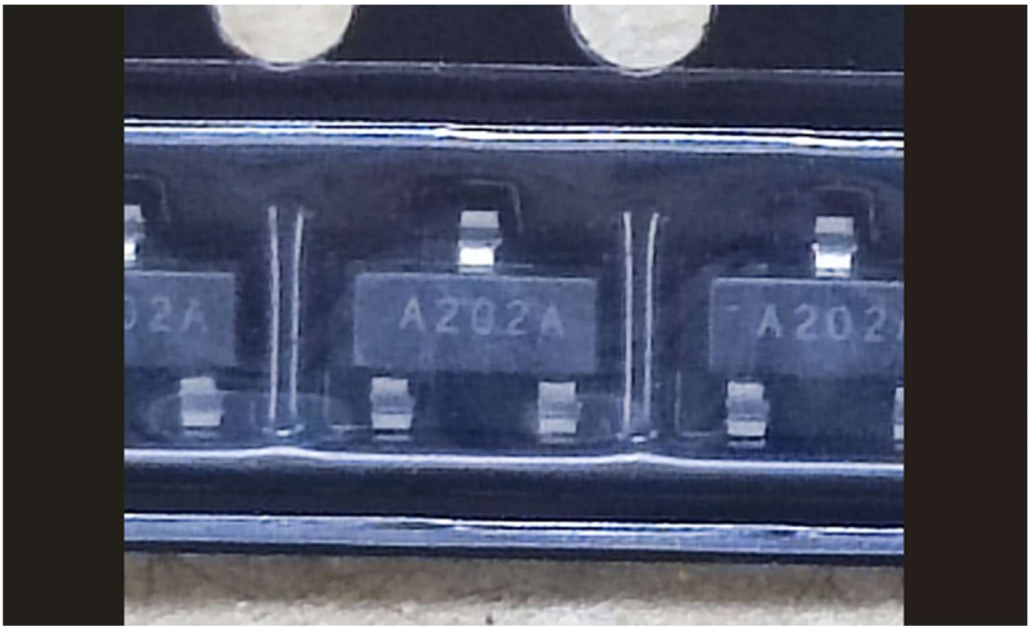


設計驗證
工程課
2025 -08- 21
發行

承　認　書

APPROVAL　SHEET

客　戶	鈺緯科技開發股份有限公司
CUSTOMER	DIVA Laboratories, Ltd.

零 件 編 號 TYPE　NO	包裝 / 品牌 PACKAGE / BRAND
AP2N030EN	Brand : APEC
3BAP2N0301Y (B0143)	Package :SOT-23S
	Tape&Reel: 3000pcs/Reel

設計驗證
工程課
2025 -08- 21
發行
鈺緯科技開發股份有限公司

REMARK

Sentronic International Corp.
昱捷
TEL:
8797-5025
新北市汐止區新台五路一段93號25樓之6

APPROVE		COMMENT :
REJECT		

ACCEPTED BY Willy　　DATE :2025/8/15

昱捷股份有限公司　　新北市汐止區新台五路一段93號25樓之6

SENTRONIC INTERNATIONAL CORP.　　TEL : 02-8797-5025　FAX :2659-2979

富鼎先進電子股份有限公司
ADVANCED POWER ELECTRONICS CORP.

Address: 12F-1&2, No.5, Taiyuan 1 ST., Zhubei City, Hsinchu County 30265, Taiwan,
R.O.C.Tel:886-3-6215899 Fax:886-3-6215999
E-mail:mail@a-power.com.tw

承 認 書

Specification Sheet

Customer：昱捷股份有限公司

Customer Part Number	AP2N030EN
APEC Part Number	AP2N030EN
Issued Date	2023/09/20
SPEC No.	SPEC-202309-0016

APEC Approved		
		批准 2023.09.20 DCC
Sales Manager	**Sales**	**QA**

Customer Approved			
Dept.			
Signature			

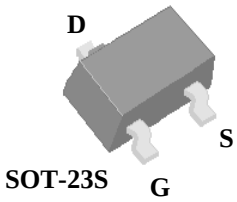
Item	Contents	Page
1	Data Sheet	p1~p6
2	Package Outline	p7~p8
3	Packing Standard	p9~p10
4	Material List	p11~p14
5	IR Reflow	p15
6	Reliability Test Report	AnnexI

Halogen-Free Product

Advanced Power Electronics Corp.

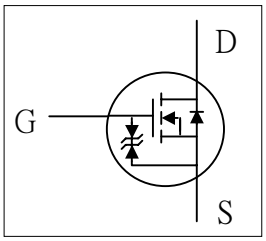
N-CHANNEL ENHANCEMENT MODE POWER MOSFET

- ▼ **Capable of 2.5V Gate Drive**
- ▼ **Lower Gate Charge**
- ▼ **Fast Switching Performance**
- ▼ **RoHS Compliant & Halogen-Free**



SOT-23S

BV_{DSS}	20V
$R_{DS(ON)}$	35mΩ
I_D	5.3A



Description

AP2N030E series are from Advanced Power innovated design and silicon process technology to achieve the lowest possible on-resistance and fast switching performance. It provides the designer with an extreme efficient device for use in a wide range of power applications.

The SOT-23S package is widely preferred for commercial-industrial surface mount applications and suited for low voltage applications such as DC/DC converters.

Absolute Maximum Ratings@T_j=25°C(unless otherwise specified)

Symbol	Parameter	Rating	Units
V_{DS}	Drain-Source Voltage	20	V
V_{GS}	Gate-Source Voltage	±12	V
I_D@T_A=25℃	Drain Current[3], V_{GS} @ 4.5V	5.3	A
I_D@T_A=70℃	Drain Current[3], V_{GS} @ 4.5V	4.3	A
I_{DM}	Pulsed Drain Current[1]	20	A
P_D@T_A=25℃	Total Power Dissipation	1.25	W
T_{STG}	Storage Temperature Range	-55 to 150	℃
T_J	Operating Junction Temperature Range	-55 to 150	℃

Thermal Data

Symbol	Parameter	Value	Unit
Rthj-a	Maximum Thermal Resistance, Junction-ambient[3]	100	℃/W

Electrical Characteristics@T_j=25°C(unless otherwise specified)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
BV_{DSS}	Drain-Source Breakdown Voltage	V_{GS}=0V, I_D=250uA	20	-	-	V
$R_{DS(ON)}$	Static Drain-Source On-Resistance[2]	V_{GS}=10V, I_D=5.6A	-	-	30	mΩ
		V_{GS}=4.5V, I_D=5.3A	-	-	35	mΩ
		V_{GS}=2.5V, I_D=2.6A	-	-	50	mΩ
$V_{GS(th)}$	Gate Threshold Voltage	V_{DS}=V_{GS}, I_D=250uA	0.5	-	1.25	V
g_{fs}	Forward Transconductance	V_{DS}=5V, I_D=5A	-	18	-	S
I_{DSS}	Drain-Source Leakage Current	V_{DS}=16V, V_{GS}=0V	-	-	10	uA
I_{GSS}	Gate-Source Leakage	V_{GS}= ±12V, V_{DS}=0V	-	-	±30	uA
Q_g	Total Gate Charge	I_D=5A	-	6.5	10.4	nC
Q_{gs}	Gate-Source Charge	V_{DS}=10V	-	1	-	nC
Q_{gd}	Gate-Drain ("Miller") Charge	V_{GS}=4.5V	-	1.7	-	nC
$t_{d(on)}$	Turn-on Delay Time	V_{DS}=10V	-	3	-	ns
t_r	Rise Time	I_D=1A	-	12	-	ns
$t_{d(off)}$	Turn-off Delay Time	R_G=3.3Ω	-	17	-	ns
t_f	Fall Time	V_{GS}=10V	-	2	-	ns
C_{iss}	Input Capacitance	V_{GS}=0V	-	520	832	pF
C_{oss}	Output Capacitance	V_{DS}=10V	-	65	-	pF
C_{rss}	Reverse Transfer Capacitance	f=1.0MHz	-	60	-	pF

Source-Drain Diode

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
V_{SD}	Forward On Voltage[2]	I_S=1A, V_{GS}=0V	-	-	1.2	V
t_{rr}	Reverse Recovery Time	I_S=5A, V_{GS}=0V,	-	6	-	ns
Q_{rr}	Reverse Recovery Charge	dI/dt=100A/μs	-	1.5	-	nC

Notes:

1.Pulse width limited by Max. junction temperature.

2.Pulse test

3.Surface mounted on 1 in^2 copper pad of FR4 board, t ≤ 10s ; 300℃/W when mounted on min. copper pad.

THIS PRODUCT IS SENSITIVE TO ELECTROSTATIC DISCHARGE, PLEASE HANDLE WITH CAUTION.

USE OF THIS PRODUCT AS A CRITICAL COMPONENT IN LIFE SUPPORT OR OTHER SIMILAR SYSTEMS IS NOT AUTHORIZED.

APEC DOES NOT ASSUME ANY LIABILITY ARISING OUT OF THE APPLICATION OR USE OF ANY PRODUCT OR CIRCUIT DESCRIBED HEREIN; NEITHER DOES IT CONVEY ANY LICENSE UNDER ITS PATENT RIGHTS, NOR THE RIGHTS OF OTHERS.

APEC RESERVES THE RIGHT TO MAKE CHANGES WITHOUT FURTHER NOTICE TO ANY PRODUCTS HEREIN TO IMPROVE RELIABILITY, FUNCTION OR DESIGN.

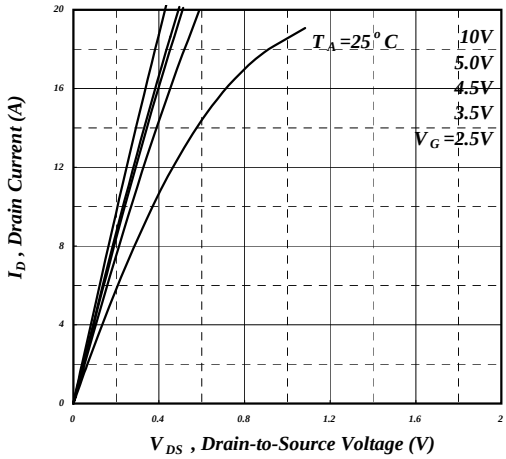


Fig 1. Typical Output Characteristics

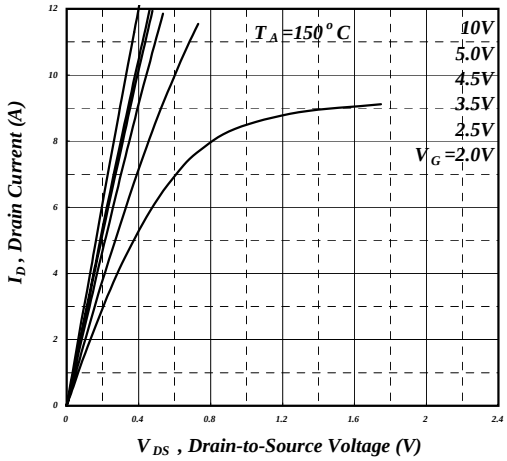


Fig 2. Typical Output Characteristics

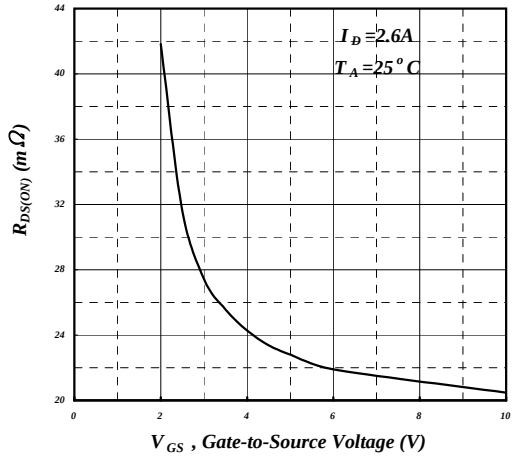


Fig 3. On-Resistance v.s. Gate Voltage

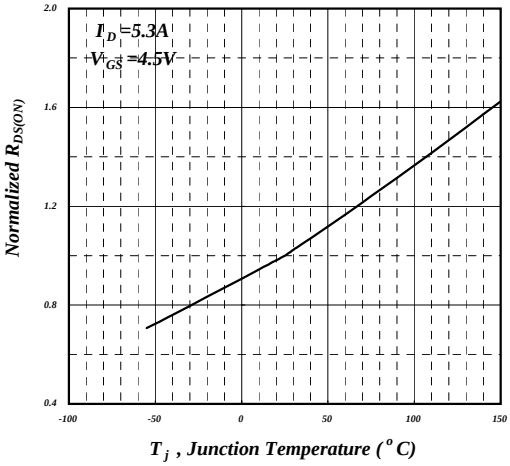


Fig 4. Normalized On-Resistance v.s. Junction Temperature

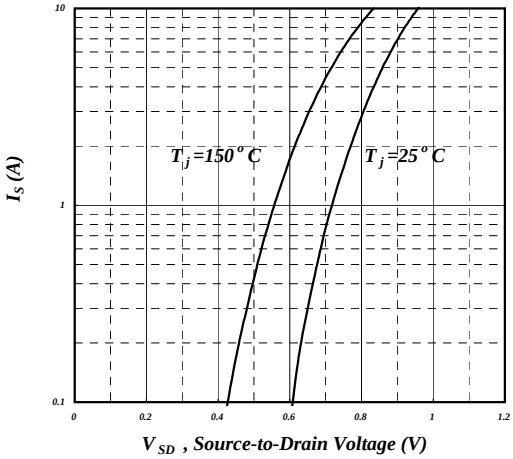


Fig 5. Forward Characteristic of Reverse Diode

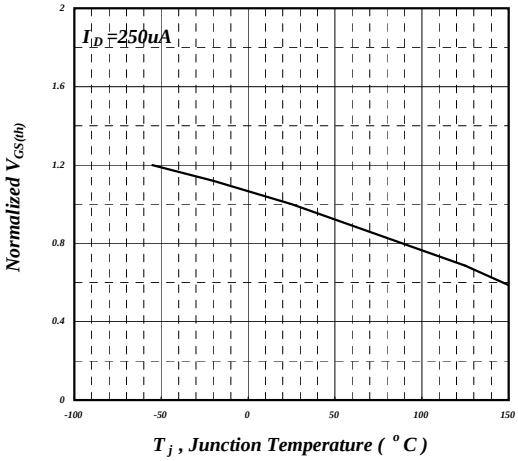


Fig 6. Gate Threshold Voltage v.s. Junction Temperature

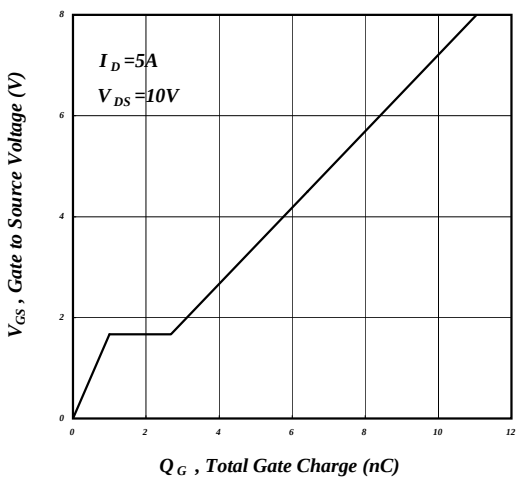


Fig 7. Gate Charge Characteristics

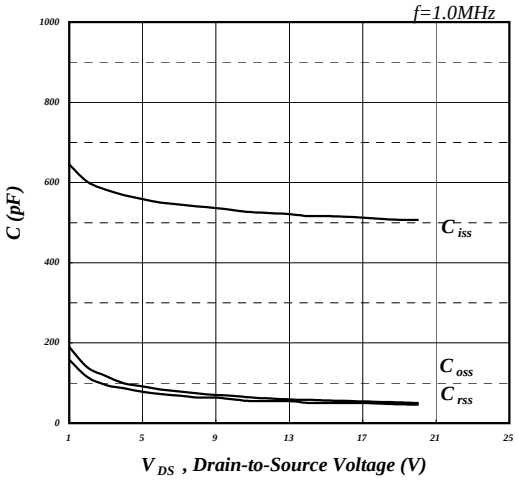


Fig 8. Typical Capacitance Characteristics

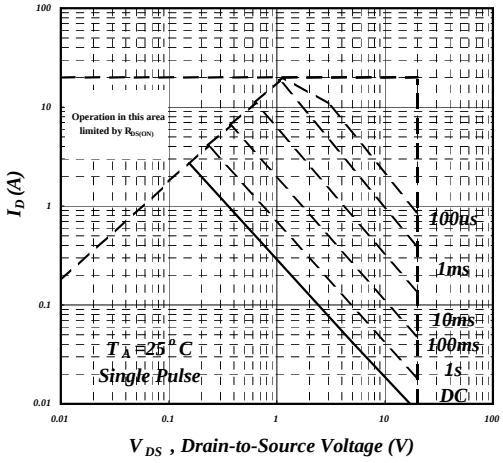


Fig 9. Maximum Safe Operating Area

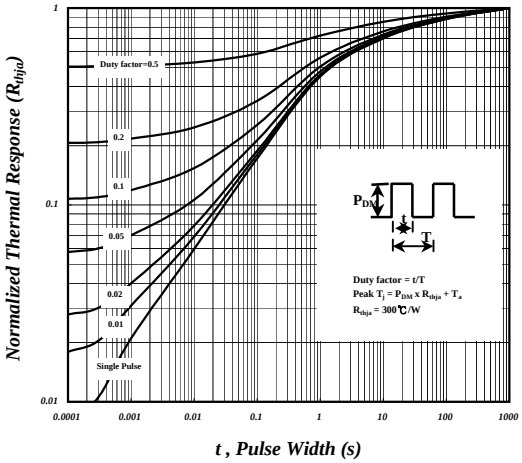


Fig 10. Effective Transient Thermal Impedance

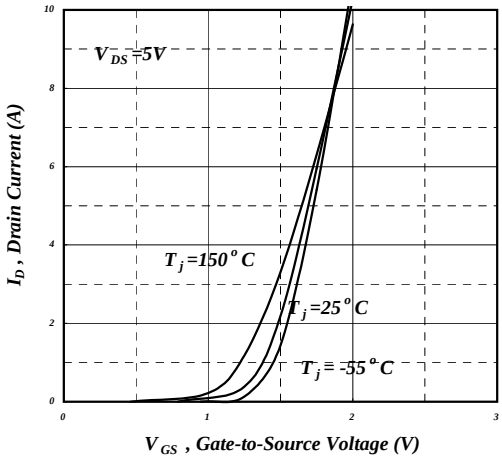


Fig 11. Transfer Characteristics

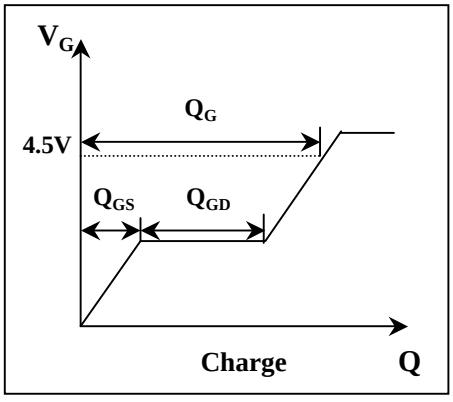


Fig 12. Gate Charge Circuit

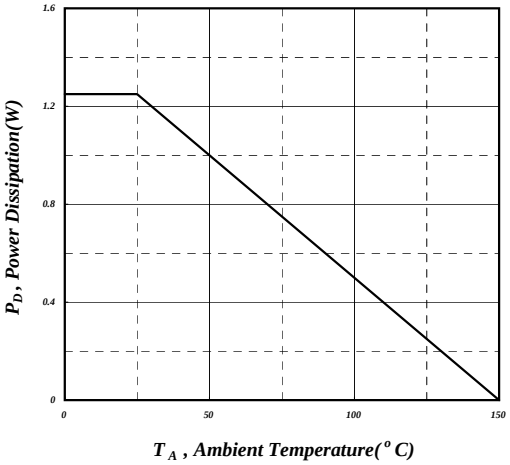


Fig 13. Total Power Dissipation

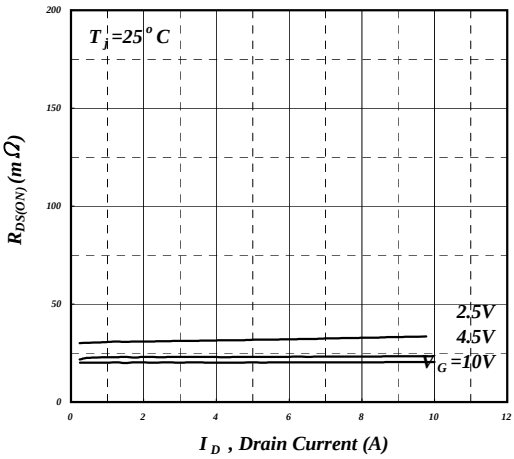
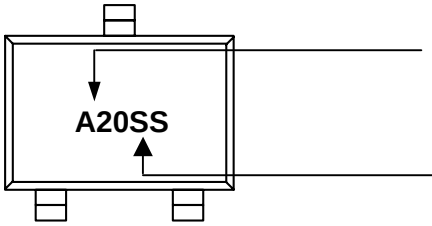


Fig 14. Typ. Drain-Source on State Resistance

MARKING INFORMATION



Part Number : A20

Date Code : SS

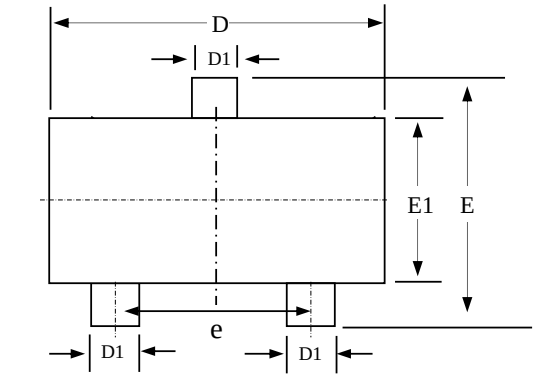
SS:2004,2008,2012,2016,2020...

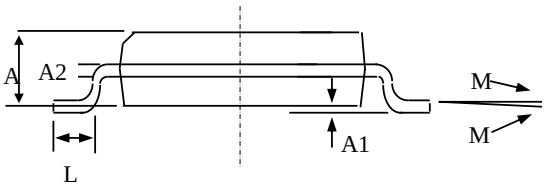
SS:2003,2007,2011,2015,2019...

SS:2002,2006,2010,2014,2018...

SS:2001,2005,2009,2013,2017...

Package Outline : SOT-23S





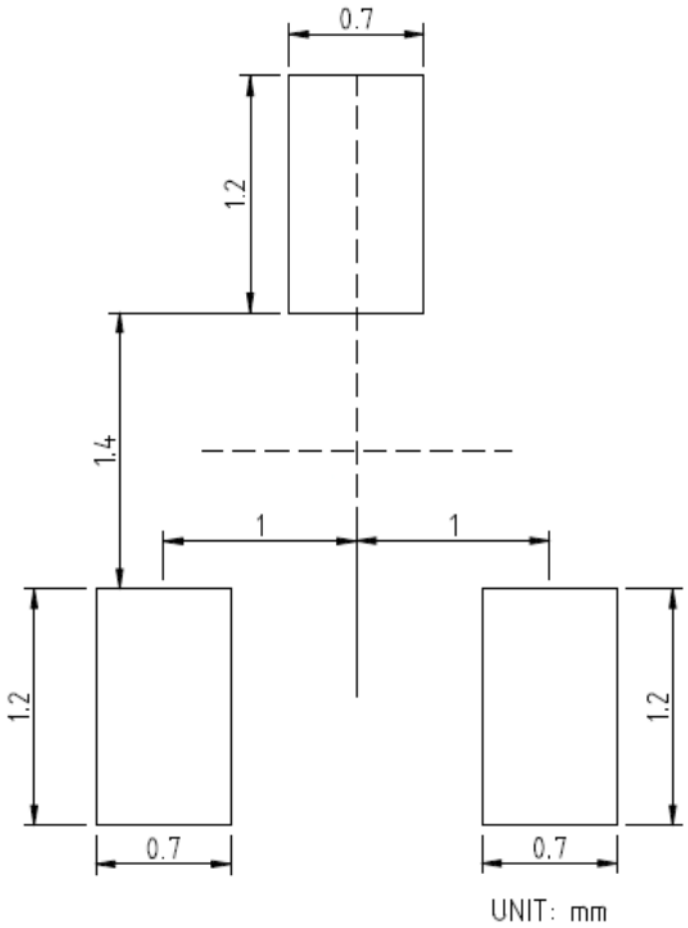
SYMBOLS	Millimeters		
	MIN	NOM	MAX
A	0.80	1.00	1.20
A1	0.00	—	0.10
A2	0.05	—	0.20
D1	0.30	0.40	0.50
e	1.80	1.90	2.00
D	2.80	2.90	3.10
E	2.10	2.40	2.70
E1	1.20	1.30	1.40
M	0°	5°	10°
L	0.20	—	0.60

1.All Dimension Are In Millimeters.

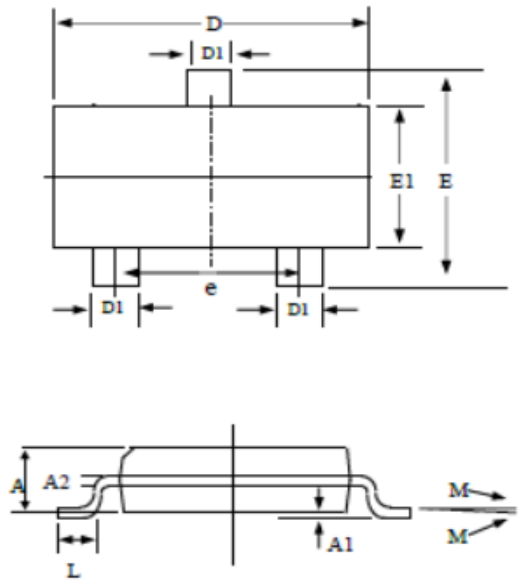
2.Dimension Does Not Include Mold Protrusions.

Draw No. M1-N3MIBF-G-v04

SOT-23S FOOTPRINT：



APEC SOT-23S PACKAGE DIMENSION REPORT



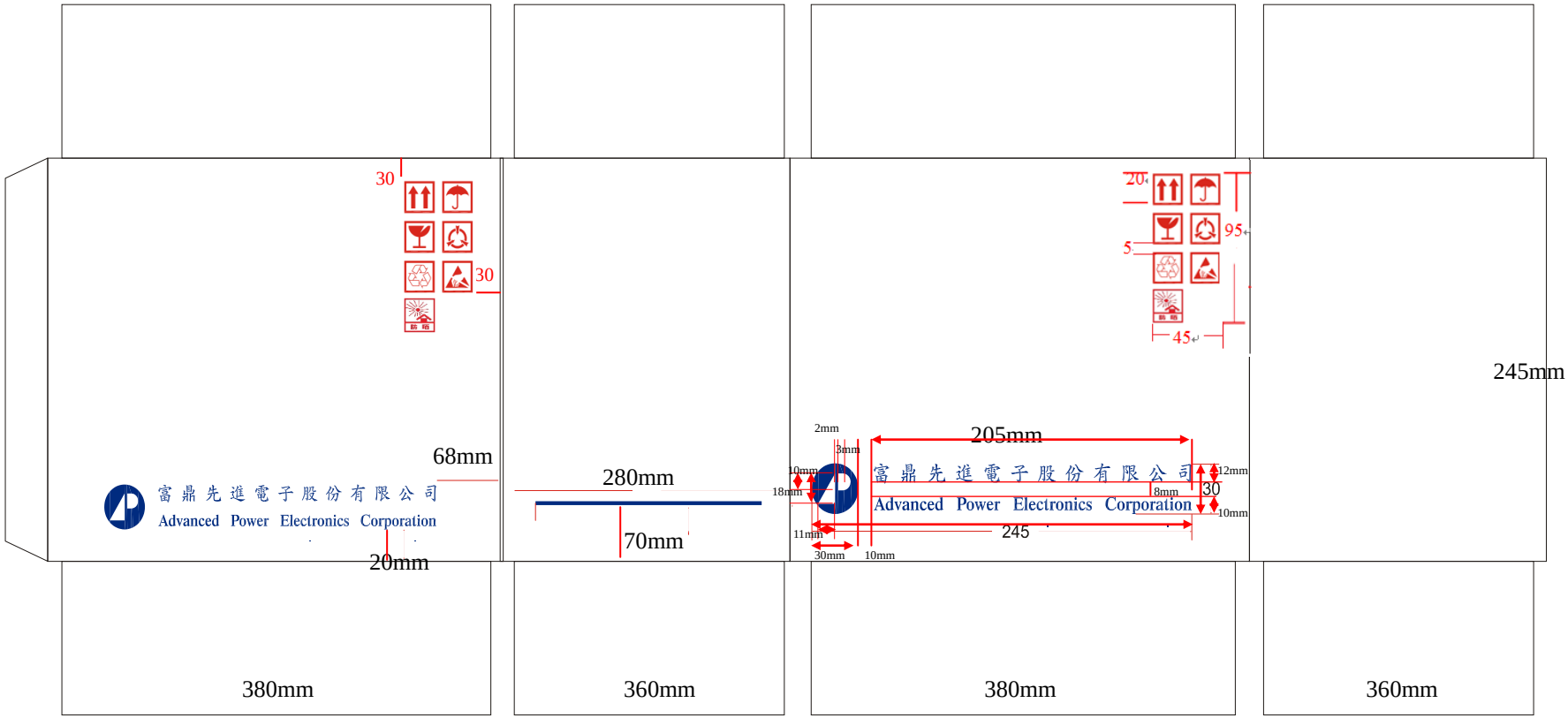


SYMBOLS	Millimeters			AIC Measure Data													
	MIN	NOM	MAX	Sample 1	Sample 2	Sample 3	Sample 4	Sample 5	Sample 6	Sample 7	Sample 8	Sample 9	Sample 10	MIN	MAX	AVERAGE
A	0.80	1.00	1.20	0.994	0.998	0.994	0.997	0.992	0.987	0.989	0.997	0.990	0.994	0.99	1.00	0.99
A1	0.00	—	0.10	0.072	0.078	0.076	0.071	0.069	0.077	0.072	0.074	0.074	0.076	0.07	0.08	0.07
A2	0.05	—	0.20	0.114	0.118	0.121	0.120	0.119	0.117	0.118	0.123	0.119	0.122	0.11	0.12	0.12
D	2.80	2.90	3.10	2.874	2.876	2.872	2.873	2.873	2.869	2.867	2.879	2.877	2.874	2.87	2.88	2.87
D1	0.30	0.40	0.50	0.414	0.416	0.422	0.428	0.419	0.421	0.422	0.419	0.427	0.418	0.41	0.43	0.42
e	1.80	1.90	2.00	1.888	1.883	1.879	1.891	1.878	1.891	1.896	1.879	1.872	1.890	1.87	1.90	1.88
E	2.10	2.40	2.70	2.416	2.418	2.420	2.419	2.414	2.418	2.417	2.422	2.418	2.420	2.41	2.42	2.42
E1	1.20		1.40	1.266	1.267	1.265	1.265	1.259	1.261	1.263	1.264	1.271	1.273	1.26	1.27	1.27
L	0.20	—	0.60	0.366	0.365	0.367	0.368	0.371	0.373	0.368	0.376	0.371	0.367	0.37	0.38	0.37
M	0°	5°	10°	2.31	2.32	2.28	2.31	2.28	2.13	2.19	2.17	2.34	2.32	2.13	2.34	2.27

富鼎先進電子股份有限公司

包裝規範 Packing Spec

Attachment 2：TO-252、TO-263、SOT-23、SOT-26、SOT-89、SOT-25、SOT-223/323/363/723、SOT-723、SC70-4L/5L、TSOT-23/5/6、GEM2928-8、2928-8RU、DFN3*2、DFN2*2、WCSP FDFN Carton



NOTE：

1. CARTON SIZE：380*360*245mm
2. MATERIAL：DOUBLE AB WALL CORRUGATED
3. COLOR OF PAPER IS YELLOWISH BROWN
4. BASIC WEIGHT：A200,100,100,130,A200(g/m²)
5. BURSTING STRENGHT：14kgf/cm²
6. TOLERANCE：±30mm
7. UNIT：mm.
8. PRINT COLOR：BLUE(PANTONE 072U)
   RED(PANTONE 186U)
9. JONIT：COMBINATION
10. IMPEDANCE：NONE
11. GTM PART NO.

文件編號：QWMPC-7801
版　　別：59
頁　　碼：12

富鼎先進電子股份有限公司
Advanced Power Electronics Corporation

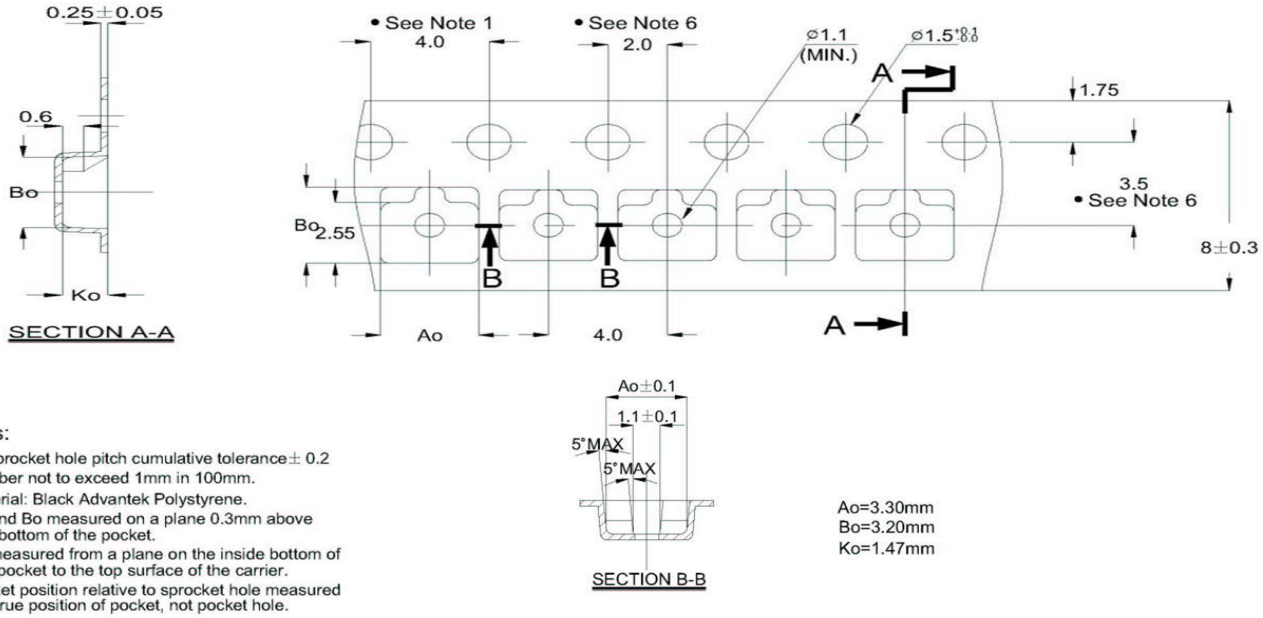


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包裝規範 Packing Spec

附圖四：SOT-23/5/6/TSOT-23/5/6 Tape & Reel Information

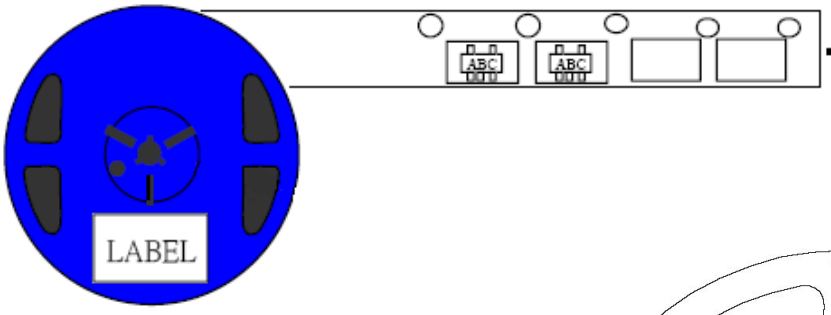


Notes:

1. 10 sprocket hole pitch cumulative tolerance± 0.2
2. Camber not to exceed 1mm in 100mm.
3. Material: Black Advantek Polystyrene.
4. Ao and Bo measured on a plane 0.3mm above the bottom of the pocket.
5. Ko measured from a plane on the inside bottom of the pocket to the top surface of the carrier.
6. Pocket position relative to sprocket hole measured as true position of pocket, not pocket hole.

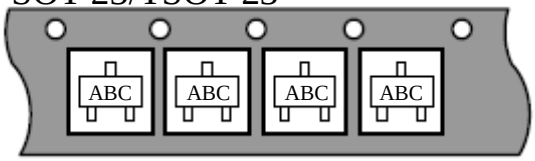
Ao=3.30mm
Bo=3.20mm
Ko=1.47mm

REEL LABEL及產品捲繞位置圖。 Reel label & Peel winding product position.

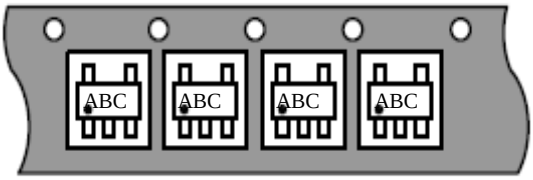


Direction of tape feed
Packing : 3000 pcs / Reel

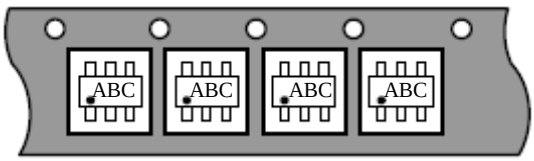
SOT-23/TSOT-23

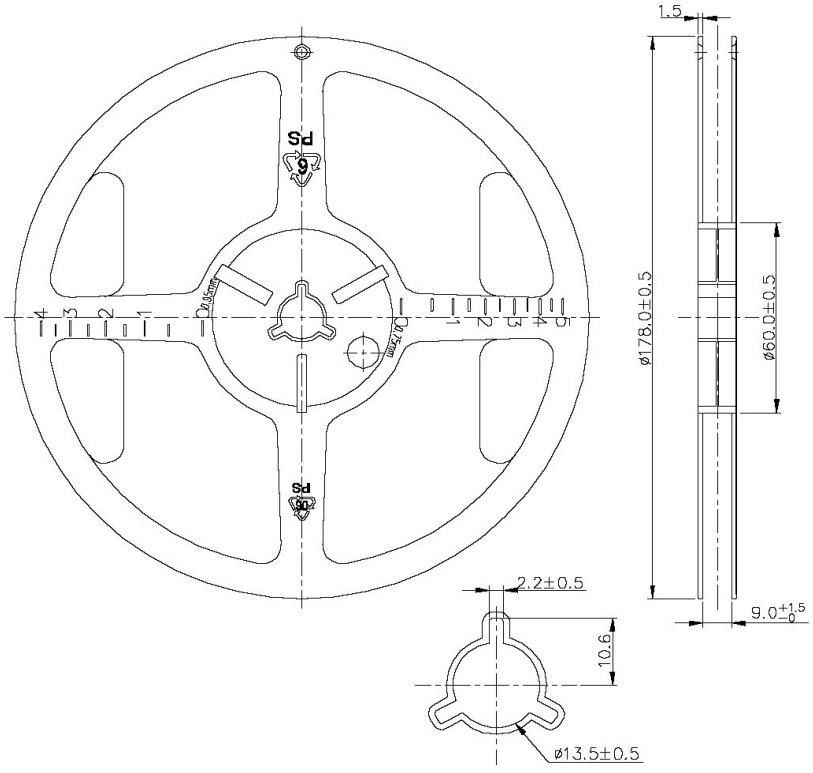


SOT-25/TSOT-25



SOT-26/TSOT-26





文件編號：QWMPC-7801
版　　別：59
頁　　碼：26

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ADVANCED POWER ELECTRONICS CORP.

Material list SOT-23S(B)

Parts	Material Supplier	Material P/N	Country	Parts Weight (mg)	Substance	Weight (mg)	Percentage	Percentage by parts	CAS No.
Compound	Sumitomo	Sumitomo G600T	Singapore	5.103	Epoxy Resin A	0.383	0.042	7.50%	Trade Secret
					Epoxy Resin B	0.128	0.014	2.50%	29690-82-2
					Phenol Resin	0.128	0.014	2.50%	Trade Secret
					Silica (Amorphous)	4.437	0.490	86.95%	60676-86-0
					Carbon Black	0.028	0.003	0.55%	1333-86-4
Die Attach	Henkel	84-1LMISR4	Korea	0.101	Silver	0.071	0.008	70.00%	7440-22-4
					Epoxy Resin	0.020	0.002	20.00%	9003-36-5
					Butane	0.005	0.001	5.00%	2425-79-8
					Aromatic Polyamine	0.005	0.001	5.00%	Trade Secret
Lead Frame	KangQiang	CAC-5	China	3.4146	Cu	3.334	0.3680	97.64%	7440-50-8
					Ni	0.027	0.0030	0.80%	7440-02-0
					Sn	0.051	0.0057	1.50%	7440-31-5
					P	0.002	0.0002	0.06%	7723-14-0
Wire	LT Metal	AuPd Cu	Korea	0.0062	Copper	0.00606	0.0669%	97.70%	7440-50-8
					Palladium	0.00014	0.0015%	2.20%	7440/5/3
					Gold	0.00001	0.0001%	0.10%	7440-57-5
Wire	Heraeus	Cu MaxSoft	Malaysia	0.0296	Copper	0.0296	0.3268%	100.00%	7440-50-8
Plating	Shenmao	Pure Tin - H99.95HS	Taiwan	0.284	Tin	0.284	3.138%	100.00%	7440-31-5
Die	Power Chip	WAFER	Taiwan	0.12	Si	0.1189697	1.31332%	99.1414%	7440-21-3
					Al	0.0007716	0.00852%	0.6430%	7429-90-5
					P	0.0001596	0.00176%	0.1330%	7723-14-0
					W	0.0000829	0.00092%	0.0691%	7440-33-7
					Ti	0.0000091	0.00010%	0.0076%	7440-32-6
					Cu	0.0000040	0.00004%	0.0033%	7440-50-8
					B	0.0000020	0.00002%	0.0017%	7440-42-8
					Ca	0.0000006	0.00001%	0.0005%	7440-70-2
					Fe	0.0000005	0.00001%	0.0004%	7439-89-6
			Total weight	9.059 mg		9.059 mg	100%		

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Material list SOT-23S(I)

Parts	Material Supplier	Material P/N	Country	Parts Weight (mg)	Substance	Weight (mg)	Percentage	Percentage by parts	CAS No.
Compound	SD	CEL-8240HF	China	6.235	Epoxy Resin-1	0.249	2.367%	4.00%	Trade secret
					Epoxy Resin-2	0.249	2.367%	4.00%	Trade secret
					Hardener	0.399	3.787%	6.40%	Trade secret
					Organic Phosphorus compounds	0.031	0.296%	0.50%	Trade secret
					Carbon Black	0.012	0.118%	0.20%	1333-86-4
					Amorphous Silica 1	5.269	50.005%	84.50%	60676-86-0
					Amorphous Silica 2	0.025	0.237%	0.40%	7631-86-9
Die Attach	HENKEL	84-1LMISR4	China	0.123	Sliver	0.092	0.876%	75.0%	7440-22-4
					Bisphenol-F Epichlorhydrin resin	0.019	0.181%	15.5%	9003-36-5
					1,4-Bis(2,3-epoxypropoxy)butane	0.009	0.088%	7.5%	2425-79-8
					Dapsone	0.002	0.023%	2.0%	80-08-0
Lead Frame	SDI	LY65	China	3.219	Cu	3.14802	29.879%	97.795%	7440-50-8
					Fe	0.06760	0.642%	2.100%	7439-89-6
					P	0.00048	0.005%	0.015%	7723-14-0
					Zn	0.00161	0.015%	0.050%	7440-66-6
					Pb	0.00097	0.009%	0.030%	7439-92-1
					Plating Ag	0.00032	0.003%	0.010%	7440-22-4
Plating	富美達 宏利	100% Sn	China	0.812	Sn	0.8116	7.703%	99.950%	7440-31-5
					Other	0.0004	0.004%	0.050%	-
Wire	Heraeus	Cu1.2mil	China	0.027	Cu	0.027	0.256257%	99.9972%	7440-50-8
					Ag	0.0000003	0.000003%	0.0012%	7440-22-4
					Fe	0.0000001	0.000001%	0.0005%	7439-89-6
					Mn	0.0000001	0.000001%	0.0003%	7439-96-5
					S	0.0000002	0.000002%	0.0006%	7704-34-9
					Ni	0.0000001	0.000001%	0.0002%	7440-02-0
Die	Powerchip	Wafer	Taiwan	0.12	Si	0.118970	1.12917%	99.1414%	7440-21-3
					Al	0.000772	0.00732%	0.6430%	7429-90-5
					P	0.000160	0.00151%	0.1330%	7723-14-0
					W	0.000083	0.00079%	0.0691%	7440-33-7
					Ti	0.000009	0.00009%	0.0076%	7440-32-6
					Cu	0.000004	0.00004%	0.0033%	7440-50-8
					B	0.000002	0.00002%	0.0017%	7440-42-8
					Ca	0.000001	0.00001%	0.0005%	7440-70-2
					Fe	0.000000	0.00000%	0.0004%	7439-89-6
			Total Weight	10.536 mg		10.536 mg	100%		

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Material list SOT-23S (F)

Parts	Material Supplier	Material P/N	Country	Parts Weight (mg)	Substance	Weight (mg)	Percentage	Percentage by parts	CAS No.
Compound	Sumitomo	EME-G600	China	5.46	Epoxy Resin A	0.300	2.798%	5.50%	Trade Secret
					Epoxy Resin B	0.109	1.018%	2.00%	29690-82-2
					Phenol Resin	0.109	1.018%	2.00%	Trade Secret
					Silica	4.914	45.788%	90.00%	60676-86-0
					Carbon Black	0.027	0.254%	0.50%	1333-86-4
Epoxy	Henkel	84-1LMISR4 7.2g/2cc	China	0.29	Silver	0.226	2.108%	78.00%	7440-22-4
					Epoxy	0.044	0.405%	15.00%	Trade Secret
					1,4-Butanedioldiglycidyl eher	0.015	0.135%	5.00%	2425-79-8
					Aromatic amine	0.006	0.054%	2.00%	Trade Secret
Lead Frame	Fusheng	L/F SOT-23 Fused#3 Large Post Full Ag	China	4.7	Cu	4.4594	41.552%	94.88%	7440-50-8
					Fe	0.1089	1.014%	2.32%	7439-89-6
					P	0.0045	0.042%	0.10%	7723-14-0
					Zn	0.0091	0.085%	0.19%	7440-66-6
					Pb	0.0005	0.004%	0.01%	7439-92-1
					Ag	0.1175	1.095%	2.50%	7440-22-4
Plating	Heesung	Solder Ball	Korea	0.12	Sn	0.11994	1.118%	99.95%	7440-31-5
					Other	0.00006	0.001%	0.05%	-
Wire	Heraeus	CU WIRE 1.2MIL	China	0.042	Cu	0.041996	0.391%	99.99%	7440-50-8
					Other	0.000004	0.00004%	0.01%	-
Die	Power Chip	WAFER	Taiwan	0.12	Si	0.1189697	1.10855%	99.1414%	7440-21-3
					Al	0.0007716	0.00719%	0.6430%	7429-90-5
					P	0.0001596	0.00149%	0.1330%	7723-14-0
					W	0.0000829	0.00077%	0.0691%	7440-33-7
					Ti	0.0000091	0.00008%	0.0076%	7440-32-6
					Cu	0.0000040	0.00004%	0.0033%	7440-50-8
					B	0.0000020	0.00002%	0.0017%	7440-42-8
					Ca	0.0000006	0.00001%	0.0005%	7440-70-2
					Fe	0.0000005	0.00000%	0.0004%	7439-89-6
			Total weight	10.732 mg		10.732 mg	100%		

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Material list SOT-23S(M)

Parts	Material Supplier	Material P/N	Country	Parts Weight (mg)	Substance	Weight (mg)	Percent	Percentage by parts	CAS No.
Compound	E'DALE	ELER-8-100HFE	Taiwan	6.140	Fused Silica	4.820	50.454%	78.50%	60676-86-0
					Epoxy Resin	0.675	7.070%	11.00%	29690-82-2
					Phenolic Resin	0.614	6.427%	10.00%	9003-35-4
					Carbon Black	0.031	0.321%	0.50%	1333-86-4
Epoxy	NAMICS	H9607	Japan	0.268	Resin	0.013	0.140%	5.00%	Trade Secret
					Silver	0.241	2.525%	90.00%	7440-22-4
					Additives	0.013	0.140%	5.00%	Trade Secret
Lead Frame	Kangqiang	A194	China	2.852	Cu	2.7806	29.107%	97.50%	7440-50-8
					Fe	0.0656	0.687%	2.30%	7439-89-6
					P	0.0029	0.030%	0.10%	7723-14-0
					Zn	0.0029	0.030%	0.10%	7440-66-6
					Pb	0.0001	0.001%	0.01%	7439-92-1
Plating	Yunnan	Sn	China	0.126	Tin	0.12599	1.319%	99.990%	7440-31-5
					Other	0.00001	0.000%	0.010%	-
Wire	LT Metal	AuPdCu	China	0.047	Copper	0.04639	0.486%	98.70%	7440-50–8
					Palladium	0.00056	0.006%	1.20%	7440-05-3
					Gold	0.00005	0.0005%	0.10%	7440–57-5
Die	Power Chip	WAFER	Taiwan	0.120	Si	0.118970	1.245%	99.1414%	7440-21-3
					Al	0.000772	0.008%	0.6430%	7429-90-5
					P	0.000160	0.002%	0.1330%	7723-14-0
					W	0.000083	0.001%	0.0691%	7440-33-7
					Ti	0.000009	0.00010%	0.0076%	7440-32-6
					Cu	0.000004	0.00004%	0.0033%	7440-50-8
					B	0.000002	0.00002%	0.0017%	7440-42-8
					Ca	0.000001	0.00001%	0.0005%	7440-70-2
					Fe	0.000000	0.00001%	0.0004%	7439-89-6
			Total Weight	9.553 mg		9.553 mg	100%		

ADVANCED POWER ELECTRONICS CORP.

Recommended Reflow Profile for Lead(Pb) Free Soldering (Pure Matte Tin Plating)

Lead(Pb) free solders which require to use higher reflow temperature. Advanced Power Electronics Corp. has studied the reliability of our products at higher reflow temperature. Customer may use below temperature profile for the solders requirement.

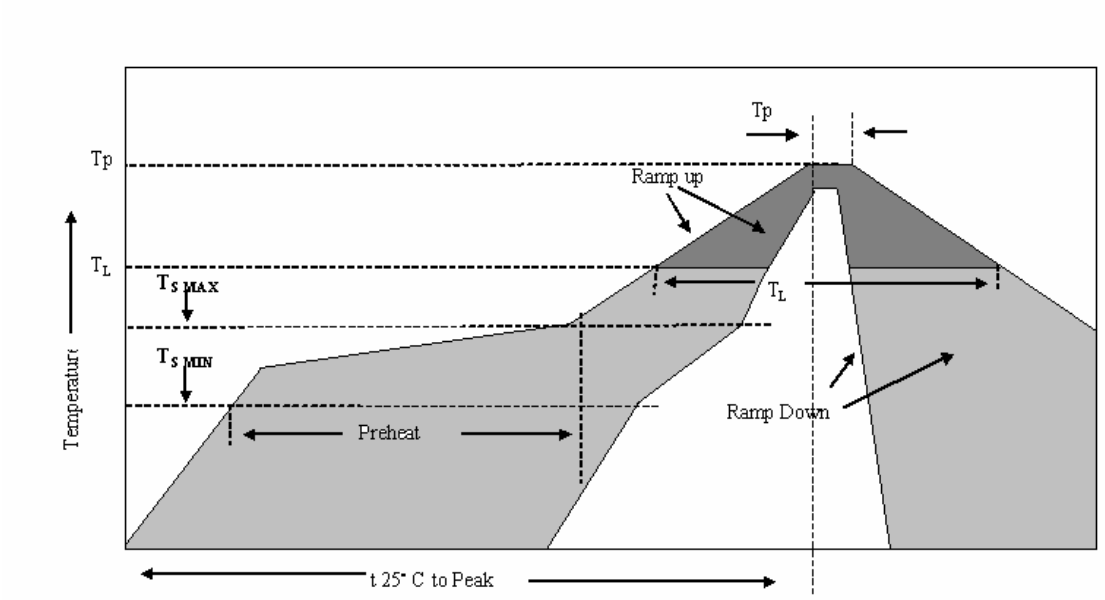


Table 1. Lead-Free Reflow Rrofile Recommendation(IPC/JEDEC J-STD-020C)	
Reflow Parameter	Lead-Free Assembly
Minimum preheat temperature(Ts_{MIN})	150° C
Maximum preheat temperature(Ts_{MAX})	200° C
Preheat Time	60-180 seconds
Ts_{MAX} TO T_L ramp-up rate	3° C/second maximum
Time above temperature T_L (t_L)	217° C 60-150 seconds
Peak Temperature (T_p)	260° C
Time 25 C To Tp	8 minute maximum
Time within 5c of Peak Tp	20-40 seconds
Ramp-down rate	6° C/second maximum

* Could meet three 3 cycles

Reliability Test Report

AP2N030N

I. Accelerated Life Times Stress Test

II. Environmental Stress Test

SOT-23S

Approved by	Prepared by
M. H. Lin	S. H. Tsai
Date: 2020/6/15	Date: 2020/6/15

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3.3 Test Item Description

3.3.1 High Temperature Gate Bias (HTGB)

3.3.2 High Temperature Reverse Bias (HTRB)

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4.1 Test Level

4.2 Test Result

4.3 Test Item Description

4.3.1 High Temperature Storage Test (HTST)

4.3.2 High Temperature & Humidity Reverse Bias (H3TRB)

4.3.3 Temperature Humidity Storage Test (THST)

4.3.4 Intermittent Operational Life (IOL)

4.3.5 Temperature Cycling Test (TCT)

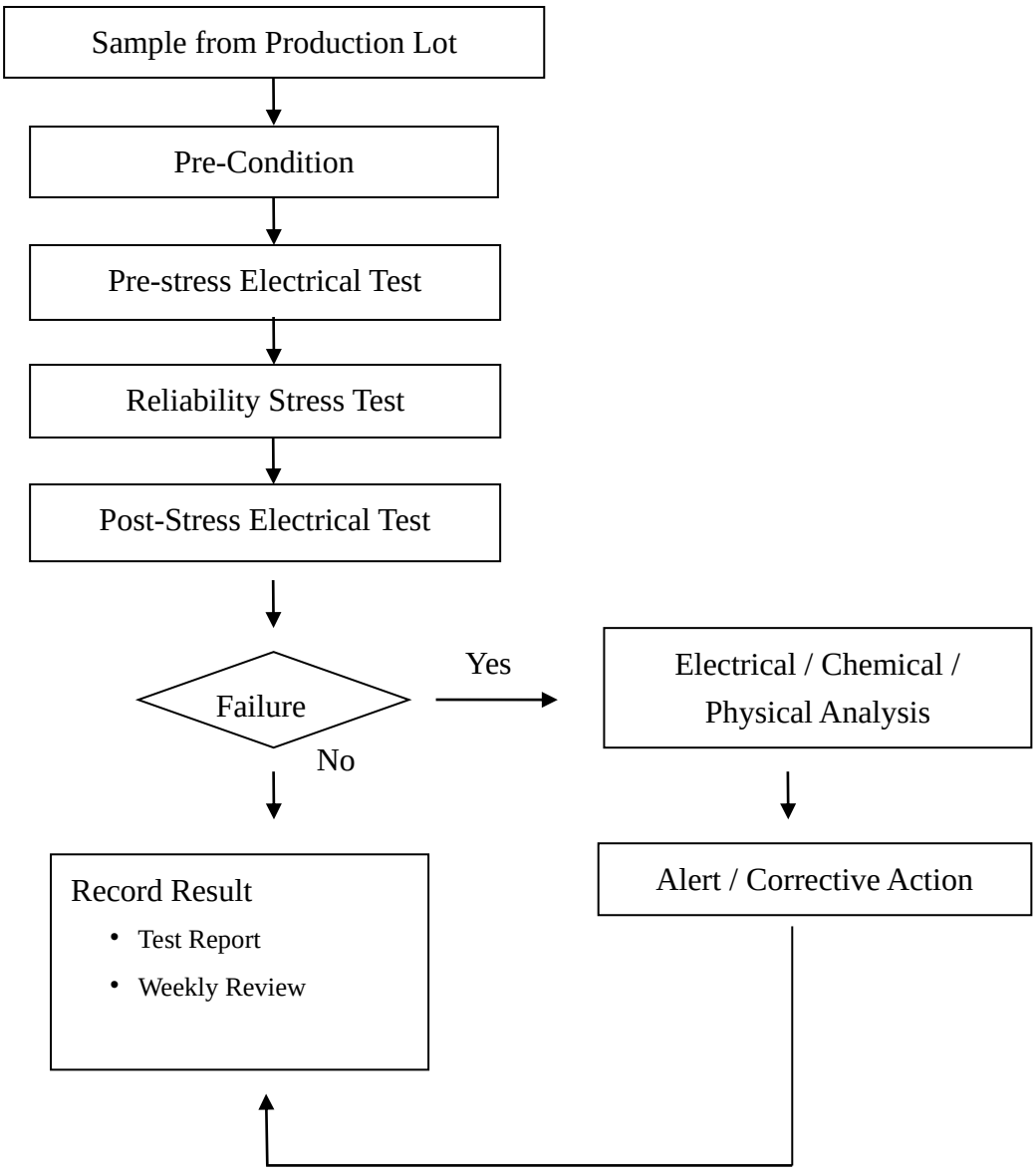
4.3.6 Autoclave (AC)

4.3.7 Unbiased HAST (uHAST)

1. Introduction

This report records the APEC product reliability test procedure, items and results; give a clear overview of reliability qualification test.

2. Test Procedure



2.1 Pre-Condition (SMD Packages devices only)

This is to simulate the product storage, shipping and customer application environment.

Step 1: Baking 125℃ , 24hrs.

Step 2: 85℃ / 85%R.H. Soaking 168hrs. (J-STD-020 Level 1)

Step 3: IR Reflow Tmax.= 260℃ , 3cycles

2.2 Sampling plan

Based on LTPD = 10% , AC=0

3. Accelerated Life Time Stress Test

3.1 Test Level

■ Routine Monitor Qualification

□ New Product Qualification

□ Engineer / Customer Request Qualification

3.2 Test Result

Test Item	Sample Size	Total Device (hours)	Result	Failure Rate (FITs)	MTTF' (10^6) Devices hrs.
High Temperature Gate Bias(HTGB)	77	77000 hrs	Pass	338.88	2.95
High Temperature Reverse Bias (HTRB)	77	77000 hrs	Pass	338.88	2.95

CL = 90% ; Ea = 0.7eV ; Operating Temp. = 70℃

3.3 Test Item Description

3.3.1 High Temperature Gate Bias (HTGB)

- Reference Standard

  JESD22-A108

  Operation spec. (QWRAD-7117)

- Condition:

Temperature: Max. Operating Temperature

Test Point: 0, 168, 500, 1000 Hours Nominal

Bias: Max. VGS Rating

3.3.2 High Temperature Reverse Bias (HTRB)

- Reference Standard

JESD22-A108

Operation spec. (QWRAD-7118)

- Condition:

Temperature: Max. Operating Temperature
Test Point: 0, 168, 500, 1000 Hours Nominal
Bias: VS=VG=0V, VD= 80% of Max. BVDSS Rating

4. Environmental & Package Stress Test

4.1 Test Level

■ Routine Monitor Qualification
□ New Product Qualification
□ Engineer / Customer Request Qualification

4.2 Test Result

Test Item	Sample Size	Test Time (hours/ cycles)	Result
HTST	77	1000 hrs.	Pass
H3TRB	77	1000 hrs.	Pass
THST	77	1000 hrs.	Pass
IOL	77	15K cyc.	Pass
TCT	77	1000 cyc.	Pass
AC	77	96 hrs.	Pass
uHAST	77	96 hrs.	Pass

The pre-conditioning (SMD Packages devices only)

4.3 Test Item Description

4.3.1 High Temperature Storage Test (HTST)

- Reference Standard

JESD22-A103

Operation spec. (QWRAD-7116)

・Condition:

Temperature: 150℃
Test Point: 0, 1000 Hours Nominal
Bias: no Bias

4.3.2 High Temperature & Humidity Reverse Bias (H3TRB)

・Reference Standard

JESD22-A101
Operation spec. (QWRAD-7111)

・Condition:

Temperature: 85℃
Relative Humidity: 85% R.H.
Test Point: 0, 168, 500, 1000 Hours Nominal
Bias: VS=VG=0V,
VD= 80% of Max. BVDSS Rating up to 100V

4.3.3 Temperature Humidity Storage Test (THST)

・Reference Standard

JESD22-A101
Operation spec. (QWRAD-7115)

・Condition:

Temperature: 85℃
Relative Humidity: 85% R.H.
Test Point: 0, 1000 Hours Nominal
Bias: no bias

4.3.4 Intermittent Operational Life (IOL)

・Reference Standard

MIL-STD-750-1037
Operation spec. (QWRAD-7114)

・Condition:

Temperature: Ta=25℃ Tj=△100℃ Ton=2 Minute, Toff=2 Minute
Test Point: 0, 10K, 15K Cycles Nominal
Bias (Set to give) : △T=100℃

4.3.5 Temperature Cycling Test (TCT)

- Reference Standard
  JESD22-A104
  Operation spec. (QWRAD-7113)
- Condition:
  Temperature: Tmin.= -55℃ , Tmax.=150℃ , △T=205℃
  Test Point: 0, 1000 cycles Nominal

4.3.6 Autoclave (AC)

- Reference Standard
  JESD22-A102
  Operation spec. (QWRAD-7110)
- Condition:
  Temperature: 121℃
  Relative Humidity: 100% R.H.
  Test Point: 0, 96 Hours Nominal

4.3.7 Unbiased HAST (uHAST)

- Reference Standard
  JESD22-A118
  Operation spec. (QWRAD-7129)
- Condition:
  Temperature: 130℃
  Relative Humidity: 85% R.H.
  Test Point: 0, 96 Hours Nominal

The information contained in this reliability test report represents the result of our internal reliability tests in accordance with the mentioned test standards, and is provided for reference only, do not imply any guarantee, warranty.

Advanced Power Electronics Corp.

AP2N030EN

Electrostatic Discharge Test

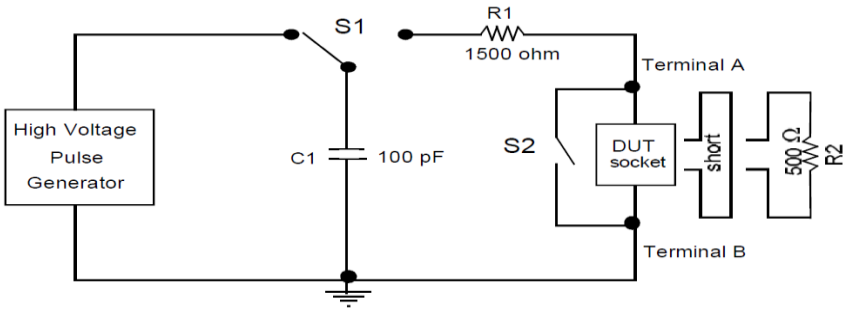
Test Result

Test Item	Passed Voltage	Sensitivity Classification
HBM	400V	Class 1A
MM	100V	Class A
CDM	1000V	Class C3

Test Item Description

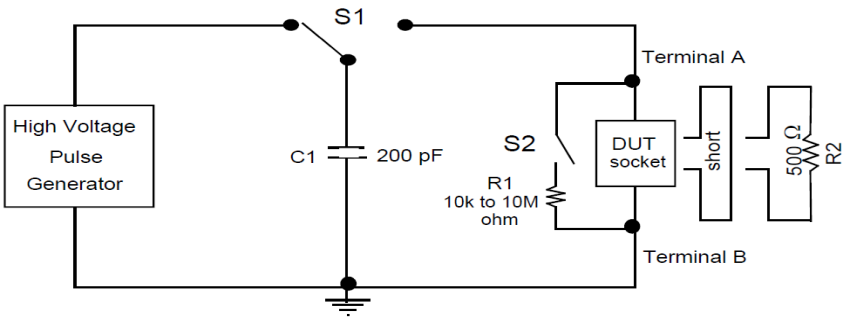
1 Human Body Model (HBM)

- Reference Standard
  MIL-STD-883 Method 3015.7
- Condition:
  C = 100pF, R = 1500Ω



2 Machine Mode (MM)

- Reference Standard
  JEDEC EIA/JESD22-A115
- Condition:
  C = 200pF, R = 0Ω



3 Charged Device Model (CDM)

- Reference Standar
  JESD22-C101F
  R = 100MΩ

