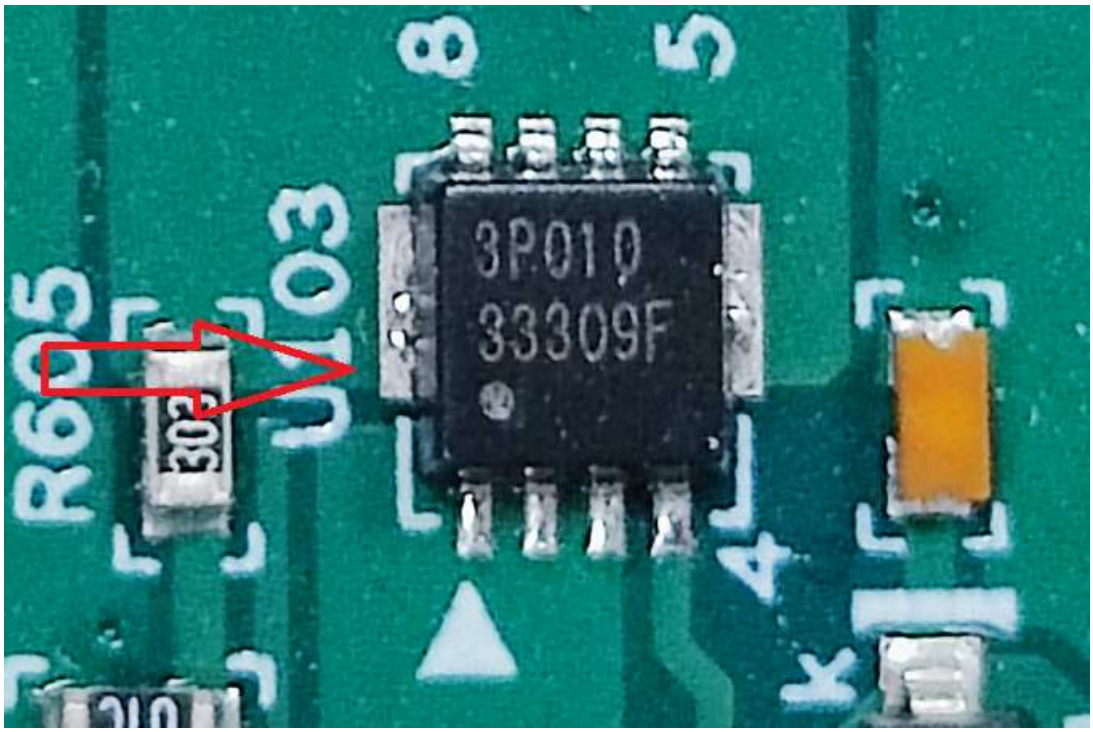


設計驗證
工程課
2025-01-08
發行

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
AP3P010YT	Brand : APEC
3BAP3P0101Y(B0141)	Package :PMPAK3*3
	Tape&Reel: 3000pcs/Reel

REMARK



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	AP3P010YT 3BAP3P0101Y(B0141)
APEC Part Number	AP3P010YT
Issued Date	2023/06/15
SPEC No.	SPEC-201803-0034

APEC Approved		
		批准 2023.06.15 DCC
Sales Manager	**Sales**	**QA**

Customer Approved			
Dept.			設計驗證 工程課 2025-01-08
Signature			發行

FP-7201-01C

RECORD OF REVISION

Rev. No	Contents of Revision	Date	Remark
1	更新datasheet	2023/06/15	

Item	Contents	Page
1	Data Sheet	p1~p5
2	Package Outline	p6~p7
3	Packing Standard	p8~p14
4	Material List	p15~p16
5	IR Reflow	p17
6	Reliability Test Report	AnnexI p1~p8

APEC DCC

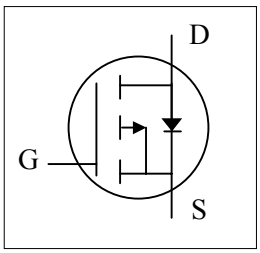
AP3P010YT

Halogen-Free Product

Advanced Power Electronics Corp.

P-CHANNEL ENHANCEMENT MODE POWER MOSFET

- ▼ **Low Gate Charge**
- ▼ **Fast Switching Characteristic**
- ▼ **Simple Drive Requirement**
- ▼ **RoHS Compliant & Halogen-Free**

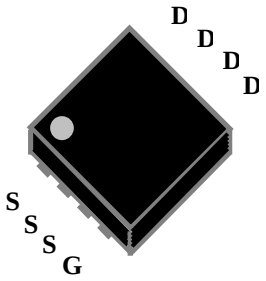


BV_{DSS}	-30V
$R_{DS(ON)}$	10mΩ
I_D	-14.6A

Description

Advanced Power MOSFETs from APEC provide the designer with the best combination of fast switching, ruggedized device design, low on-resistance and cost-effectiveness.

The PMPAK® 3x3 package is special for DC-DC converters application and lower 1.0mm profile with backside heat sink.



PMPAK® 3x3

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

Symbol	Parameter	Rating	Units
V_{DS}	Drain-Source Voltage	-30	V
V_{GS}	Gate-Source Voltage	±25	V
I_D@T_A=25℃	Drain Current[3], V_{GS} @ 10V	-14.6	A
I_D@T_A=70℃	Drain Current[3], V_{GS} @ 10V	-11.7	A
I_{DM}	Pulsed Drain Current[1]	-50	A
P_D@T_A=25℃	Total Power Dissipation	3.12	W
T_{STG}	Storage Temperature Range	-55 to 150	℃
T_J	Operating Junction Temperature Range	-55 to 150	℃

設計驗證
工程課
2025-01-08
發行
全宇科技開發股份有限公司

Thermal Data

Symbol	Parameter	Value	Unit
Rthj-c	Maximum Thermal Resistance, Junction-case	5	℃/W
Rthj-a	Maximum Thermal Resistance, Junction-ambient[3]	40	℃/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	-30	-	-	V
$R_{DS(ON)}$	Static Drain-Source On-Resistance[2]	V_{GS}=-10V, I_D=-10A	-	-	10	mΩ
		V_{GS}=-4.5V, I_D=-6A	-	-	14.5	mΩ
$V_{GS(th)}$	Gate Threshold Voltage	V_{DS}=V_{GS}, I_D=-250uA	-1	-	-3	V
g_{fs}	Forward Transconductance	V_{DS}=-5V, I_D=-10A	-	33	-	S
I_{DSS}	Drain-Source Leakage Current	V_{DS}=-24V, V_{GS}=0V	-	-	-10	uA
I_{GSS}	Gate-Source Leakage	V_{GS}=±20V, V_{DS}=0V	-	-	±100	nA
Q_g	Total Gate Charge	I_D=-6A	-	34	54.4	nC
Q_{gs}	Gate-Source Charge	V_{DS}=-15V	-	9	-	nC
Q_{gd}	Gate-Drain ("Miller") Charge	V_{GS}=-4.5V	-	12	-	nC
$t_{d(on)}$	Turn-on Delay Time	V_{DS}=-15V	-	11	-	ns
t_r	Rise Time	I_D=-1A	-	9	-	ns
$t_{d(off)}$	Turn-off Delay Time	R_G=3.3Ω	-	150	-	ns
t_f	Fall Time	V_{GS}=-10V	-	70	-	ns
C_{iss}	Input Capacitance	V_{GS}=0V	-	3800	6080	pF
C_{oss}	Output Capacitance	V_{DS}=-15V	-	500	-	pF
C_{rss}	Reverse Transfer Capacitance	f=1.0MHz	-	345	-	pF
R_g	Gate Resistance	f=1.0MHz	-	9	18	Ω

Source-Drain Diode

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
V_{SD}	Forward On Voltage[2]	I_S=-2.6A, V_{GS}=0V	-	-	-1.2	V
t_{rr}	Reverse Recovery Time	I_S=-10A, V_{GS}=0V,	-	27	-	ns
Q_{rr}	Reverse Recovery Charge	dI/dt=100A/μs	-	16	-	nC

Notes:

1.Pulse width limited by Max. junction temperature.

2.Pulse test

3.Surface mounted on 1 in^2 2oz copper pad of FR4 board, t ≤10sec ; 135°C/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.

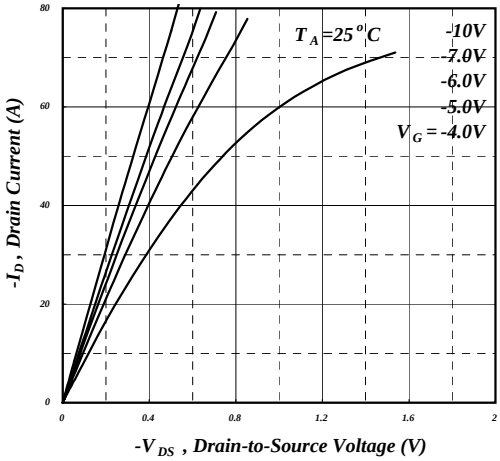


Fig 1. Typical Output Characteristics

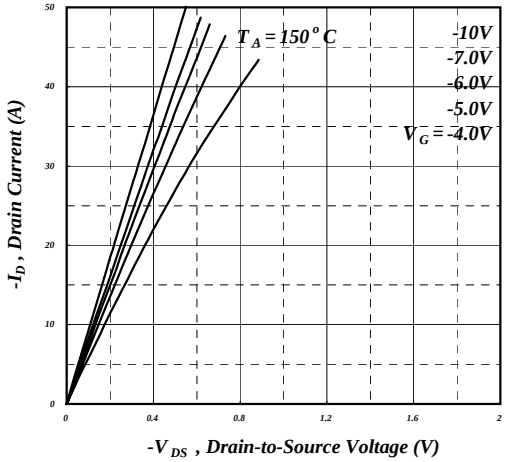


Fig 2. Typical Output Characteristics

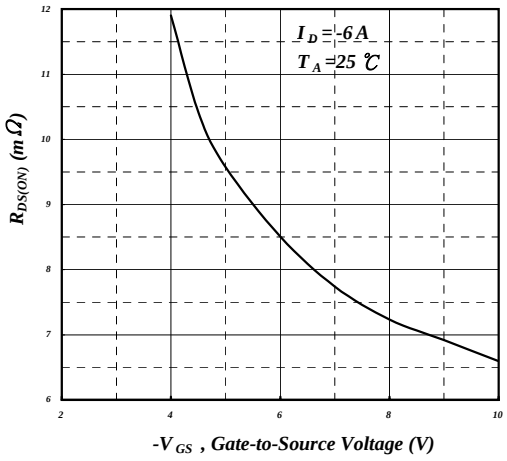


Fig 3. On-Resistance v.s. Gate Voltage

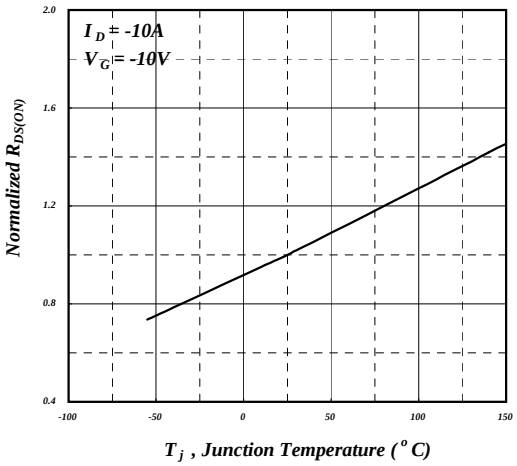


Fig 4. Normalized On-Resistance v.s. Junction Temperature

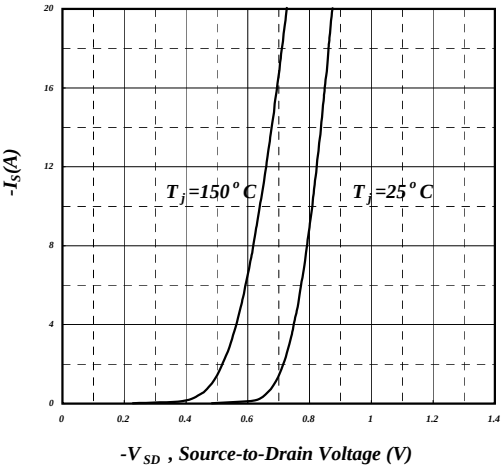


Fig 5. Forward Characteristic of Reverse Diode

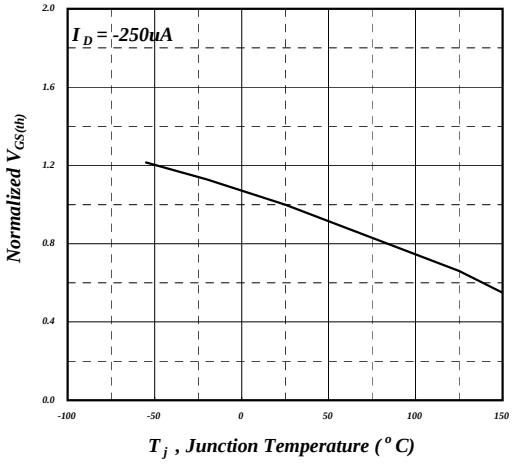


Fig 6. Gate Threshold Voltage v.s. Junction Temperature

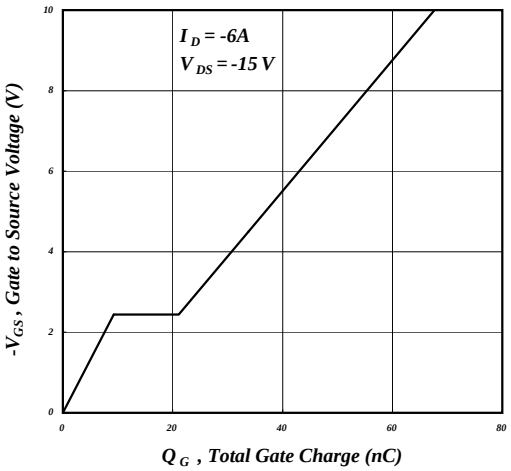


Fig 7. Gate Charge Characteristics

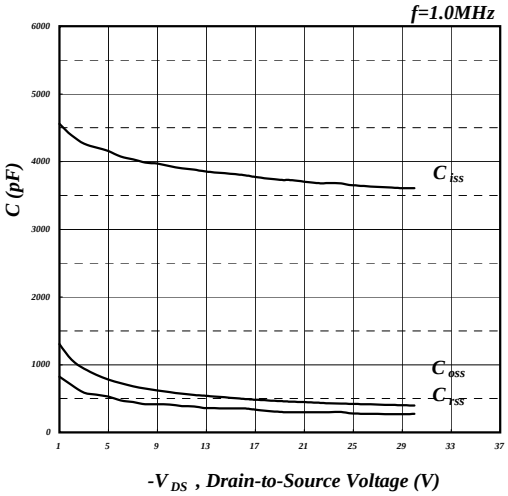


Fig 8. Typical Capacitance Characteristics

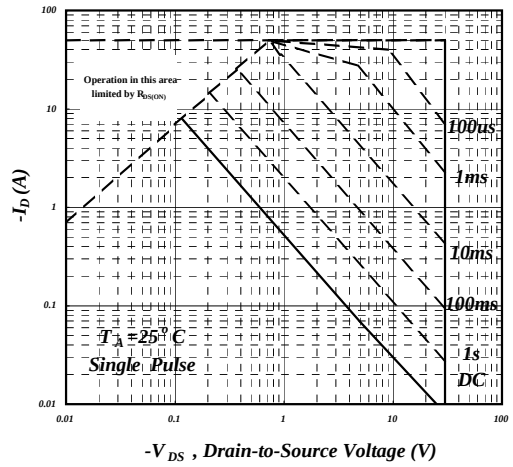


Fig 9. Maximum Safe Operating Area

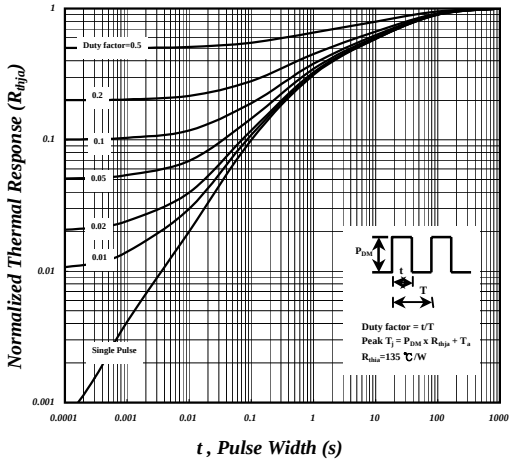


Fig 10. Effective Transient Thermal Impedance

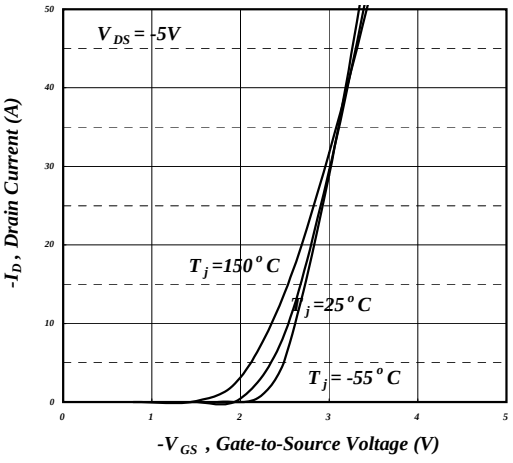


Fig 11. Transfer Characteristics

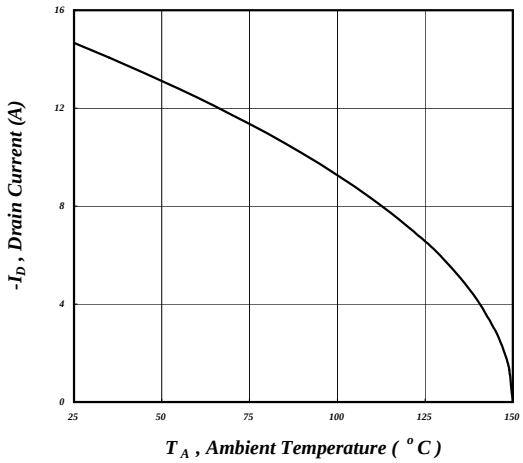
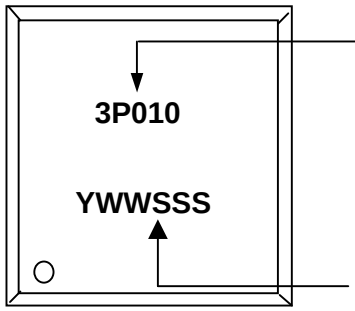


Fig 12. Drain Current v.s. Ambient Temperature

MARKING INFORMATION



Part Number

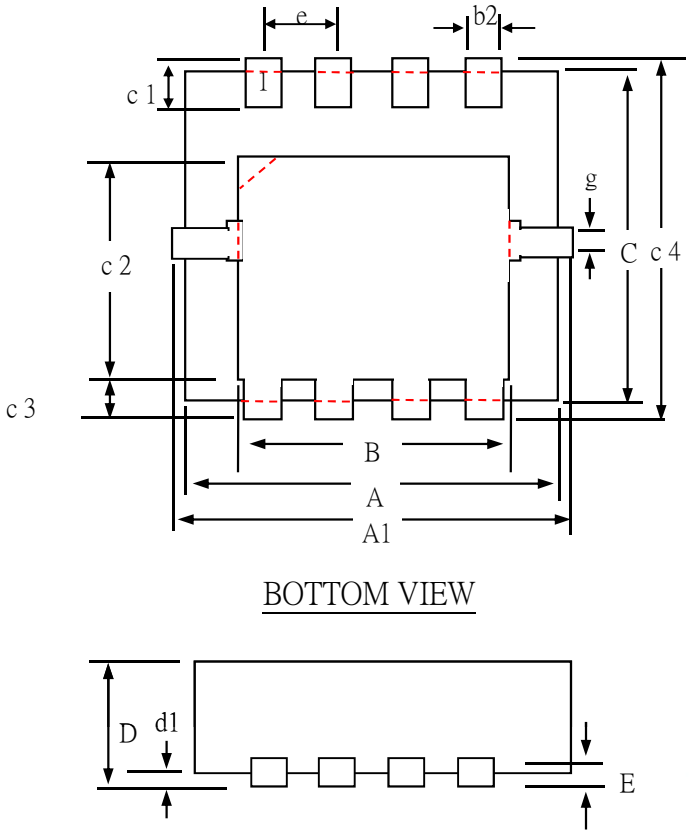
Date Code (YWWSSS)

Y：Last Digit Of The Year

WW：Week

SSS：Sequence

Package Outline : PMPAK 3x3



SYMBOLS	Millimeters		
	MIN	NOM	MAX
A	2.90	3.10	3.40
B	2.20	2.45	2.80
e	0.60	0.65	0.70
b2	0.20	0.30	0.40
C	2.90	3.10	3.40
c1	0.10	0.30	0.50
c2	1.20	1.70	2.20
c3	0.10	0.38	0.65
D	0.65	0.80	1.05
d1	0.00	0.10	0.20
E	0.10	0.18	0.25
A1	2.900	3.30	3.600
c4	2.900	3.30	3.600
g	0.20 (ref)		

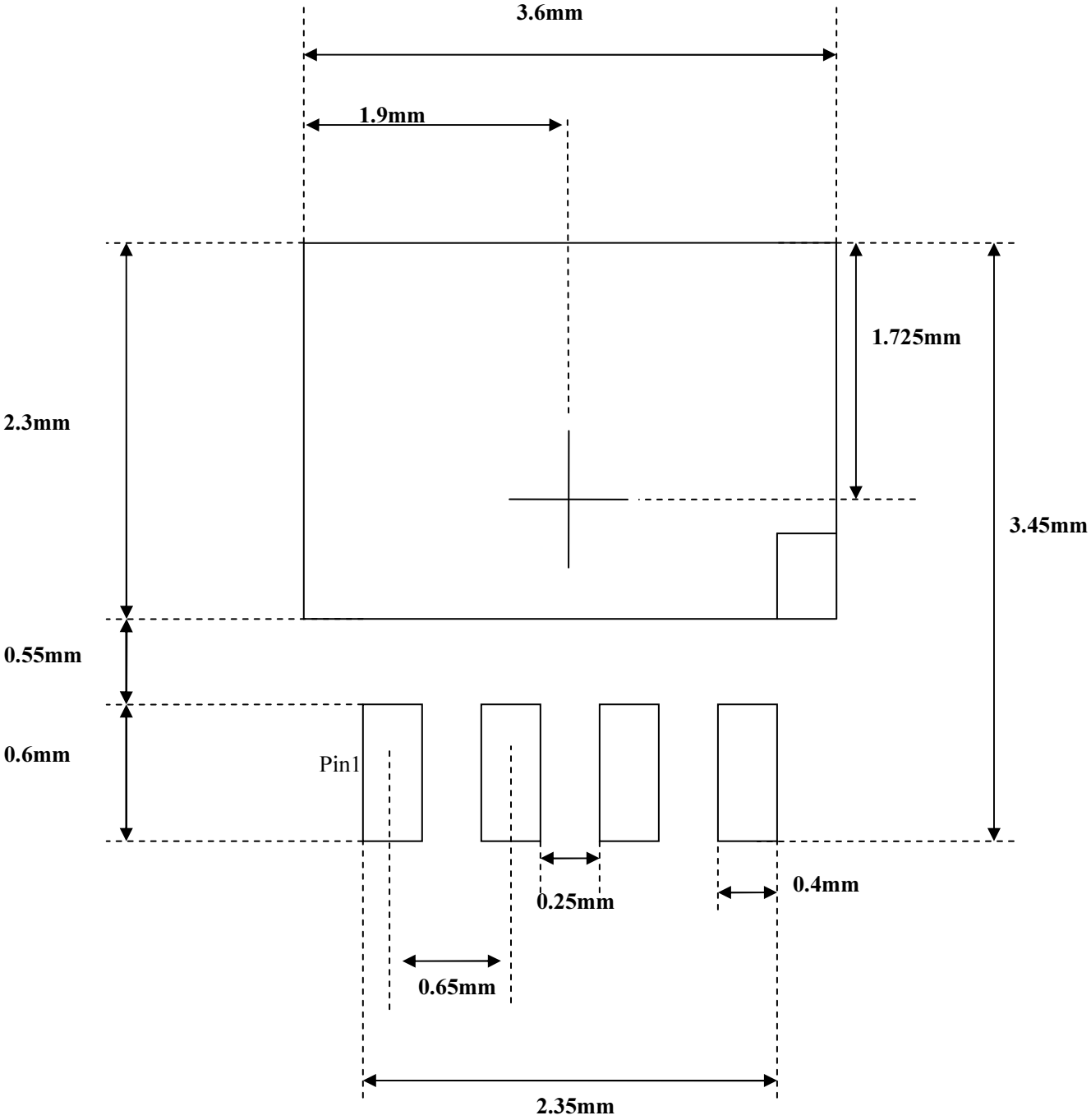
1.All Dimension Are In Millimeters.

2.Dimension Does Not Include Mold Protrusions.

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

Draw No. M1-YT8-G-v06

PMPAK3X3 FOOTPRINT：



富鼎先進電子股份有限公司

包裝規範 Packing Spec

WAFER BOX ONTO CARTON. AS ATTACHMENT 十一-3)

5.2 PACKAGE 產品包裝作業規定(5.2 PACKAGED FG PACKING STANDARD.)

5.2.1 管條(TUBE)之裝箱法(5.2.1 TUBE PACKING STANDARD.)

5.2.1.1

PKG TYPE	TO-220	TO-220CFM TO-126F	TO-262	DIP-8	TO-3P	TO-251 TO-251ST	TO-247
TUBE	50ea	50ea	50ea	50ea	30ea	80ea	30ea
INNER BOX	1000ea/Box	1000ea/Box	1000ea/Box	3000ea/Box	360ea/Box	8000ea/Box	240ea/Box
OUTER CORTON	6000ea/carton	6000ea/carton	6000ea/carton	12000ea/carton	1440ea/carton	40000ea/carton	1200ea/carton
CARTON DIMENSION	Attachment (一)	Attachment(一) Attachment (一-1)	Attachment (一)	Attachment (五)	Attachment (七)	Attachment(四)	Attachment (十二)

5.2.1.2 單一 INNER BOX 只允許二個不同 DATA CODE 併管。

(5.2.1.2 Only allow 2 different date code to be combined into one Inner Box.)

5.2.1.3 尾數箱裝箱時需將剩餘空間，以小內盒或氣泡膠填充之。

(5.2.1.3 NEED TO PUT EMPTY INNER BOX INSIDE OUTER CARTON FOR NON FULL PACKED CARTON.)

5.2.2 捲型包裝(TAPE&REEL)之裝箱法

(5.2.2 TAPE & REEL PECKING STANDARD.)

5.2.2.1

PKG TYPE	TO-252/ SOT-223	TO-263	SOP-Series TSSOP- Series PMPAK/ESOP MESOP- Series DFN 3*3/ DFN 3*3RU QFN3.5*3.5 PDFN 5*6	SOT-23/5/6/ SOT-323/363 SOT-723 SC70-4L/5L/ TSOT-23/5/6 DFN 3*2/ DFN 2*2 WCSP/FDFN	SOT-89	GEM2928-8	TO-92
REEL	3000ea	800ea	3000ea	3000ea	1000ea	3000ea	2000ea
INNER BOX	6000ea/Box	800ea/box	6000ea/box	15000ea/box	4000ea/box	15000ea/box	2000ea/box
OUTER CORTON	24000ea/carton	4000ea/carton	48000ea/carton	150000ea/carton	40000ea/carton	150000ea/box	32000ea/box

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CARTON DIMENSION	Attachment (三)	Attachment (三)	Attachment (三)	Attachment (二)	Attachment (二)	Attachment(二)	Attachment(八)
REEL SPEC.	Figure 一/六	Figure 三	Figure 二/八/十一/十五/十七-十九/二十一/二十二/二十四	Figure 四/十/十二/十三/十四/十六/十七/二十七	Figure 五	Figure 七	Figure 九

5.2.2.2 產品料卷外圍必需要有保護圈或當不滿卷時需用紅色泡棉條填充后再上保護圈，尾數箱裝箱時需將剩餘空間，以小內盒或氣泡膠填充之。

(5.2.2.2 EVERY REEL MUST HAVE A PROTECT BAND OR **IF REEL IS NOT FULL MUST HAVE READ FOAM LINER AND PROTECT BAND**. NEED TO PUT EMPTY IN'NER BOX OUTER CARTON FOR NON FULL PACKED CARTON.)

5.2.2.3 單一料捲只允許二個不同 DATA CODE 併捲。

(5.2.2.3 Only allow 2 different date code to be combined into one reel.)

5.2.3 靜電袋之裝箱法(5.2.3 BAG PACKING STANDARD.)

PKG TYPE	TO-220	TO-251/TO-92
BAG	50ea	100ea
INNER BOX	500ea/box	10000ea/box
OUTER CORTON	4000ea/carton	40000ea/carton
CARTON DIMENSION	Attachment (六)	Attachment (八)

5.2.3.2 尾數箱裝箱時需將剩餘空間，以小內盒氣泡膠填充之。

(5.2.3.2 NEED TO PUT EMPEY INNER BOX INSIDE OUTER CARTON FOR NON FULL PACKED CARTON.)

5.3 不同產品不可裝入同一箱子內，以避免產品混料。

(5.3 NO ANY DIFFERENT P/N FG INSIDE SAME CARTON.)

5.4 包裝箱標籤：整貨裝箱後將型號數量標籤(如附件七)貼在紙箱及小內盒側面。

(5.4 LABELING：ATTACH LABEL ONTO INNER BOX & OUTER CARTON AS ATTAHMENT 七.)

5.5 真空包裝：產品料卷外圍必需要有保護圈或當不滿卷時需用紅色泡棉條填充后再上保護圈，再放入抗靜電鋁箔袋中，同乾燥劑及濕度指示卡一起抽真空後，再置入內盒.

(5.5 VACUUM PACKING:EVERY REEL MUST HAVE A PROTECT BAND OR **IF REEL IS NOT FULL MUST HAVE READ FOAM LINER AND PROTECT BAND** ; VACUUM AND SEAL THE BAG BEFORE PUT ONE REEL TOGETHER WITH DESICCANTS AND HUMIDITY INDICATOR CARD IN THE ESD MOISTURE BARRIER BAG; THEN PUT INTO THE INNER BOX.

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5.5.1.真空包裝之裝箱法：(5.5.1 VACUUM PACKING STANDARD.)

抗靜電鋁箔袋 PKG INCHTYPE	TO-252/ SOT-223	TO-263	SOP-Series TSSOP-Series ESOP-8/PMPAK/ MESOP--Series DFN 3*3 DFN 3*3RU QFN3.5*3.5 PDFN 5*6	SOT-23/5/6/SOT-323/363 SOT-723 SC70-4L/5L/TSOT-23/5/6 DFN 3*2/DFN 2*2 WCSP/FDFN	SOT-89	GEM2928-8
REEL	3000ea	800ea	3000ea	3000ea	1000ea	3000ea
INNER BOX	6000ea/Box	800ea/box	6000ea/box	12000ea/box	3000ea/box	12000ea/box
OUTER CORTON	24000ea/carton	4000ea/carton	48000ea/carton	120000ea/carton	30000ea/carton	120000ea/box
CARTON DIMENSION	Attachment (二)	Attachment (二)	Attachment (三)	Attachment (二)	Attachment (二)	Attachment(二)
REEL SPEC.	*Figure 一/六*	*Figure 三*	*Figure 二/八/十一/十五/十七-十九/二十一/ 二十二/二十四*	*Figure 四/十/十二/十三/十四/十六/十七/二十七*	*Figure 五*	*Figure 七*

5.5.2. 7 吋料卷如附件(九)

(5.5.2.ATTACHMENT(九)ESD MOISTURE BARRIER BAG FOR 7 INCH REEL.)

5.5.3. 13 吋料卷如附件(十)

(5.5.3.ATTACHMENT(十)ESD MOISTURE BARRIER BAG FOR 13 INCH REEL.)

*以上依客戶需求使用之。*ABOVE ITEM USED BY CUSTOMER REQUIREMENT.

5.5.4 真空包裝 PKG TYPE: (VACUUM PKG TYPE:)

PRODUCT TYPE	PKG TYPE
MOS	SO-8,ESOP-8,SOT-223,WLCSP , DFN SERIES , PDFN SERIES, SOT-723 (PMPAK5*6→ONLY P/N:***CMT)
IC	ALL IC TYPE

5.5.5 若有真空包裝需求不在”5.5.4 真空包裝 pkg Type”之中,APEC 會在工單上備註“真空”或是在出貨前以 E-mail 方式通知“真空”,告知封裝廠作業.

(5.5.5 IF MUST OF VACUUM PACING BUT NOT “5.5.4 VACUUM PKG TYPE”; APEC WILL REMARK “VACUUM” ON WORK SHEET OR BEFORE SHIPPING

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WILL NOTICE “VACUUM” BY E-MAIL TO ASS’Y HOUSE.)

5.6 包裝檢驗：裝箱完成後通知 QA 檢驗，檢驗合格則蓋上檢查合格章後等待出貨。

(5.6 PACKING INSPECTION：STAMP QA IN SPETION ONTO LABEL AFTER COMPLETELY PACKING STEP.)

6.外購成品的包裝規範依客戶要求。

(6. THE PACKING SPEC. OF PURCHASED FG IS FOLLOWED BY CUSTOMER’S REQUIREMENT.)

7. 相關文件：QWMPC-7805

(7. DOCUMENT：QWMPC-7805)

附件七：外箱標籤（ATTACHMENT:CARTON LABEL ）

檢驗合格標章樣式：(STAMP FOR INSPECT BY ACCEPTED)



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富鼎先進電子股份有限公司
包裝規範 Packing Spec

無鉛產品標籤(For Pb Free Product) ：



PO. BEFORE 2014YEAR WW13



PO. AFTER 2014YEAR WW14

標籤資訊要求:
(LABEL REQUIREMENT)
A. 封裝別 Ex. TO-220
(A. PKG TYPE Ex. TO-220)
(B. QC 章
(B. QC STAMP)

條碼說明:
(BAR CODE STANDARD)
〔P/N〕:PART NO.
〔Lot No〕:D/C+YWW
〔Q’ ty〕:數量(QUANTITY)
〔Date code〕:D/C

無鹵產品標籤(For Halogen Free Product) ：



PO. BEFORE 2014YEAR WW13

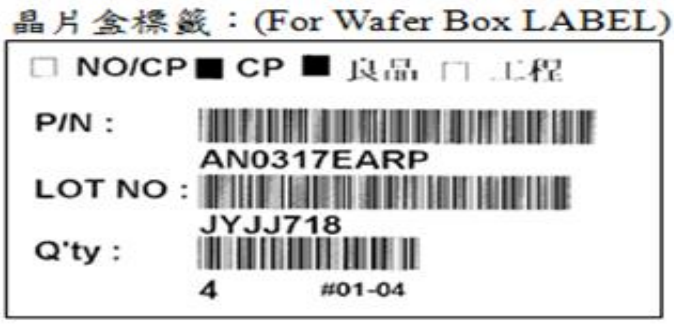


PO. AFTER 2014YEAR WW14

G.P.PASS LABEL 貼於外箱右上角：
(PASTED ON RIGHT CORNEROF THE CARTON)



晶片盒標籤：(For Wafer Box LABEL)



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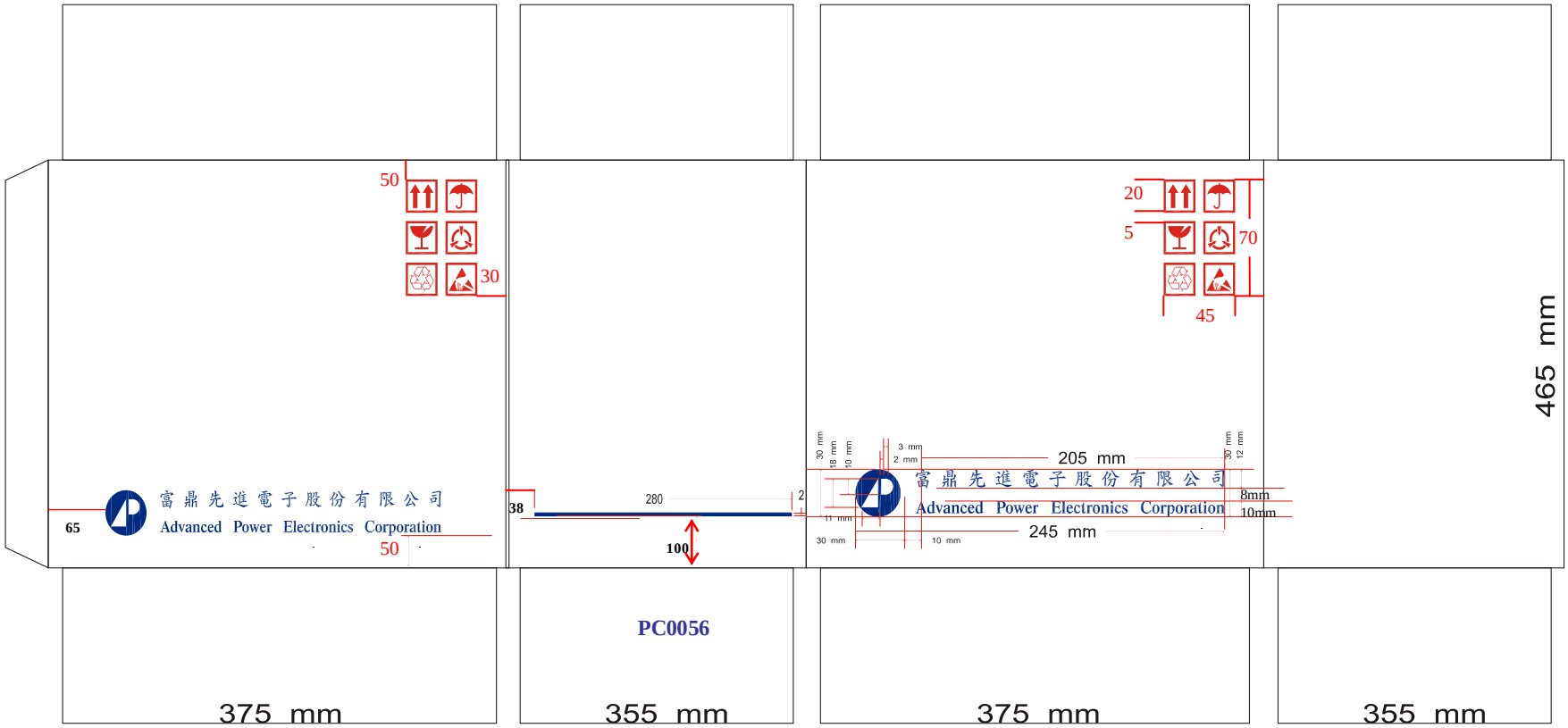
包裝規範 Packing Spec

Attachment 3：TO-252、TO-263、SOP-series 、ESOP-8 、TSSOP- series、PMPAK、MESOP-series、DFN 3*3 、DFN 3*3RU 、QFN3.5*3.5、PDFN 5*6 Carton



TOLERANCE：±30mm

文件編號：QWMPC-7801
版　　別：48
頁　　碼：9

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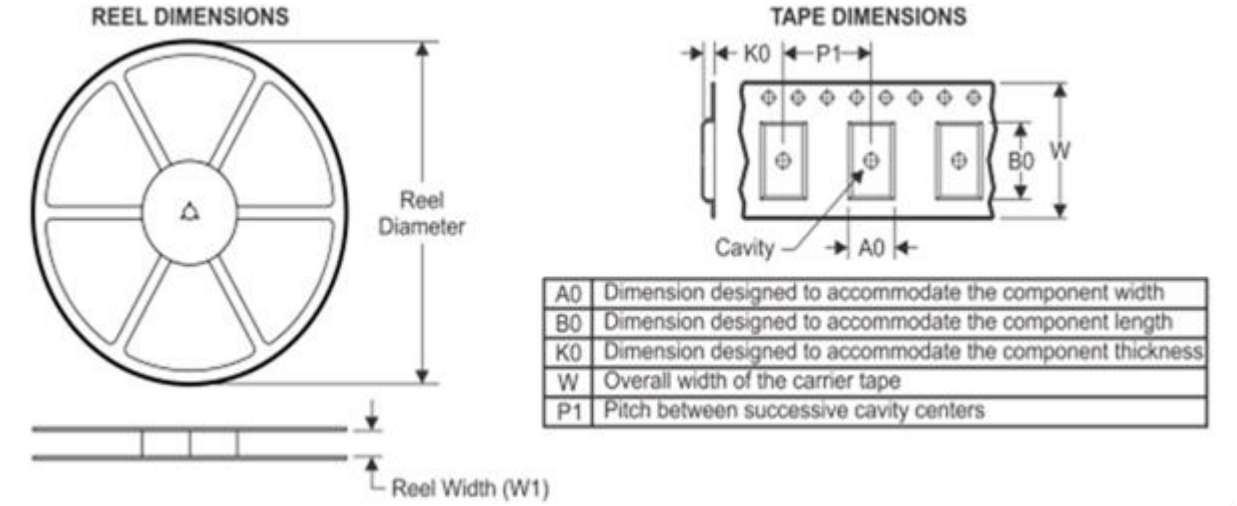
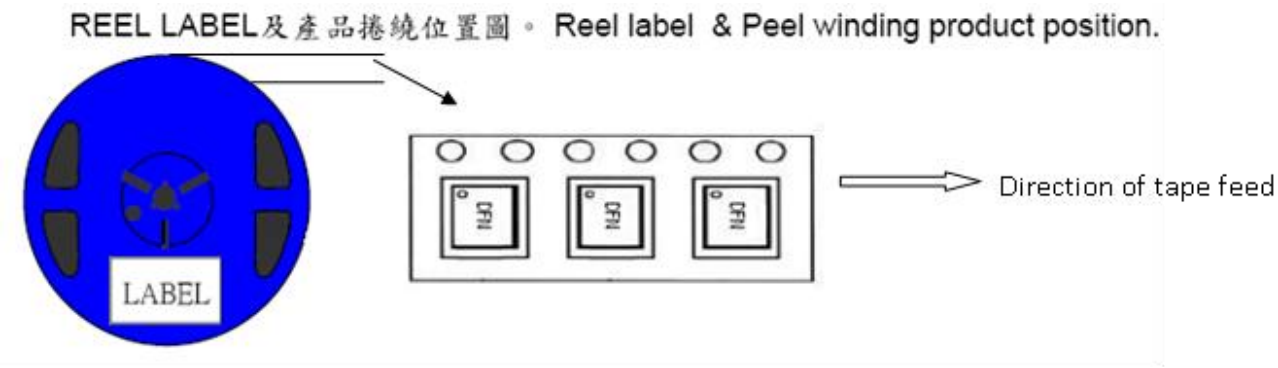
附圖八-2：PMPAK 3*3 、DFN 3*3 Tape & Reel Information



A0	Dimension designed to accommodate the component width
B0	Dimension designed to accommodate the component length
K0	Dimension designed to accommodate the component thickness
W	Overall width of the carrier tape
P1	Pitch between successive cavity centers

Reel Diameter (mm)	Reel Width W1(mm)	A0 (mm)	B0 (mm)	K0 (mm)	P1 (mm)	W (mm)
330.0	16.0	3.3	3.3	1.1	8.0	12.0



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ADVANCED POWER ELECTRONICS CORP.

Material List PMPAK3X3(I)

Parts	Materila Supplier	Materila P/N	Country	Parts Weight (mg)	Hazardous Substance	Weight (mg)	Percent	Percentage by parts	CAS No.
Compound	SUMITOMO	EME-G620 A	China	11.383	Epoxy Resin A	0.398	1.456%	3.500%	Trade secret
					Epoxy Resin B	0.228	0.832%	2.000%	Trade secret
					Phenol Resin	0.228	0.832%	2.000%	Trade secret
					Silica(Amorphous) A	9.676	35.365%	85.000%	60676-86-0
					Silica(Amorphous) B	0.797	2.912%	7.000%	7631-86-9
					Carbon Black	0.057	0.208%	0.500%	1333-86-4
Die Attach	HENKEL	84-1LMISR4	China	0.482	Silver	0.400	1.462%	83.000%	7440-22-4
					Epoxy resin	0.048	0.176%	10.000%	9003-36-5
					1,4-Bis(2,3-epoxypropoxy)butane	0.024	0.088%	5.000%	2425-79-8
					dapsone	0.010	0.035%	2.000%	80-08-0
Lead Frame	AAM JIEXIN	A194	China	13.17	Cu	12.708	46.448%	96.490%	7440-50-8
					Fe	0.329	1.203%	2.500%	7439-89-6
					Pb	0.001	0.005%	0.010%	7439-92-1
					P	0.013	0.048%	0.100%	7723-14-0
					Zn	0.013	0.048%	0.100%	7440-66-6
					Ag	0.105	0.385%	0.800%	7440-22-4
Plating	Hongli(Tongding) fumeida(Xinyang) Shengmei(Anchen) Syundai(Tongding)	Tin	China	0.812	Sn	0.812	2.968%	99.99%	7440-31-5
					Other	0.000081	0.00030%	0.01%	-
Wire	HERAEUS	Maxsoft	China	0.492	Cu	0.491986	1.798261%	99.9972%	7440-50-8
					Ag	0.000006	0.000022%	0.0012%	7440-22-4
					Fe	0.000002	0.000009%	0.0005%	7439-89-6
					Mn	0.000001	0.000005%	0.0003%	7439-96-5
					S	0.000003	0.000011%	0.0006%	7704-34-9
					Ni	0.000001	0.000004%	0.0002%	7440-02-0
Die	Powerchip	Wafer	Taiwan	1.02	Si	1.011242	3.696196%	99.1414%	7440-21-3
					Al	0.006559	0.023972%	0.6430%	7429-90-5
					P	0.001357	0.004959%	0.1330%	7723-14-0
					W	0.000705	0.002576%	0.0691%	7440-33-7
					Ti	0.000078	0.000283%	0.0076%	7440-32-6
					Cu	0.000034	0.000123%	0.0033%	7440-50-8
					B	0.000017	0.000063%	0.0017%	7440-42-8
					Ca	0.000005	0.000019%	0.0005%	7440-70-2
					Fe	0.000004	0.000015%	0.0004%	7439-89-6
			Total weight	27.359 mg		27.359 mg	100%		

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ADVANCED POWER ELECTRONICS CORP.

Material list PMPAK3x3 (E-SH)

Parts	Material Supplier	Material P/N	Country	Parts Weight (mg)	Substance	Weight (mg)	Percentage	Percentage by parts	CAS No.
Compound	Sumitomo	EME-G600FL	China	15.498	Epoxy Resin A	1.085	3.7570%	7.0000%	Trade Secret
					Epoxy Resin B	0.465	1.6101%	3.0000%	29690-82-2
					Phenol Resin	0.387	1.3418%	2.5000%	Trade Secret
					Silica(Amorphous) A	12.708	44.0101%	82.0000%	60676-86-0
					Silica(Amorphous) B	0.775	2.6835%	5.0000%	7631-86-9
					Carbon Black	0.077	0.2684%	0.5000%	1333-86-4
Die Attach	Kyocera	CT285	Japan	0.336	Silver	0.289	1.0007%	86.0000%	7440-22-4
					Epoxy resin dilluent	0.017	0.0582%	5.0000%	confidential
					Mixture of Epoxy resin and its hardener	0.018	0.0640%	5.5000%	confidential
					2,3-Epoxypropylphenyl ether	0.012	0.0407%	3.5000%	122-60-1
Lead Frame	AAM	A194	China	11.088	Copper(Cu)	10.721	37.1277%	96.6900%	7440-50-8
					Fe	0.261	0.9024%	2.3500%	7439-89-6
					Pb	0.001	0.0038%	0.0100%	7439-92-1
					P	0.009	0.0307%	0.0800%	7723-14-0
					Zn	0.013	0.0461%	0.1200%	7440-66-6
					Ag	0.083	0.2880%	0.7500%	7440-22-4
Wire	Hereaus	Cu	Singapore	0.489	Copper	0.489	1.6934%	99.9972%	7440-50-8
					Ag	0.00001	0.0000%	0.0012%	7440-22-4
					Fe	0.000002	0.0000%	0.0005%	7439-89-6
					Mn	0.000001	0.0000%	0.0003%	7439-96-5
					S	0.000003	0.0000%	0.0006%	7704-34-9
					Ni	0.000001	0.0000%	0.0002%	7440-02-0
Plating	ASEM	Sn	China	0.445	Tin	0.445	1.540946%	99.9918%	7440-31-5
					Pb	0.00002	0.000054%	0.0035%	7439-92-1
					As	0.000002	0.000008%	0.0005%	7440-38-2
					Fe	0.000004	0.000012%	0.0008%	7439-89-6
					Cu	0.000001	0.000005%	0.0003%	7440-50-8
					Bi	0.000008	0.000026%	0.0017%	7440-69-9
					Sb	0.000004	0.000014%	0.0009%	7440-36-0
					Zn	0.0000004	0.000002%	0.0001%	7440-66-6
					Al	0.0000004	0.000002%	0.0001%	7429-90-5
					Cd	0.000001	0.000005%	0.0003%	7440-43-9
Die	Powerchip	Wafer	TW	1.02	Si	1.011242	3.50202%	99.1414%	7440-21-3
					Al	0.006559	0.02271%	0.6430%	7429-90-5
					P	0.001357	0.00470%	0.1330%	7723-14-0
					W	0.000705	0.00244%	0.0691%	7440-33-7
					Ti	0.000078	0.00027%	0.0076%	7440-32-6
					Cu	0.000034	0.00012%	0.0033%	7440-50-8
					B	0.000017	0.00006%	0.0017%	7440-42-8
					Ca	0.000005	0.00002%	0.0005%	7440-70-2
					Fe	0.000004	0.00001%	0.0004%	7439-89-6
			Total Weight	28.876 mg		28.876 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.

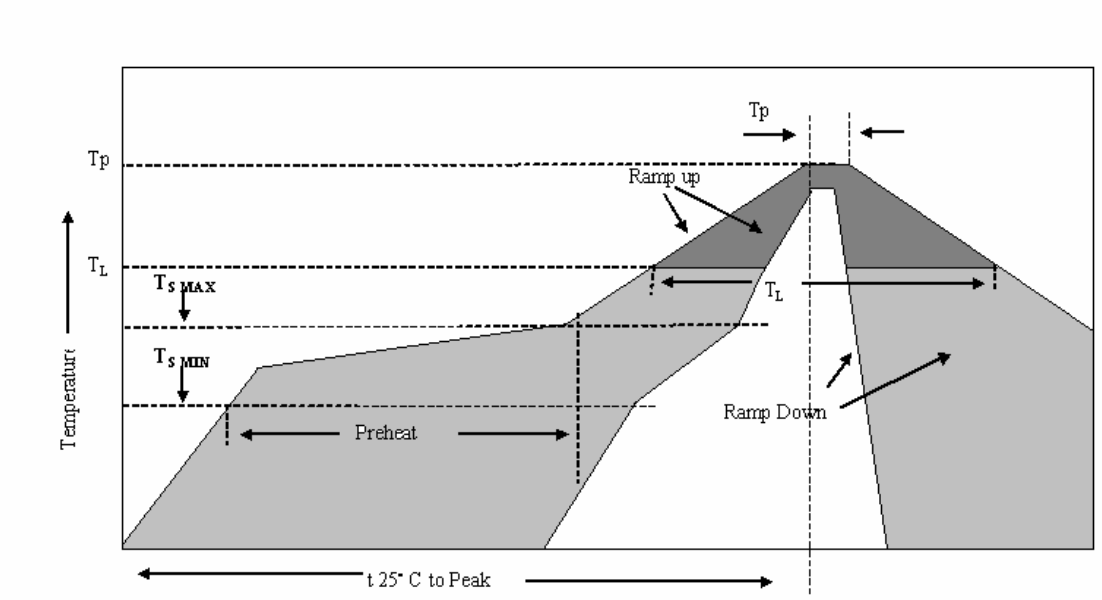

Table 1. Lead-Free Reflow Rrofile Recommendation(IPC/JEDEC J-STD-020C)	
Reflow Parameter	Lead-Free Assembly
Minimum preheat temperature(Ts_{MIN})	150° C
Maximum preheat temperature(Ts_{MAX})	200° C
Preheat Time	60-180 seconds
Ts_{MAX} TO T_L ramp-up rate	3° C/second maximum
Time above temperature T_L (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

AP3P010YT

I. Accelerated Life Times Stress Test

II. Environmental Stress Test

PMPAK 3x3

Approved by	Prepared by
M. H. Lin	S. H. Tsai
Date: 2017/9/10	Date: 2017/9/10

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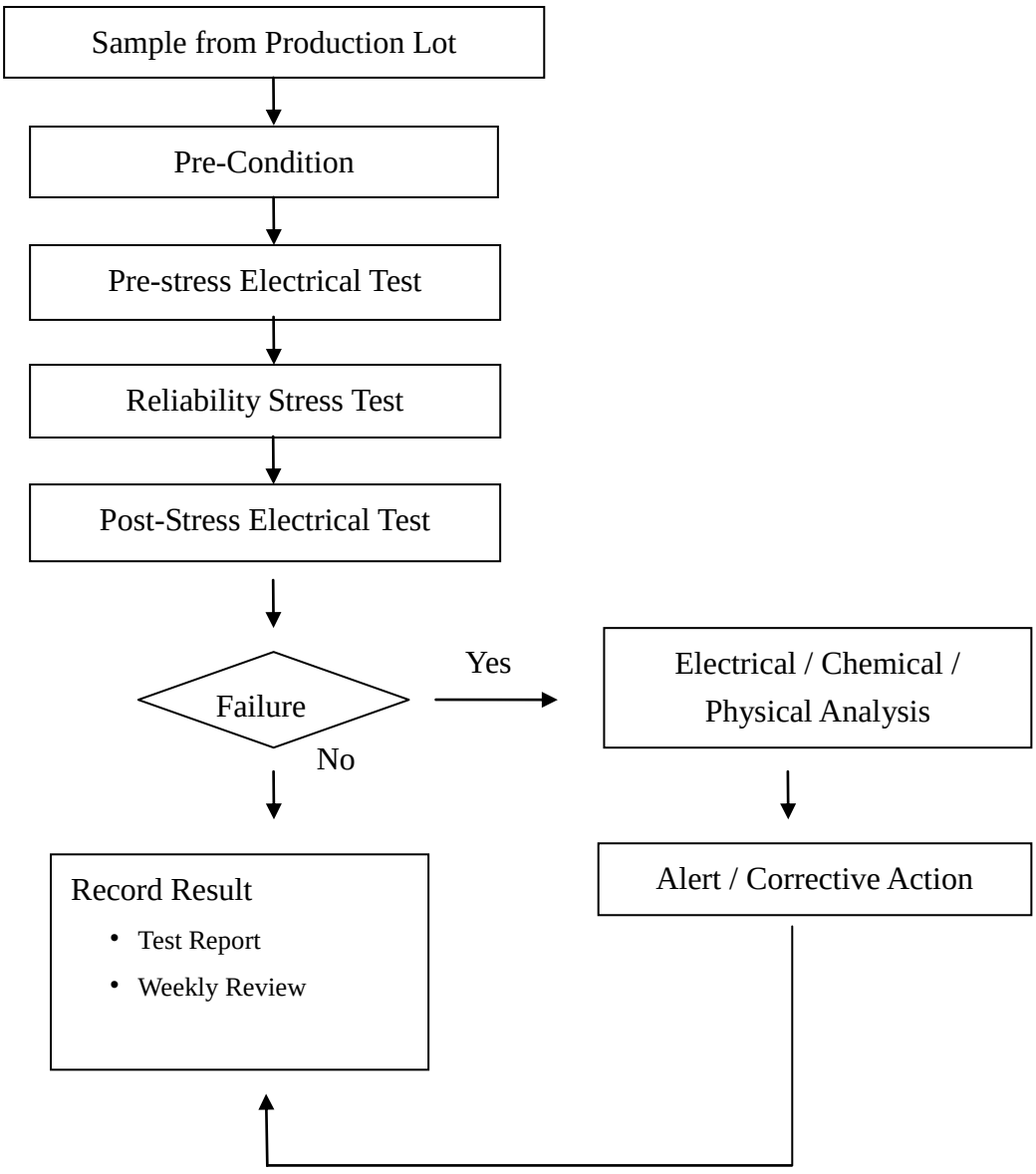
1. Introduction

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

2. Test Procedure



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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

  EIAJ ED-4701 D323

  HTGB Operation spec. (QWRAD-7117)

- Condition:

  Temperature: Max. Operating Temperature

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Test Point: 0, 168, 500,1000 Hours Nominal
Bias: Max. VGS Rating

3.3.2 High Temperature Reverse Bias (HTRB)

- Reference Standard
  EIAJ ED-4701 D321
  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 : 0/77
H3TRB	77	1000 hrs.	Pass : 0/77
THST	77	1000 hrs.	Pass : 0/77
PRCL	77	15K cyc..	Pass : 0/77
TCT	77	1000 cyc.	Pass : 0/77
PCT	77	168 hrs.	Pass : 0/77
HAST	77	96 hrs.	Pass : 0/77

The pre-conditioning (SMD Packages devices only)

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4.3 Test Item Description

4.3.1 High Temperature Storage Test (HTST)

- Reference Standard
  EIAJ ED-4701 B111A
  HTST 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
  EIAJ ED-4701 B122A
  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
  EIAJ ED-4701 B121
  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

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EIAJ ED-4701 D322
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) : Tj=△100℃

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-A102C
PCT Operation spec. (QWRAD-7110)

- Condition:

Temperature: 121℃
Relative Humidity: 100% R.H.
Pressure: 2 atm
Test Point: 0, 168 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

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