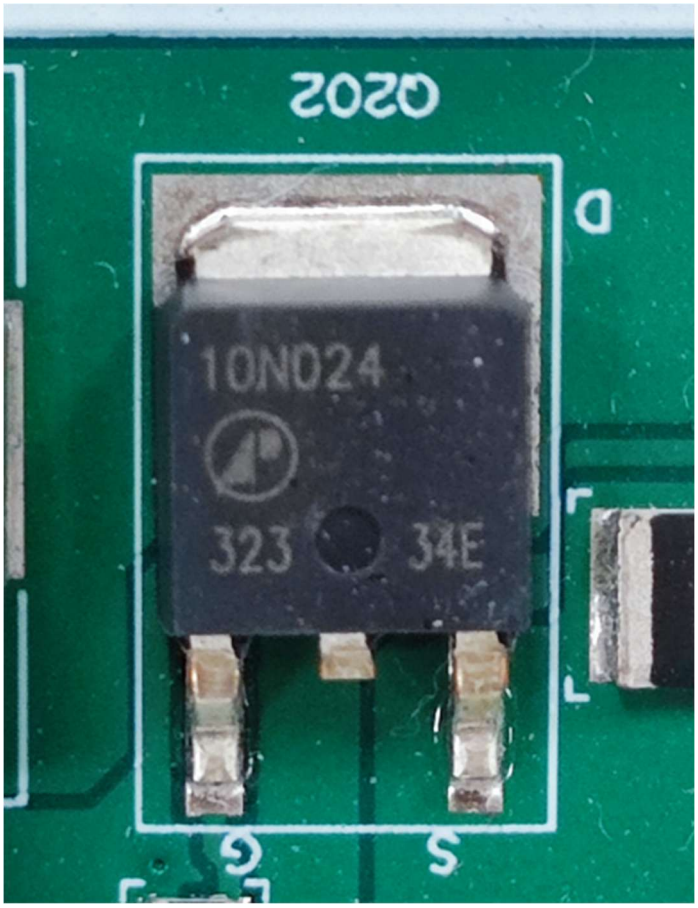


設計驗證
工程課
2025-01-07
發行
台灣科技開發股份有限公司

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
AP10N024H	Brand : APEC
3BAP10N021Y(B0140)	Package :TO-252
	Tape&Reel: 3000pcs/Reel

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

設計驗證 工程課 2025-01-07 發行 鈺緯科技開發股份有限公司

APPROVE		COMMENT :
REJECT		

ACCEPTED BY Willy　　DATE :2024/12/4

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	AP10N024H 3BAP10N021Y(B0140)
APEC Part Number	AP10N024H
Issued Date	2023/05/31
SPEC No.	SPEC-202305-0022

APEC Approved		
		批准 2023.05.31 DCC
Sales Manager	**Sales**	**QA**

Customer Approved			
Dept.			設計驗證 工程課 2025-01-07
Signature			發行

Item	Contents	Page
1	Data Sheet	p1~p5
2	Package Outline	p6~p7
3	Packing Standard	p8
4	Material List	p9~p11
5	IR Reflow	p12
6	Reliability Test Report	AnnexI

APEC DCC

AP10N024H

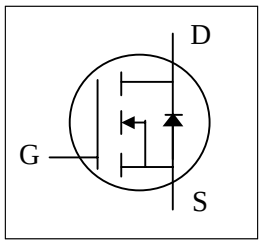
Halogen-Free Product

Advanced Power Electronics Corp.

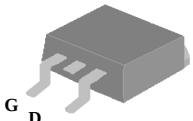
N-CHANNEL ENHANCEMENT MODE

POWER MOSFET

- ▼ **100% R_g & UIS Test**
- ▼ **Simple Drive Requirement**
- ▼ **Lower On-resistance**
- ▼ **RoHS Compliant & Halogen-Free**



BV_{DSS}	100V
$R_{DS(ON)}$	24mΩ
I_D	25.8A



TO-252(H)

Description

AP10N024 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.

TO-252 package is widely preferred for all commercial-industrial surface mount applications using infrared reflow technique and suited for high current application due to the low connection resistance.

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

Symbol	Parameter	Rating	Units
V_{DS}	Drain-Source Voltage	100	V
V_{GS}	Gate-Source Voltage	±20	V
I_D@T_C=25℃	Drain Current, V_{GS} @ 10V	25.8	A
I_D@T_C=100℃	Drain Current, V_{GS} @ 10V	16.3	A
I_{DM}	Pulsed Drain Current[1]	100	A
P_D@T_C=25℃	Total Power Dissipation	31.2	W
P_D@T_A=25℃	Total Power Dissipation	2	W
E_{AS}	Single Pulse Avalanche Energy[4]	16.2	mJ
T_{STG}	Storage Temperature Range	-55 to 150	℃
T_J	Operating Junction Temperature Range	-55 to 150	℃

設計驗證
工程課
2025-01-07
發行
鈺鐘科技開發股份有限公司

Thermal Data

Symbol	Parameter	Value	Units
Rthj-c	Maximum Thermal Resistance, Junction-case	4	℃/W
Rthj-a	Maximum Thermal Resistance, Junction-ambient (PCB mount)[3]	62.5	℃/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	100	-	-	V
$R_{DS(ON)}$	Static Drain-Source On-Resistance[2]	V_{GS}=10V, I_D=12A	-	-	24	mΩ
		V_{GS}=5V, I_D=6A	-	-	40	mΩ
$V_{GS(th)}$	Gate Threshold Voltage	V_{DS}=V_{GS}, I_D=250uA	1.2	-	3	V
g_{fs}	Forward Transconductance	V_{DS}=10V, I_D=12A	-	20	-	S
I_{DSS}	Drain-Source Leakage Current	V_{DS}=80V, V_{GS}=0V	-	-	25	uA
I_{GSS}	Gate-Source Leakage	V_{GS}= 20V, V_{DS}=0V	-	-	100	nA
Q_g	Total Gate Charge	I_D=6A	-	14.5	23.2	nC
Q_{gs}	Gate-Source Charge	V_{DS}=50V	-	5	-	nC
Q_{gd}	Gate-Drain ("Miller") Charge	V_{GS}=5V	-	7	-	nC
$t_{d(on)}$	Turn-on Delay Time	V_{DS}=50V	-	10	-	ns
t_r	Rise Time	I_D=12A	-	21	-	ns
$t_{d(off)}$	Turn-off Delay Time	R_G=3.3Ω	-	22	-	ns
t_f	Fall Time	V_{GS}=10V	-	6	-	ns
C_{iss}	Input Capacitance	V_{GS}=0V	-	1350	2160	pF
C_{oss}	Output Capacitance	V_{DS}=50V	-	185	-	pF
C_{rss}	Reverse Transfer Capacitance	f=1.0MHz	-	10	-	pF
R_g	Gate Resistance	f=1.0MHz	-	1.6	3.2	Ω

Source-Drain Diode

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
V_{SD}	Forward On Voltage[2]	I_S=12A, V_{GS}=0V	-	-	1.3	V
t_{rr}	Reverse Recovery Time	I_S=12A, V_{GS}=0V,	-	55	-	ns
Q_{rr}	Reverse Recovery Charge	dI/dt=100A/μs	-	80	-	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

4.Starting T_j=25°C , V_{DD}=50V , L=0.1mH , R_G=25Ω , V_{GS}=10V

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.

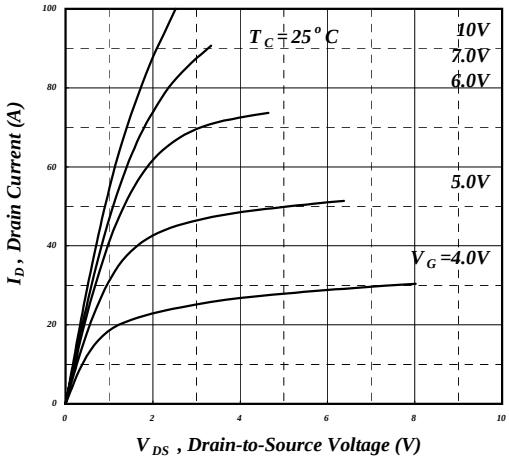


Fig 1. Typical Output Characteristics

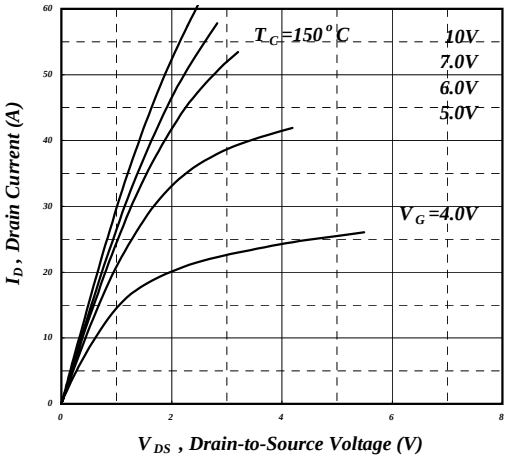


Fig 2. Typical Output Characteristics

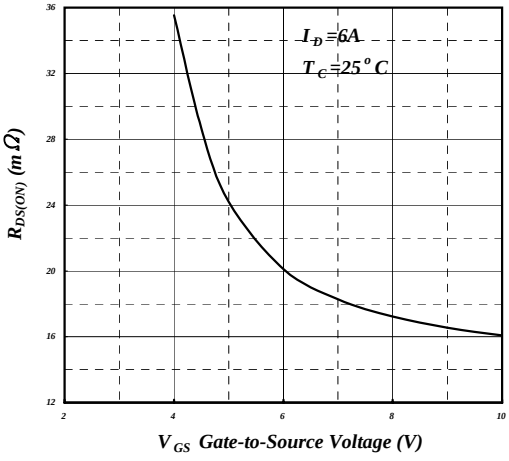


Fig 3. On-Resistance v.s. Gate Voltage

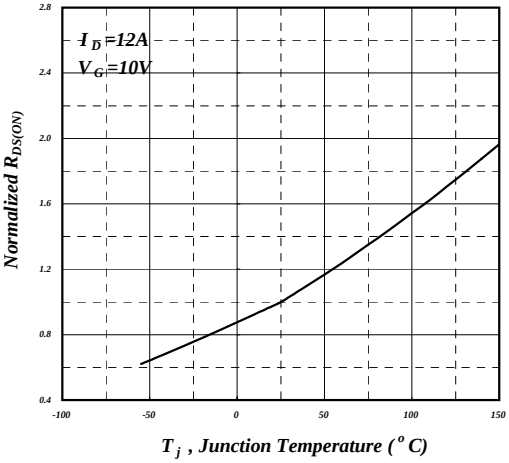


Fig 4. Normalized On-Resistance v.s. Junction Temperature

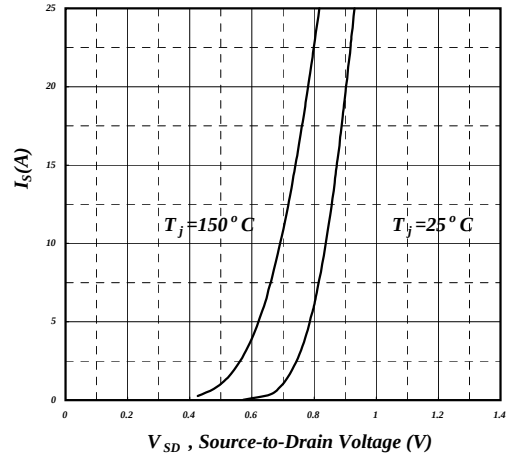


Fig 5. Forward Characteristic of Reverse Diode

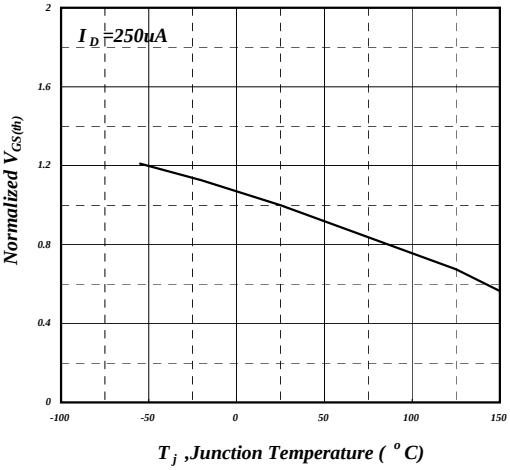


Fig 6. Gate Threshold Voltage v.s. Junction Temperature

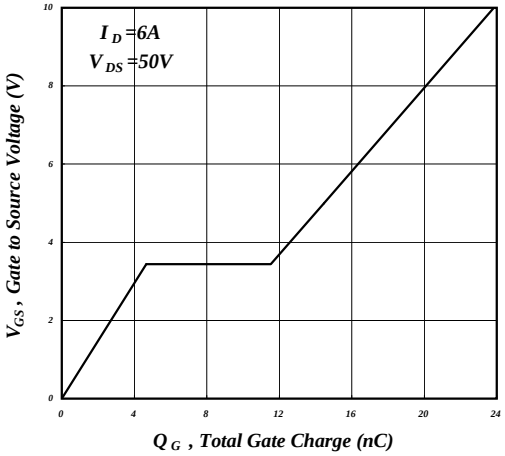


Fig 7. Gate Charge Characteristics

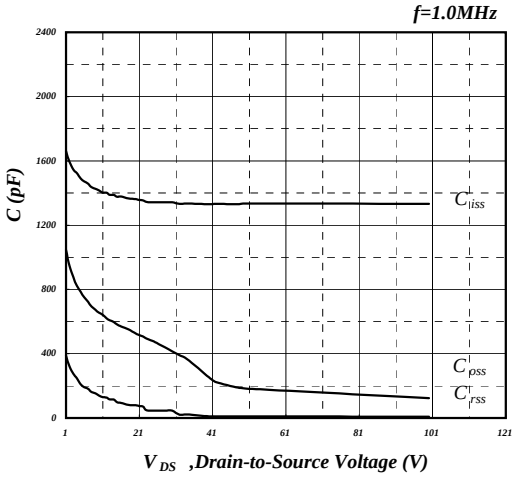


Fig 8. Typical Capacitance Characteristics

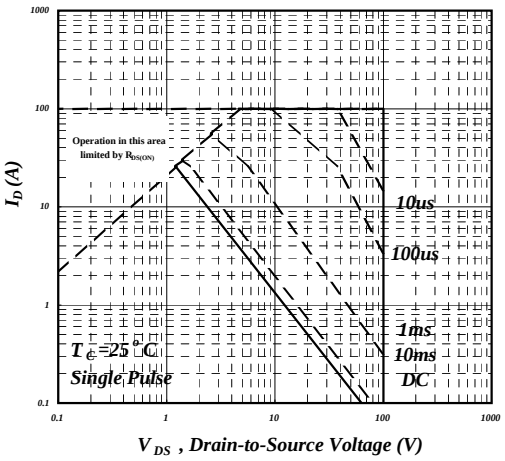


Fig 9. Maximum Safe Operating Area

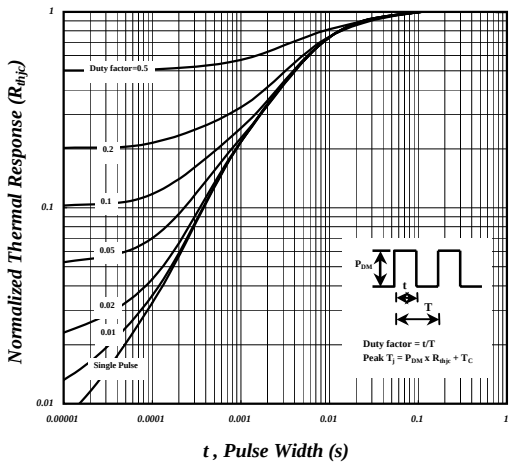


Fig 10. Effective Transient Thermal Impedance

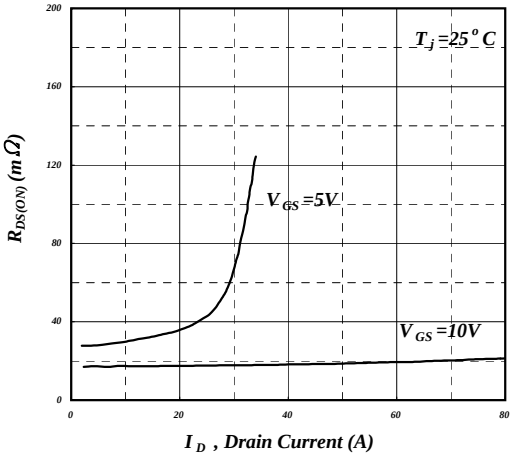


Fig 11. Typ. Drain-Source on State Resistance

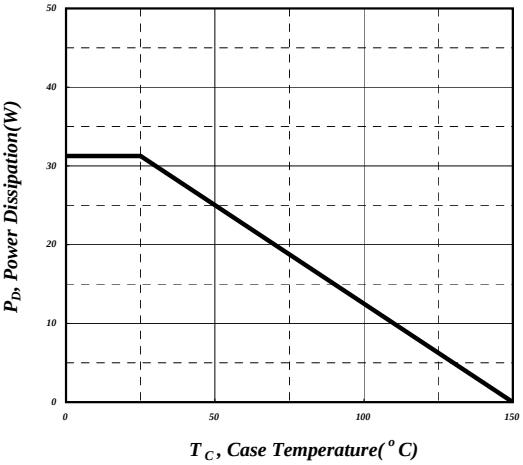
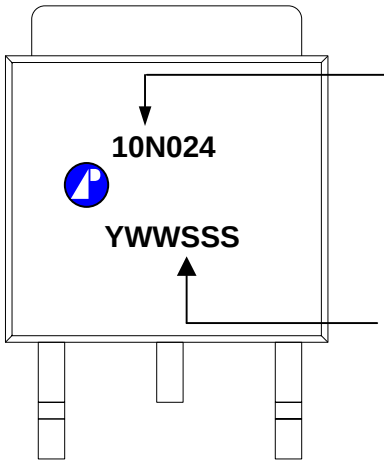
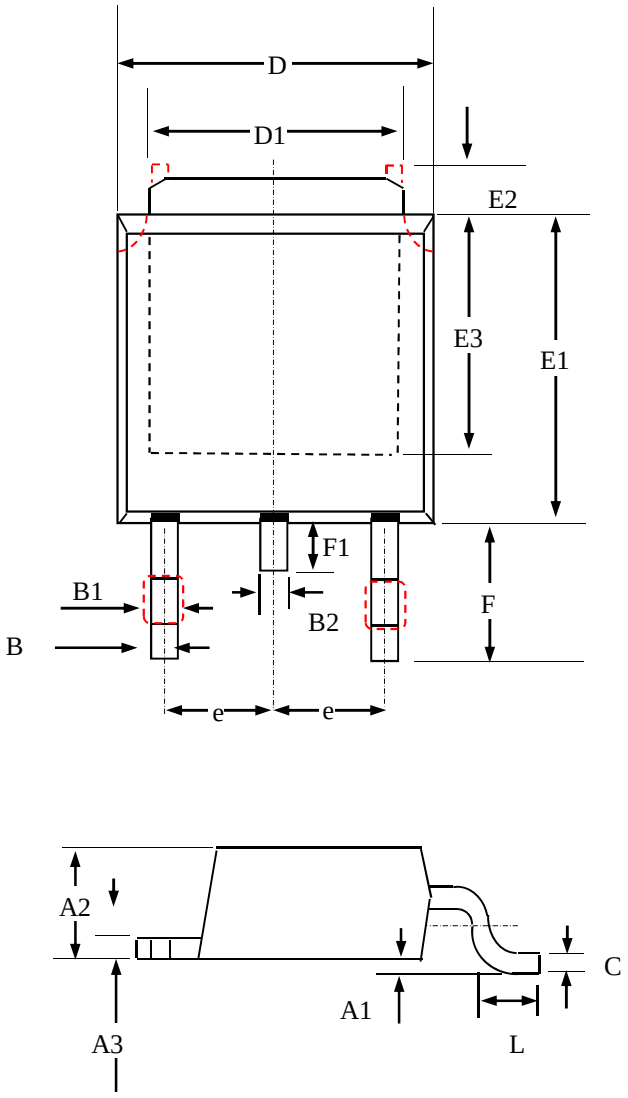


Fig 12. Total Power Dissipation

MARKING INFORMATION



Package Outline : TO-252



SYMBOLS	Millimeters		
	MIN	NOM	MAX
A2	2.18	2.30	2.40
A3	0.40	0.50	0.65
B	0.40	0.70	1.00
B1	0.50	0.85	1.20
D	6.00	6.50	6.80
D1	4.80	5.35	5.90
E3	4.00 (ref.)		
F	2.00	2.63	3.05
F1	0.50	0.85	1.20
E1	5.00	5.70	6.30
E2	0.50	1.10	1.80
e	2.3 (ref)		
C	0.35	0.525	0.70
A1	0.00	—	0.25
B2	—	—	1.25
L	0.90	1.34	1.78

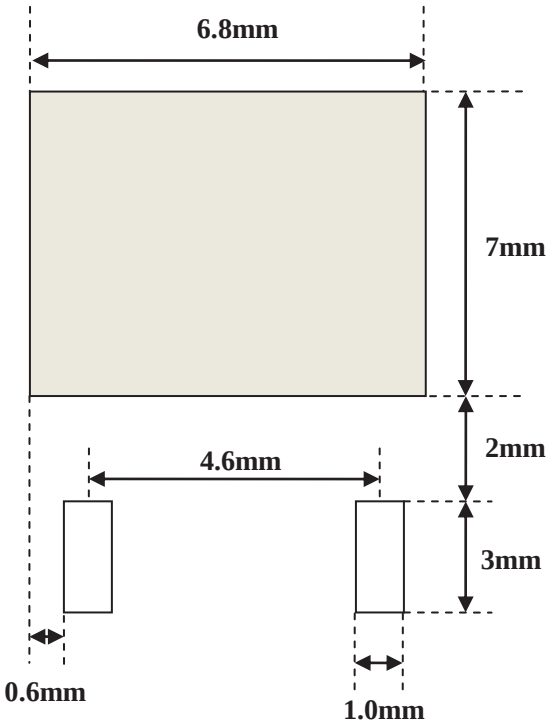
1.All Dimensions Are in Millimeters.

2.Dimension Does Not Include Mold Protrusions.

3. Thermal PAD, Body and Pin contour is for reference, it may has little difference by option.

Draw No. M1-H3EFIMT-G-v10

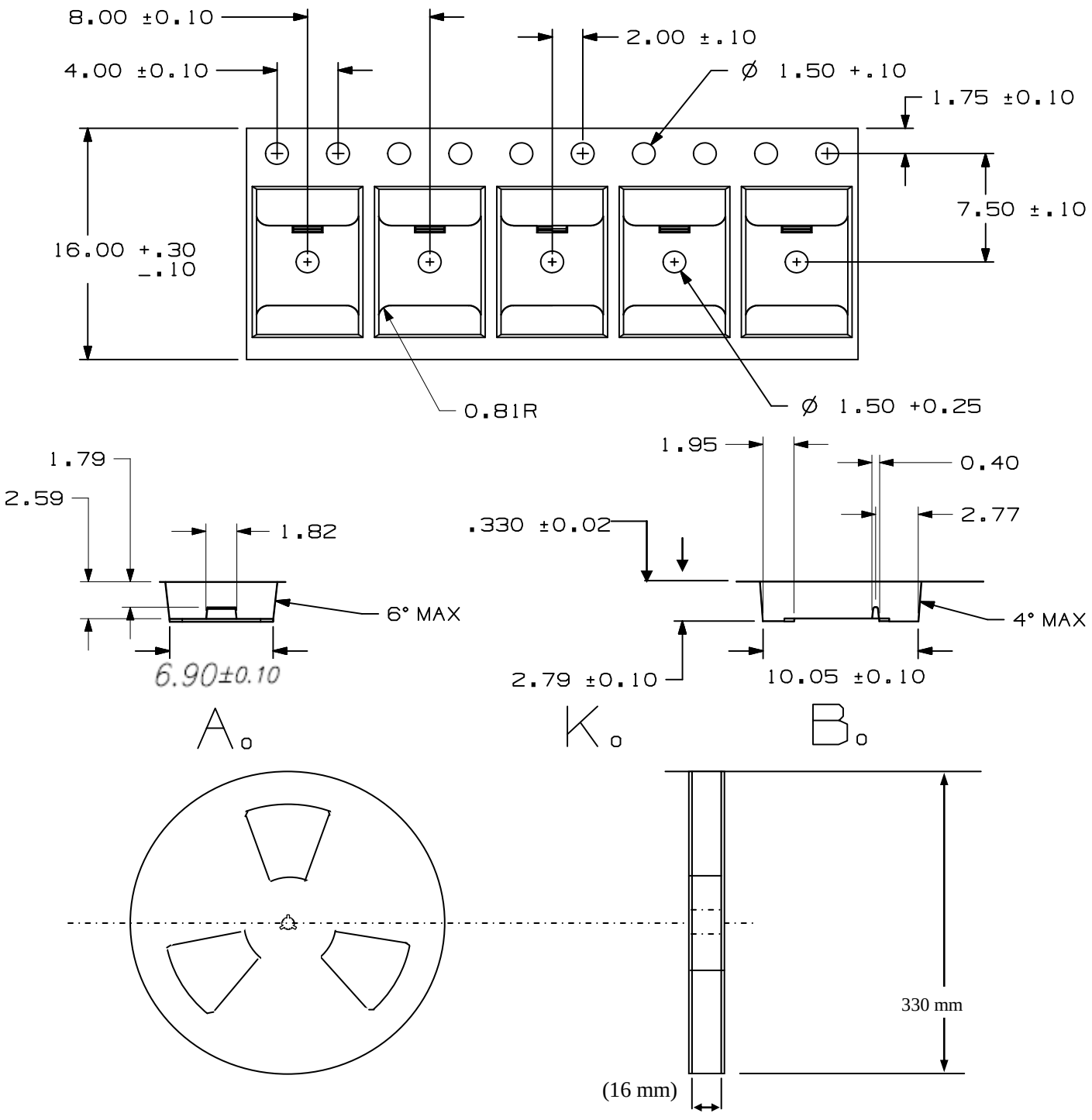
TO-252 FOOTPRINT：



富鼎先進電子股份有限公司

包裝規範 Packing Spec

附圖一：Tape & Reel Information : TO-252



1.All Dimensions Are Shown in Millimeters.
2. Packing : 3000 pcs / reel

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ADVANCED POWER ELECTRONICS CORP.

Material List_TO-252(E)

Parts	Materila Supplier	Materila P/N	Country	Parts Weight (mg)	Hazardous Substance	Weight (mg)	Percent	Percentage by parts	CAS No.
Compound	Sumitomo	EME-G600FB	China	148.372	Epoxy Resin A	11.1279	3.45505%	7.50000%	Trade Secret
					Epoxy Resin B	4.4512	1.38202%	3.00000%	29690-82-2
					Phenol Resin	4.4512	1.38202%	3.00000%	Trade Secret
					Silica(Amorphous) A	120.1813	37.31458%	81.00000%	60676-86-0
					Silica(Amorphous) B	7.4186	2.30337%	5.00000%	7631-86-9
					Carbon Black	0.7419	0.23034%	0.50000%	1333-86-4
Die Attach	Heraeus	PbSn5Ag2.5	China	2.019	Lead	1.8676	0.57986%	92.50000%	7439-92-1
					Tin	0.1010	0.03134%	5.00000%	7440-31-5
					Silver	0.0505	0.01567%	2.50000%	7440-22-4
Lead Frame	PSJ	PMC90	China	168.043	Cu	167.8027	52.10034%	99.85700%	7440-50-8
					Fe	0.1680	0.05217%	0.10000%	7439-89-6
					Pb	0.0050	0.00157%	0.00300%	7439-92-1
					P	0.0504	0.01565%	0.03000%	12023-53-9
					Ag	0.0168	0.00522%	0.01000%	7440-22-4
Plating	ASEM	99.99%Sn	China	1.092	Sn	1.091910	0.33902%	99.99180%	7440-31-5
					Pb	0.000038	0.00001%	0.00350%	7439-92-1
					As	0.000005	0.000002%	0.00050%	7440-38-2
					Fe	0.000009	0.0000027%	0.00080%	7439-89-6
					Cu	0.000003	0.0000010%	0.00030%	7440-50-8
					Bi	0.000019	0.0000058%	0.00170%	7440-69-9
					Sb	0.000010	0.0000031%	0.00090%	7440-36-0
					Zn	0.000001	0.0000003%	0.00010%	7440-66-6
					Al	0.000001	0.0000003%	0.00010%	7429-90-5
					Cd	0.000003	0.0000010%	0.00030%	7440-43-9
Gate wire1	MKE	99.99%Cu	China	0.047	Cu	0.046995	0.01459%	99.99000%	7440-50-8
					Ca	0.000001	0.0000003%	0.00200%	7440-70-2
					Al	0.000001	0.0000003%	0.00200%	7429-90-5
					Ag	0.000001	0.0000003%	0.00200%	7440-22-4
					Other	0.000002	0.0000006%	0.00400%	-
Gate wire2	Heraeus	99.99%Cu Maxsoft LD	China		Cu	0.046996	0.01459%	99.99150%	7440-50-8
					Ag	0.000002	0.0000005%	0.00350%	7440-22-4
					Mn	0.000001	0.0000002%	0.00150%	7439-96-5
					Ni	0.000001	0.0000002%	0.00150%	7440-02-0
					Fe	0.0000005	0.0000001%	0.00100%	7439-89-6
					S	0.0000005	0.0000001%	0.00100%	7704-34-9
Source wire1	Tanaka	TANW	Singapore	1.773	Al	1.7728	0.55044%	99.99000%	7429-90-5
					Other	0.0002	0.00006%	0.01000%	-
Source wire2	Runxiang	99.99%Al	China		Al	1.7729	0.55044%	99.99160%	7429-90-5
					Ni	0.000106	0.00003%	0.00600%	7440-02-0
					Si	0.000018	0.00001%	0.00100%	7440-21-3
					Fe	0.000005	0.0000017%	0.00030%	7439-89-6
					Mg	0.000005	0.0000017%	0.00030%	7439-95-4
					Cu	0.000005	0.0000017%	0.00030%	7440-50-8
					B	0.000002	0.0000006%	0.00010%	7440-42-8
					Ag	0.000002	0.0000006%	0.00010%	7440-22-4
					Mn	0.000002	0.0000006%	0.00010%	7439-96-5
					Ca	0.000002	0.0000006%	0.00010%	7440-70-2
					Cr	0.000002	0.0000006%	0.00010%	7440-47-3
Die	Power Chip	WAFER	Taiwan	0.730	Si	0.723732	0.22471%	99.14140%	7440-21-3
					Al	0.004694	0.00146%	0.64300%	7429-90-5
					P	0.000971	0.00030%	0.13300%	7723-14-0
					W	0.000504	0.00016%	0.06910%	7440-33-7
					Ti	0.000055	0.00002%	0.00760%	7440-32-6
					Cu	0.000024	0.00001%	0.00330%	7440-50-8
					B	0.000012	0.0000039%	0.00170%	7440-42-8
					Ca	0.000004	0.0000011%	0.00050%	7440-70-2
					Fe	0.000003	0.0000009%	0.00040%	7439-89-6
			Total weight	322.076 mg		322.076 mg	100%		

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ADVANCED POWER ELECTRONICS CORP.

Material list TO-252 (E-HF)

Parts	Materila Supplier	Materila P/N	Country	Parts Weight (mg)	Hazardous Substance	Weight (mg)	Percent	Percentage by parts	CAS No.
Compound	Sumitomo	G600FB	China	150.000	Epoxy Resin A	11.2500	3.50768%	7.50%	Trade Secret
					Epoxy Resin B	4.5000	1.40307%	3.00%	29690-82-2
					Phenol Resin	4.5000	1.40307%	3.00%	Trade Secret
					Silica(Amorphous) A	117.0000	36.47985%	78.00%	60676-86-0
					Silica(Amorphous) B	11.2500	3.50768%	7.50%	7631-86-9
					Carbon Black	1.5000	0.46769%	1.00%	1333-86-4
Die Attach	Heraeus	PbSn5Ag2.5	China	1.515	Pb	1.401375	0.43694%	92.50%	7439-92-1
					Sn	0.07575	0.02362%	5.00%	7440-31-5
					Ag	0.037875	0.01181%	2.50%	7440-22-4
Lead Frame	PSJ	PMC90	China	165.720	Cu	165.487992	51.59810%	99.86%	7440-50-8
					Fe	0.16572	0.05167%	0.10%	7439-89-6
					Pb	0.016572	0.00517%	0.01%	7439-92-1
					P	0.049716	0.01550%	0.03%	12023-53-9
Cu Wire	Heraeus	Copper wire(Maxsoft LD)	China	0.092	Copper	0.091992	0.02868%	99.9915%	7440-50-8
					Silver	0.000003	0.00000%	0.0035%	7440-22-4
					Manganese	0.000001	0.00000%	0.0015%	7439-96-5
					Nickel	0.000001	0.00000%	0.0015%	7440-02-0
					Iron	0.000001	0.00000%	0.0010%	7439-89-6
					Sulfur	0.000001	0.000000%	0.0010%	7704-34-9
	TANAKA Runxiang AMETEK	Al Wire Al≥99.99% 99.99%Al	Singapore China Malaysia	1.576	Al	1.57586762	0.49134543%	99.9916%	7429-90-5
					Ni	0.00009456	0.00002948%	0.0060%	7440-02-0
					Si	0.00001576	0.00000491%	0.0010%	7440-21-3
					Fe	0.00000473	0.00000147%	0.0003%	7439-89-6
					Mg	0.00000473	0.00000147%	0.0003%	7439-95-4
					Cu	0.00000473	0.00000147%	0.0003%	7440-50-8
					B	0.00000158	0.00000049%	0.0001%	7440-42-8
					Ag	0.00000158	0.00000049%	0.0001%	7440-22-4
					Mn	0.00000158	0.00000049%	0.0001%	7439-96-5
					Ca	0.00000158	0.00000049%	0.0001%	7440-70-2
					Cr	0.00000158	0.00000049%	0.0001%	7440-47-3
Plating	ASEM	99.99%Sn	China	1.092	Sn	1.0919	0.34044%	99.990%	7440-31-5
					others	0.0001	0.00003%	0.010%	N/A
Die	Power Chip	WAFER	Taiwan	0.730	Si	0.723732	0.22566%	99.14140%	7440-21-3
					Al	0.004694	0.00146%	0.64300%	7429-90-5
					P	0.000971	0.00030%	0.13300%	7723-14-0
					W	0.000504	0.00016%	0.06910%	7440-33-7
					Ti	0.000055	0.00002%	0.00760%	7440-32-6
					Cu	0.000024	0.00001%	0.00330%	7440-50-8
					B	0.000012	0.000004%	0.00170%	7440-42-8
					Ca	0.000004	0.000001%	0.00050%	7440-70-2
					Fe	0.000003	0.000001%	0.00040%	7439-89-6
			Total weight	320.725 mg		320.725 mg	100%		

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Material list TO-252 (I)

Parts	Material Supplier	Material P/N	Country	Parts Weight (mg)	Substance	Weight (mg)	Percent	Percentage by parts	CAS No.
Compound	SD	Cel-8240HF10GT	China	141.384	Epxoy Resin-1	5.655	1.79%	4.00%	Trade secret
					Epxoy Resin-2	5.655	1.79%	4.00%	Trade secret
					Hardener	9.049	2.87%	6.40%	Trade secret
					Organic Phosphorus compounds	0.707	0.22%	0.50%	Trade secret
					Carbon Black	0.283	0.09%	0.20%	1333-86-4
					Amorphous Silica 1	119.469	37.90%	84.50%	60676-86-0
					Amorphous Silica 2	0.566	0.18%	0.40%	7631-86-9
Solder wire	Heraeus	Pb2Sn2.5Ag	China	2.438	Pb	2.328	0.74%	95.50%	7439-92-1
					Sn	0.049	0.02%	2.00%	7440-22-4
					Ag	0.061	0.02%	2.50%	7440-31-5
L/F	ECE / TSP / 廈門永紅	PMC-90	China	169.503	Cu	169.164	53.66%	99.80%	7440-50-8
					Fe	0.254	0.08%	0.15%	7439-89-6
					P	0.034	0.01%	0.02%	12023-53-9
					Ag	0.051	0.02%	0.03%	7440-22-4
Al wire	Ametek	200 micron	Malaysia	0.345	Al	0.3449655	0.11%	99.99%	7429-90-5
					Other	0.0000345	0.00%	0.01%	-
Cu wire	Heraeus	30 Micron PD (Pdsoft)	China	0.028	Cu	0.027	0.01%	97.495%	7440-50-8
					Pd	0.001	0.0002%	2.500%	7440-05-3
					Ag	0.000001	0.0000002%	0.002%	7440-22-4
					Fe	0.0000004	0.0000001%	0.0015%	7439-89-6
					Mn	0.0000001	0.00000004%	0.0005%	7439-96-5
					Ni	0.0000003	0.0000001%	0.001%	7440-02-0
Plating	新陽(富美達) Hongli(TonDing) Huanggang (TongDing) 勝鎂-安臣	Sn	China	0.812	Sn	0.812	0.257%	99.95%	7440-31-5
					Pb	0.00004	0.00001%	0.005%	7439-92-1
					Other	0.00037	0.00012%	0.045%	-
Die	Powerchip	wafer	TW	0.73	Si	0.723732	0.22958%	99.14140%	7440-21-3
					Al	0.004694	0.00149%	0.64300%	7429-90-5
					P	0.000971	0.00031%	0.13300%	7723-14-0
					W	0.000504	0.00016%	0.06910%	7440-33-7
					Ti	0.000055	0.00002%	0.00760%	7440-32-6
					Cu	0.000024	0.00001%	0.00330%	7440-50-8
					B	0.000012	0.00000%	0.00170%	7440-42-8
					Ca	0.000004	0.00000%	0.00050%	7440-70-2
					Fe	0.000003	0.00000%	0.00040%	7439-89-6
			Total Weight	315.240 mg		315.240 mg	100%		

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Material List_TO-252 (T)

Parts	Materila Supplier	Materila P/N	Country	Parts Weight (mg)	Hazardous Substance	Weight (mg)	Percent	Percentage by parts	CAS No.
Compound	SSB	EME-G630AY	Suzhou	131	Epoxy ResinA	3.275	1.064%	2.500%	Trade secret
					Epoxy ResinB	3.930	1.277%	3.000%	29690-82-2
					Phenol Resin	3.275	1.064%	2.500%	Trade secret
					Silica(aAmorphous)A	112.660	36.610%	86.000%	60676-86-0
					Silica(Amorphous)B	6.550	2.128%	5.000%	7631-86-9
					Carbon Black	1.310	0.426%	1.000%	1333-86-4
Softsolder	Heraeus	Pb95.5Sn2Ag2.5	Shanghai	3	Pb	2.865	0.931%	95.500%	7439-92-1
					Sn	0.060	0.019%	2.000%	7440-31-5
					Ag	0.075	0.024%	2.500%	7440-22-4
Leadframe	YRE	DPAK单点银	Taizhou	168	Cu	167.630	54.473%	99.780%	7440-50-08
					Fe	0.252	0.082%	0.150%	7439-89-6
					P	0.067	0.022%	0.040%	12023-53-9 1310-43-6
					Ag	0.050	0.016%	0.030%	7440-22-4
Wire	Heraeus	Cu(Maxsoft)	Shanghai	1.6	Cu	1.5999552	0.519922%	99.997%	7440-50-8
					Ag	0.0000192	0.000006%	0.001%	7440-22-4
					S	0.0000096	0.000003%	0.001%	7704-34-9
					Fe	0.0000080	0.000003%	0.001%	7439-89-6
					Mn	0.0000048	0.000002%	0.0003%	7439-96-5
					Ni	0.0000032	0.000001%	0.0002%	7740-02-0
	TANAKA	Al	Singapore	0.4	Al	0.39994	0.130%	99.984%	7429-90-5
					Other	0.00006	0.00002%	0.016%	7440-02-0
plating	AISEN	Sn	GuangZhou	3	Sn	2.9997	0.9748%	99.990%	7440-31-5
					Other	0.0003	0.0001%	0.010%	-
Die	Power Chip	WAFER	Taiwan	0.73	Si	0.723732	0.23518%	99.141%	7440-21-3
					Al	0.004694	0.00153%	0.643%	7429-90-5
					P	0.000971	0.00032%	0.133%	7723-14-0
					W	0.000504	0.00016%	0.069%	7440-33-7
					Ti	0.000055	0.00002%	0.008%	7440-32-6
					Cu	0.000024	0.00001%	0.003%	7440-50-8
					B	0.000012	0.000004%	0.002%	7440-42-8
					Ca	0.000004	0.000001%	0.001%	7440-70-2
					Fe	0.000003	0.000001%	0.000%	7439-89-6
			Total weight	307.73 mg		307.73 mg	100%		

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.

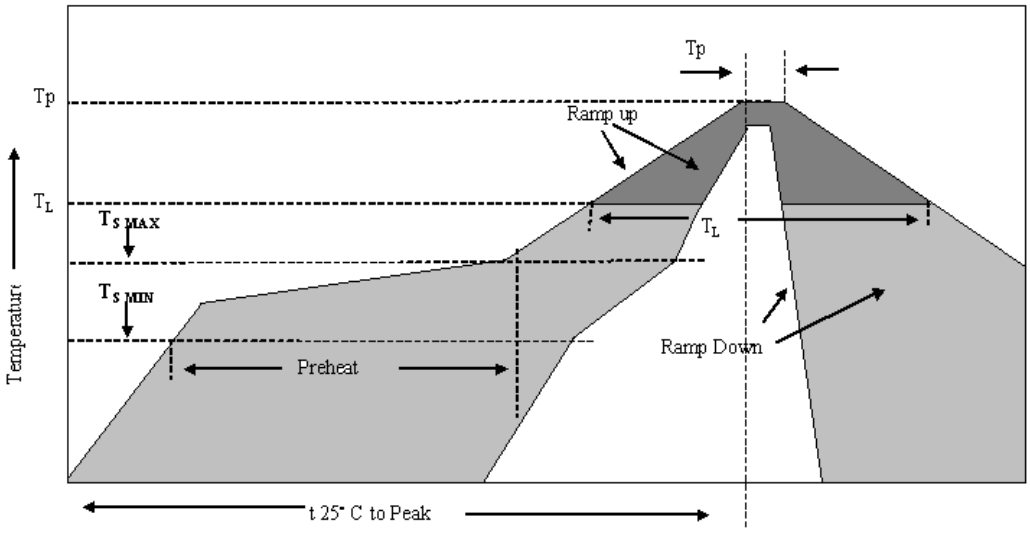

Table 1. Lead-Free Reflow Rrofile Recommendation(IPC/JEDEC J-STD-020E)	
Reflow Parameter	Lead-Free Assembly
Minimum preheat temperature(Ts_{MIN})	150° C
Maximum preheat temperature(Ts_{MAX})	200° C
Preheat Time	60-120 seconds
Ts_{MAX} TO T_L ramp-up rate	3° C/second maximum
Time above temperature T_L (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	30 seconds
Ramp-down rate	6° C/second maximum

* Could meet three 3 cycles

Reliability Test Report

AP10N024H

I. Accelerated Life Times Stress Test

II. Environmental Stress Test

TO-252

Approved by	Prepared by
M. H. Lin	S. H. Tsai
Date: 2019/1/2	Date: 2019/1/2

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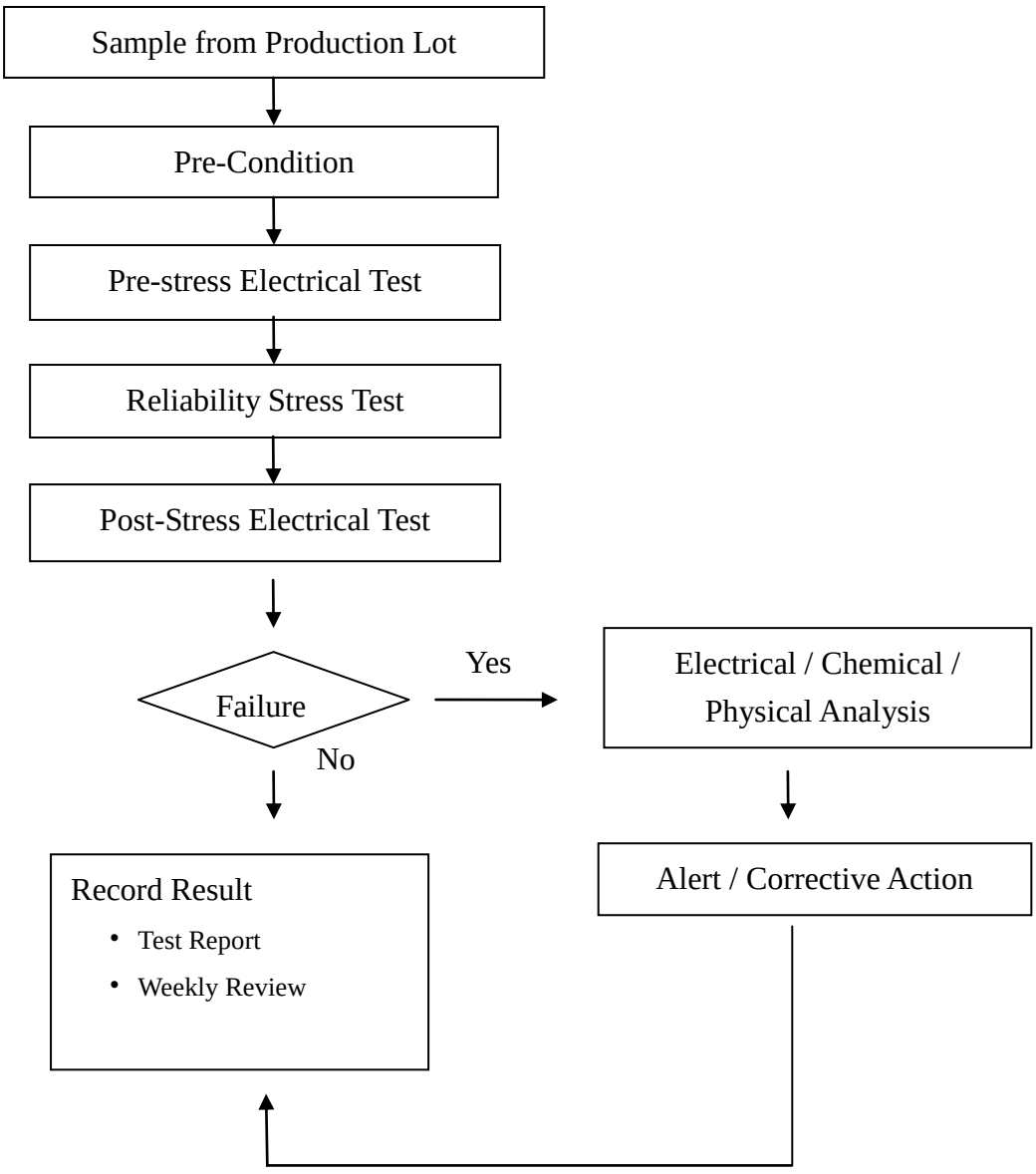
APEC DCC

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



APEC DCC

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

  HTGB Operation spec. (QWRAD-7117)

- Condition:

Temperature: Max. Operating Temperature

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

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Bias: Max. VGS Rating

3.3.2 High Temperature Reverse Bias (HTRB)

- Reference Standard

JESD22-A108

HTRB 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
PRCL	77	15K cyc.	Pass
TCT	77	1000 cyc.	Pass
PCT	77	96 hrs.	Pass
HAST	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

HTST Operation spec. (QWRAD-7116)

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• 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

H3TRB 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

THST Operation spec. (QWRAD-7115)

• Condition:

Temperature: 85℃

Relative Humidity: 85% R.H.

Test Point: 0, 1000 Hours Nominal

Bias: no bias

4.3.4 Power Cycling Test (PRCL)

• Reference Standard

JESD22-A105

PRCL 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℃

APEC DCC

4.3.5 Temperature Cycling Test (TCT)

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

4.3.6 Pressure Cooker Test (PCT)

- Reference Standard
  JESD22-A102
  PCT Operation spec. (QWRAD-7110)
- Condition:
  Temperature: 121℃
  Relative Humidity: 100% R.H.
  Pressure: 2 atm
  Test Point: 0, 96 Hours Nominal

4.3.7 Highly Accelerated Stress Test (HAST)

- Reference Standard
  JESD22-A118
- Condition:
  Temperature: 130℃
  Relative Humidity: 85% R.H.
  Pressure: 33.3 psia / 230kPa
  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.

AP10N024H

Electrostatic Discharge Test

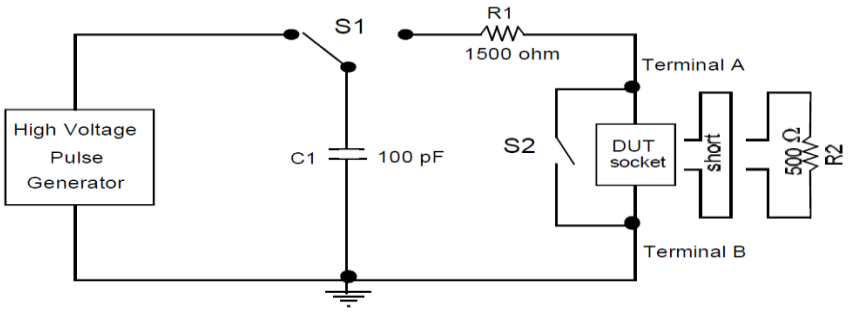
Test Result

Test Item	Passed Voltage	Sensitivity Classification
HBM	1700V	Class 1C
MM	350V	Class B
CDM	1000V	Class C3

Test Item Description

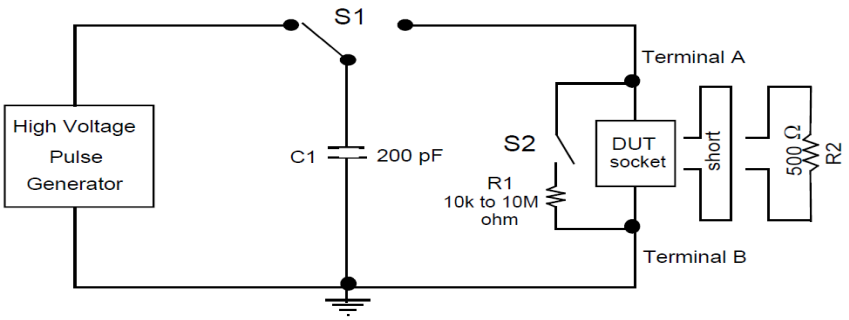
1 Human Body Model (HBM)

- 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

