

17S 2 P

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CB ROBP

2

NJ .SUZY TFLJ
& (TSYSZTX4 ZUZY(ZWWSY NM.SYLVWJ
R R +*9X
NJ 4 ZUZY TFLJ 7FSLJ
6 ZNXHJSY(ZWWSY Z&
(HQ G (HQ(ZWWSY1RNSL
.SYVQ RX8TKY8FW1RNXWJ NSVXM
HZWWSY
+NJI P_8 NMSL +WVZJSH
.SUZY: SI JW TFLJ 1THPTZY
5T JWF J RTI J FYQIMQFI
4 JWJRWWZW 5WYHNTS
& FNGQSF 849 FSI 9849 5FHFFLJ

MM F ELKP?

+GY5FSJQ NNFQ FSI 2 TSNTW
8ZWJMSHJ
8JY9TU' T JX
3JY TMSL 8 XJRX
(TSXZRJW QHMTSNDX
, JSJWQ5ZWTXJ

OBS PPL K E P L O V

349* 5FLJ SZRGJWKTWW NTZXW NTSXRF I KJWTR UFLJ SZRGJWNS YJ HZWYSY J WTS

7J NTS 7JQFXJI Y 2FWJY

7J NTS : U FY .VNS UFLJ FS HTWVHY9 5 NS*(YGQ

7J NTS : U FY 5&(0&, * .3+472&9.43 849

7J NTS : U FY) * .(* 47) *7 .3+472&9.43

7J NTS : U FY &' 8 9/ RF FS FII 281 NTRFYS

ABS F EL OABO K C L O EL K

8(9	9 &7	9FW	7JJQ				
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MKCRK FLKP?

.3			5T JWKZUQ NSUZY .3 XZUQX YW UT JWT YW .(FX JQFX YW XYU IT S HTS JWMWX NMX) WJ .3 NMF Y UT JWXZMW ' UFX .3 Y , 3) NMF XZFGQ QWJ HFUHNWWT JORNFY STXJ TS YW NSUZY YW .(8JJ .SUZY(FUFHNTW
8			5T JVB NMSL 4ZYZY 8 X YW X NMSL STI J WYXZUQX UT JWT YW TZUZY (TSSJHY YW TZUZY1(KQVWTR 8 Y YW TZUZYQFI 3TY WYF HFUHNWVX WZNM KTR 8 Y ' 89 Y UT JWM MNMXNJ X NFM
, 3)			5T JWLWZSI 2 ZYGY XTQJW I NWHQ Y L WZSI UQSI
' 89			5T JWKZUQ KTWY MNMXNJ UT JW2 48+*9 LFY I WJW2 ZXYHTSSJHY F Z+ TW WFY WJWTR NMFUHNWVGY JJS' 89 USFSI 8 STI J
* 3			* SFGQ QLIN NSUZY +QFYS YW US JSFGQX YW I J NU 9MJ I J NU MFX UWHTS JSFGQ YW XMTQX WNSL KQVL KTWUWLWRFGQ : 14 YW XMTQFSI MXYWXX
+			' ZP HTS JMW TZUZY KJI GFHP XJSXSL TOFLJ (TSSJHY F WXXYTW I NNJWTR 4: 9 Y + ' Y XJZUTZUZY TOFLJ 9MJ I J NU WLZQYX+ Y YW SYWFGQKWSHU TK YUNFQ

OB L BKABALMBO HKD? LKAF FLKP?

4 JVTWVYSL KQJ FNWRUWVZW VSLJ ZSQXTYMWXJ STYI

.3		.SUZY TOFLJ WSLJ		
9/		4 W VYSL QZSHNTS YRWVZW		(

BPAID HKDP?

8)		- ZRFS' TI 2 TI JQ ' 2 UW&38./) *(/8 XUHNHNTS FQNSX		P
		(MFWJI) J NU 2 TI JQ) 2 UW&38./*) *(/8 XUHNHNTS FQNSX		P
- ' 2 FSI () 2 XWXXSL FWI TSJ NFFHTWFSHU NMYW &38.*8) & /*) *(/8		XUHNHNTS		

EBO I HKCLO FLK?

7 /&		/ ZSHNTS Y FRGN SYW VRFQWXXFSHU		(
7 /(		/ ZSHNTS Y HFJ YW VRFQWXXFSHU		

8(9 UW INJX7 /&FSI 7 /(SZRGWTSQFXWKWSHU Y JXRFY QZSHNTS YRWVZWXTKYW I J NUX 7 /&FSI 7 /(FWSTYF
HMFVWVXNHTKUFHFLJ NQJ QZYTFRFS TYWVX XYR Q JHMFVWVXNHTXZMFX YW I JXNSFS Q ZYTKYW UNFYI HNZY
GTFW 5(' TS MNMYW 8(9 FWRTZSYI FSI J YW FQIS NTSRJSYFQHYTW 9MJ 5(' GTFW X F MIFYXSP YFYX XTQJW
Y YW QFI XFS YW VRFQFI TKY 8(9 (MSLSL YW I JXNSTVHTSHU ZVNTS TKY 5(' GTFW HVS LJX YW JKNN SH TKY
MIFYXSPFS YW VKTW YW FHZFQ /&FSI 7 /(



+TVR TW NTRFYS

XMTSYSHTR

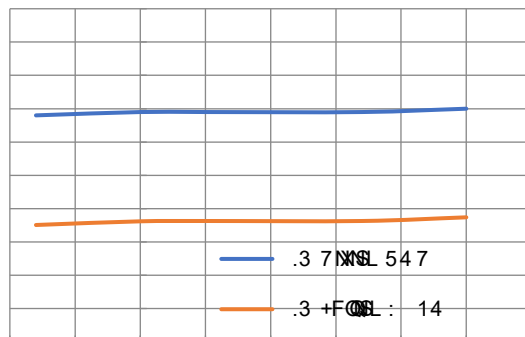
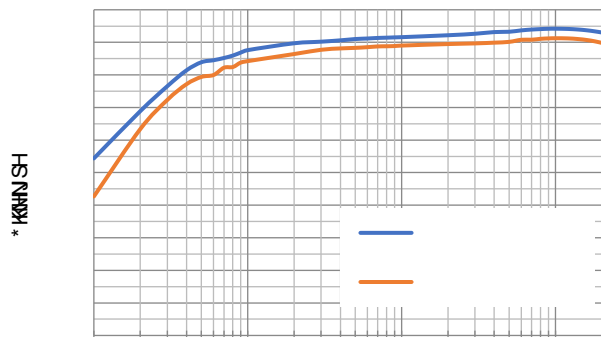
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5W ZH+TQJWNPX 8(9

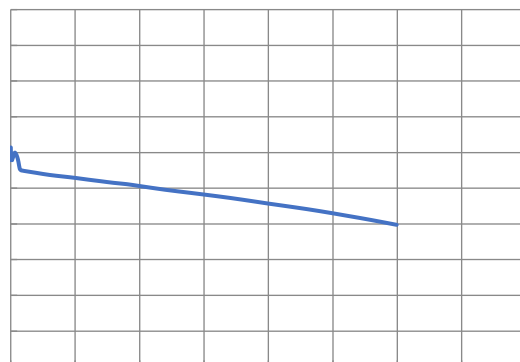
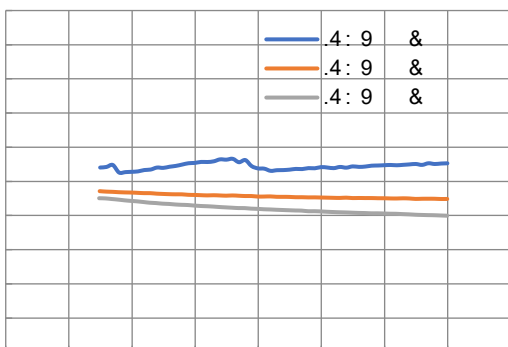
BIB OF I E O BOP F P

.3	9/ (c (YUNFQFQJXFWYXMI ZSI JW (			
.3	4 W WNSL NSUZY TOFLJ			
.3D: 14	.SUZY: 14 - XWXX	.3 WNSL		R
.8)	8MZY T SHZW/SY	* 3 3 T QFI .3		Z&
.6	6 ZNXHJSYHZW/SY	* 3 3 T QFI 3 T X NMSL .3 ' 89 8		Z&

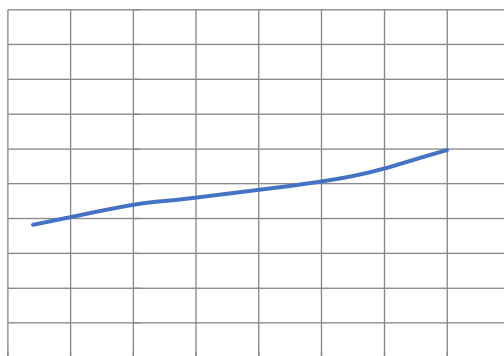
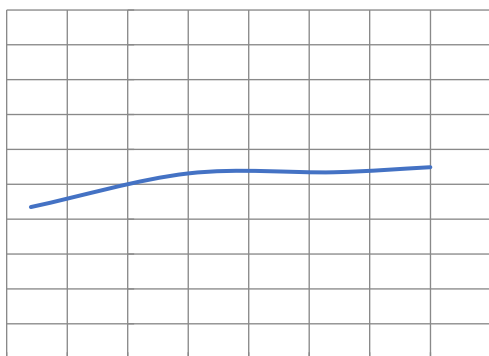
VMF I E O BOHP F P



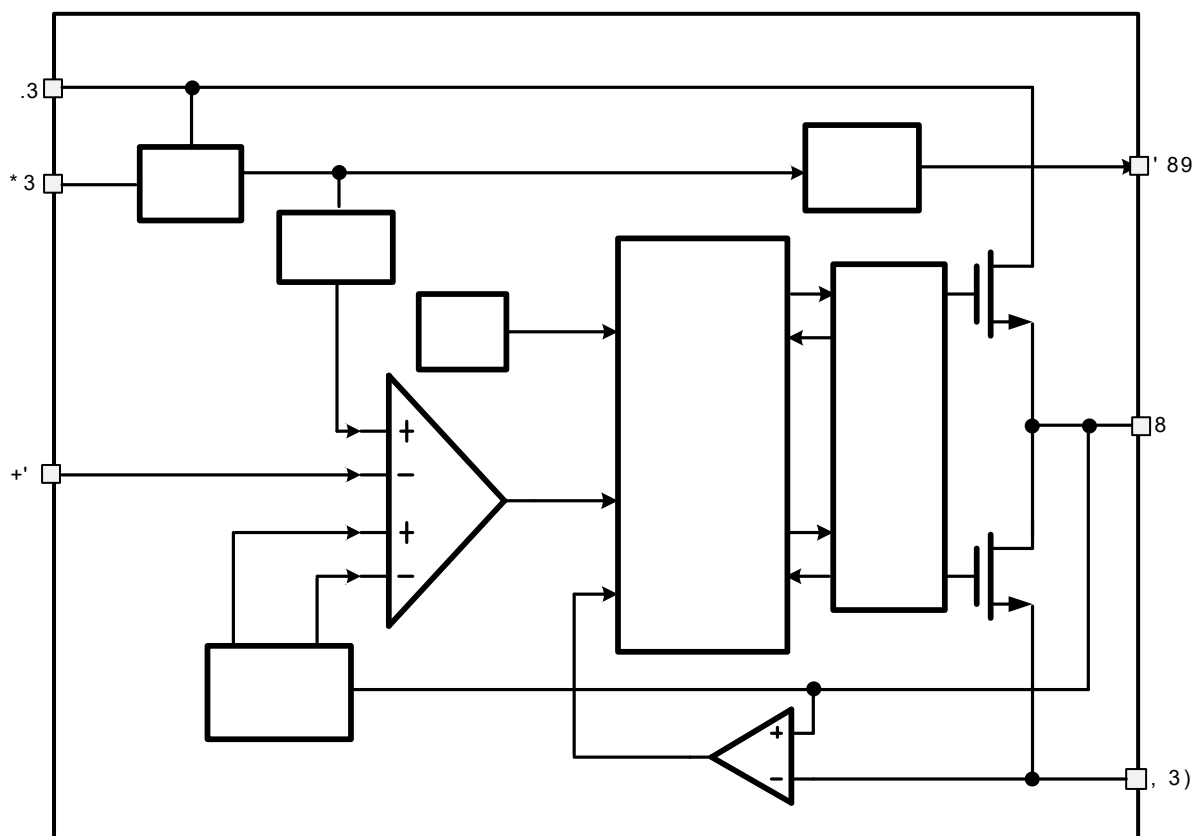
4 Z Y Z Y (Z W S Y R &



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LMB0 FLK

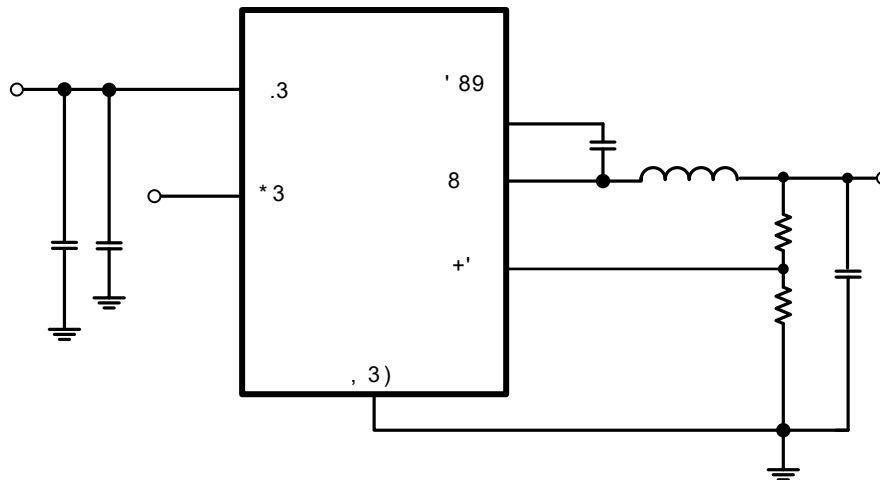
9MJ 8(9 IJ MU NX SUZY & TZUZY X SHWSTZX XJUI T S HTS JWMX NM SYWQUT JW
248+*9X &I FUNJ HTSXF SYTS YRJ &(49 HTSW

.S J F H M X N H M S L H H Q Y W I S I Z H T W H Z W S Y X X J S X I G R T S N T V S L Y W Q X N J 2 4 8 + * 9 I Z V S L Y W 4 + + U W W I
M I S Y W T O F L J G Y J J S , 3) U S F S I 8 U S I X Q J W W F S Y W T J W H Z W S Y W M X M T Q T O F L J Y W 4 (5 N Q J
Y M L J W I F S I Y W H T S Y T Q W P J J U X Y W 4 + + X F Y I & S J X N H M S L H H Q N Q G I L S T S Q M I S Y W R J F X Z W I
T O F L J I X M M M W W F S O R N Y T O F L J . K T Z Y Z Y Q F I S L H T S Y S Z J X Y T S H W F X J T Z Y Z Y N Q W U W I G I Q Y W : 5
F S I 8 8 U S I X I X H M F W J I X Z H M Y F Y T Z Y Z Y I X 9 M I S Y W I J N U N Q H T Z S Y K T W H H Q X T K X T Y X F W Y R J K T W
M H Z U F N S L Y R J F S I W X F W S T V R F Q F K J W H H Q X X T K X F W U W I

& S J Y W F Q G T T X Y W U H F U F H N T W G J Y J J S ' 8 9 F S I 8 U S U T J W K O F Y S L M M M X N J U T J W 2 4 8 + * 9 L F Y I W J W
9 M G T T X Y W U H F U F H N T W T O F L J I X H M F W J I K W R F S N S Y L W Y I T O F L J W L Z Q Y T W M I S M M M X N J U T J W 2 4 8 + * 9
I X T K F S I Q X N J U T J W 2 4 8 + * 9 I X T S

4 S H Y W Q Z S H T S Y R U W F Z W I S Y W 8 (9 J H J I X ° (Y W Y W R F Q X J S X S L H N A Z Y X T U X H T S J W W
X N H M S L F S I W X F W K N M Y W Q Z S H T S Y R U W F Z W K F O L G I Q ° (9 M W R F Q M Z Y T S U W J S X Y W I F R F L J
T S I J N U I Z V S L J H X X N J M I F Y F S I U T J W I X X U F Y T S H T S N T S

MM F H L K K C L O H L K



.SUZY TO FLJ	
4 ZUZY TO FLJ	
4 ZUZY(ZW SY	&
8 NMSL + WZJSH	P-

+TWLTTI SUZY TO FLJ KOWSL HMTXJ Q * 87 HJWRNIHFUFHNTW & HJWRNIHFUFHNTW + N WHTRRJSI JI
KTWWJ I JHTZUOL HFUFHNTWFS F + HJWRNI G UFXX HFUFHNTW WHTRRJSI JI YT GJ UGHJ FXHQJ FX
UTXXHQ YT WJ .3 US TKWJ 8(9

: XJ * VZF YTS YTHFQZCY WJ SUZY TO FLJ WUQ

$$\Delta = \frac{1}{x} \times \frac{V_{OUT}}{V_{IN}} \times (1 - \frac{1}{x})$$

FUQIF YTSX (MITXJ YU WMMHFUFHNTWFQJ HFVKZQ NMHTSXNJVL MUMHFUFHNF SHU HUVRNHFUFHNTX) (GRXJKJHY MIMMFXF XWVSL NQJSHU TS YU NQFQJKJHNJ HFUFHNF SHU

9MU WWTWF SHU TKNS ZHTWFKJHX YU UT JWZUQX XYFI XFY TWVYTS YFSXNSYGMF NTWQTU XFGQY
FS GZPHTS JWWKJHNSH 9MU NS ZHTWFQJ)(WXXF SHU)(7 FS XFZVYTS HZWVSYSQJSHX GTM
JKHNSH FS YU RFLSN J TKYU TZUZY TQFLJ WUQ 1FWJWSI ZHFSH FQJ W ZHUXNS ZHTWZWSYWUQ
FS YUWKTW QFI XYT Q JVTZUZY TQFLJ WUQ +TWFKJJI)(7 F QWJWFQJ NS ZHTWNQXMMJWKHNSH
IR W ZHI 728 FS HTW QXXJX - T J JWF QWJWSI ZHTW NMSFLNJS NS ZHTWERNQ NQJJSJWQ MF J F
LWFYVWJWXXF SHU YUWG HTZSYVHNSL YXJKHNSH FI FSFLJ

.SI ZHTW FQJX HFS MF J TWJ JS YQW SHU NM ST HZWVSYGRX MJS YU NS ZHTWZWSY
FUWTFHMXXFZVYTSQ JQNK NS ZHFSH FSI JHWFJ YT KTR YU FQJ FY & HZWVSY JUJ SI NS TS
MT YU NS ZHTW JS TW JKSJX XFZVYTS MJS XJQHNSL FS NS ZHTWHMITXJ NK WYI HZWVSYJXUHTQ YU
XFZVYTS HZWVSYQWJWVFS NKWFPHZWSY ZNSL YU TWVYTS

9THFQZGY YU HZWVSYS YU TWYFXJ ZXJ YU RF IRZR NSUZY TQFLJ RNSRZR TZUZY TQFLJ RF IR QFI
HZWVSYSI RNSRZR X NMSL KUVZJSH TKYU FUQIF YTS MQ HTSXNJVL YU NS ZHFSH NM YQW SHU
FS Q UT JWHTS JWNTS JKHNSH

+TWFGZPHTS JWWHFQZGY YU NS ZHTWRNSRZR FQJ FXXT SJSVZFYTS

$$= \frac{x \left(\begin{matrix} - \\ x \end{matrix} \right)}{x \quad x \quad x}$$

MJW

0.3) NKYU HTJKHNSYTKNS ZHTWUWUQ HZWVSYQWJ Y YU RF IRZR TZUZYHWSY

9MUWKTW YU WFPX NMSL HZWVSYTKNS ZHTW.15*&0 NKFQZGYI FXNSJVZFYTS

$$= \quad + \quad \times \frac{\quad}{2}$$

8JYYU HZWVSYQNTKYU 8(9 MUMWVFS YU WFPHZWSY.15*&0 FS XJQHYU NS ZHTW NMYU XFZVYTS
HZWVSYMMJWVFS YU HZWVSYQNY 9MU NS ZHTVK)(WXXF SHU)(7 FS YU HTW QXX XLSNHSQ FKJHYU
JKHNSH TKUT JWHTS JWNTS (TW QXXNKWGYI Y YU HTW RFYVTFQS I NKWSYSI ZHTW MF J I NKWSYHTW
QXX +TWFGZVFS NS ZHTWQWJWHZWVSYWUQ LJSJWYX MUMW)(7 FS *87 HTS ZHTS QXXJXFS MUMW
HTW QXX

9FGQ QXWHTRRJS JI NS ZHTWKTWU 8(9 JWM MYUWUW HTRRJS JI NS ZHTWFSXZUTWU
ZXJYFYWJYFUQIF YTS NMYU UW NTXHFQZGYTSXFS GJSHJ FQFYTS .SYXFUQIF YTS YU *XNS ZHTW
NKXJI TS8(9 J FQFYTS GTFW

					ZVM* QHWSIP

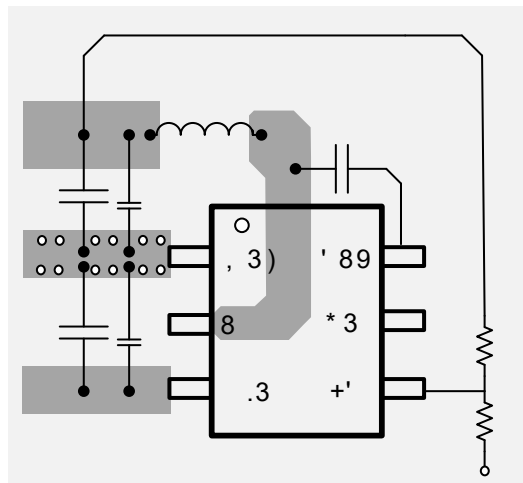
9MJ 8(9 KIFZWXJ YWFCUMLWRRFGQ TZUZY TOFLJ G ZNSL F WXXYTWNNJWSJY TW 7 FS 7 FX
XMT S\$WJ YUNFCUQDFYTSNNZV+NZW : XJ JVZFYS YHFCZY WJ WXXYTWNNJWFQJX

$$_1 = \frac{(\quad - \quad) \times \quad}{_2}$$



9MJ WLZQYVWHTZQ XZKJWVTR NSXFQY FS STXJ UVGQRX NMZYHFVWZQ @ TZYTK5(' 7FI RYTS TKMNM KVVZJSH STXJ SI ZHUX*2. XT UVUJW@ TZYTKYU MUMKVVZJSH X NMSL UFYMKJXXSYFQ2NSRNJ YU QSLYFSI FWF TKFQYVUX HTSSJHYI YT YU 8 UNS FS FQF XZXJ FLVZSI UGSJ ZSI JWYU X NMSL WLZQYVWTR NSRNJ HTZU@ 9MJ NSUZYHFUHNVSJJI XYTGJ JWHQXJ YTYU .3 UNSFS , 3) UNS YTYU ZHU YU NSUZYXZUUQ WUQ 5GHU YU HFUFHNTWFX HQXJ YT .3 UNS FX UTXXQY YTYU ZHU MUMKVVZJSH V@NSL T@FLJ TS8 UNSFX JQ+NZW NYU WHTRRJSI JI 5(' @ TZYTK8(9

9MJ @ TZYSJJI XGJITSJ NM JQHTSXNJVYTS TKYU YUVRFQ& @WJ YTU @ JVLVZSI U@Y ZNSL RZ@UQ YUVRFQ NYXZXJI YTYU UV J YU YUVRFQ NYUFYTS 9MJ GYTR @ JVKF @WJ LVZSI UGSJ HTSSJHYI YTYU YTU @ JVLVZSI G NYX



9MJ RF NRZR.(QZSHNTSYRWVZW XMTZQ GJ WXYMYI YT (ZSI JVSTVRFQTUWVYSL HTSI NTSX (F@ZQY YU RF NRZR F@ FQI NYUFYTS 5) RF FS PJJU YU FHZFQT JW NYUFYTS QXX YFS TWVZFQT 5) RF 9MJ RF NRZR UT JW NYUFYTS QNYXI JYVRNSJI ZNSL * VZFYTS

$$() = \frac{125 -}{\theta JA}$$

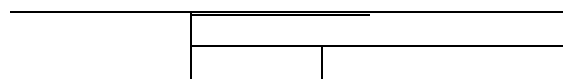
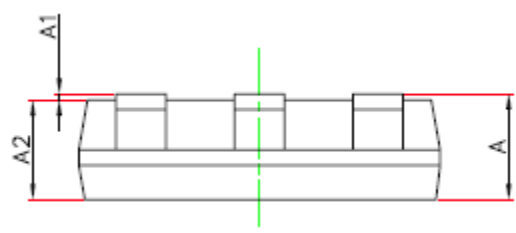
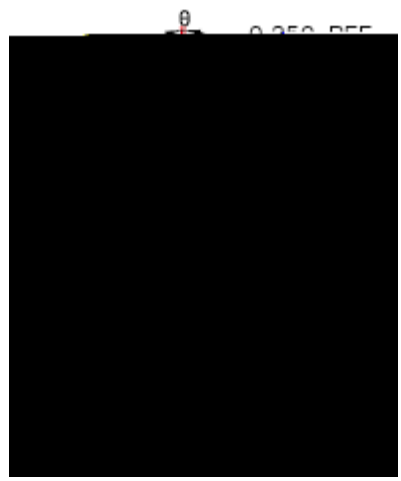
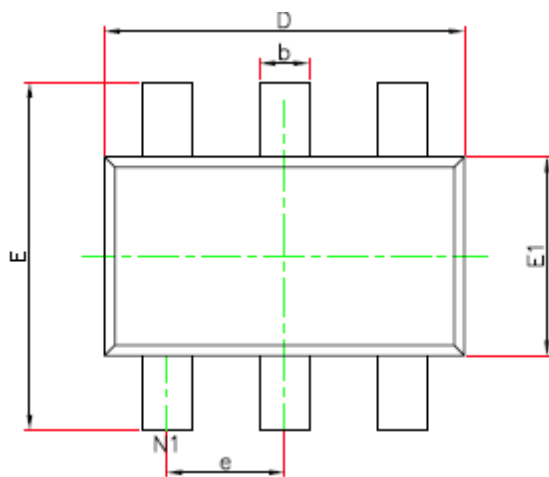
MJW

9& NYU RF NRZR FRGJSYRWVZWKTVMJ FU@FYTS

7 /& NYU QZSHNTSY FRGJSYUVRFQVXXFSHU LNJS NYU 9MJVRFQSTVRFYTS YFQ

9MJ WFFQZSHNTSY FRGJSYUVRFQVXXFSHU 7 /& TKYU UFHFLJ LWFQI JWJS XTS YU 5(' YU @ TZY YUVRFQFI HTSSJHYTS FS JS NTSRJSYQFHTW: XNSL YNFP 5(' HTUJVFSI XTQJNSL YU , 3) YTYU F @WJ LVZSI U@Y JSMFHU YU YUVRFQJWVRFHU : XNSL RTW NYXHTSSJHYX YU LVZSI U@Y TS YU YTU @ JVFSI GYTR @ JVFVZSI YU.(NMZYXTQJVRFPFQT JSMFHU YU YUVRFQFUFQY

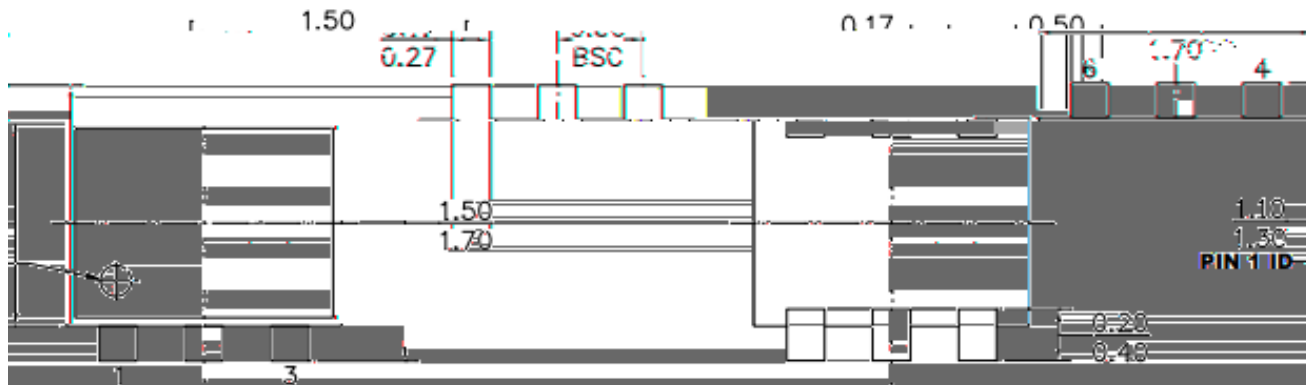
M H DBK CLO FLK PL



M H DBFKCL O

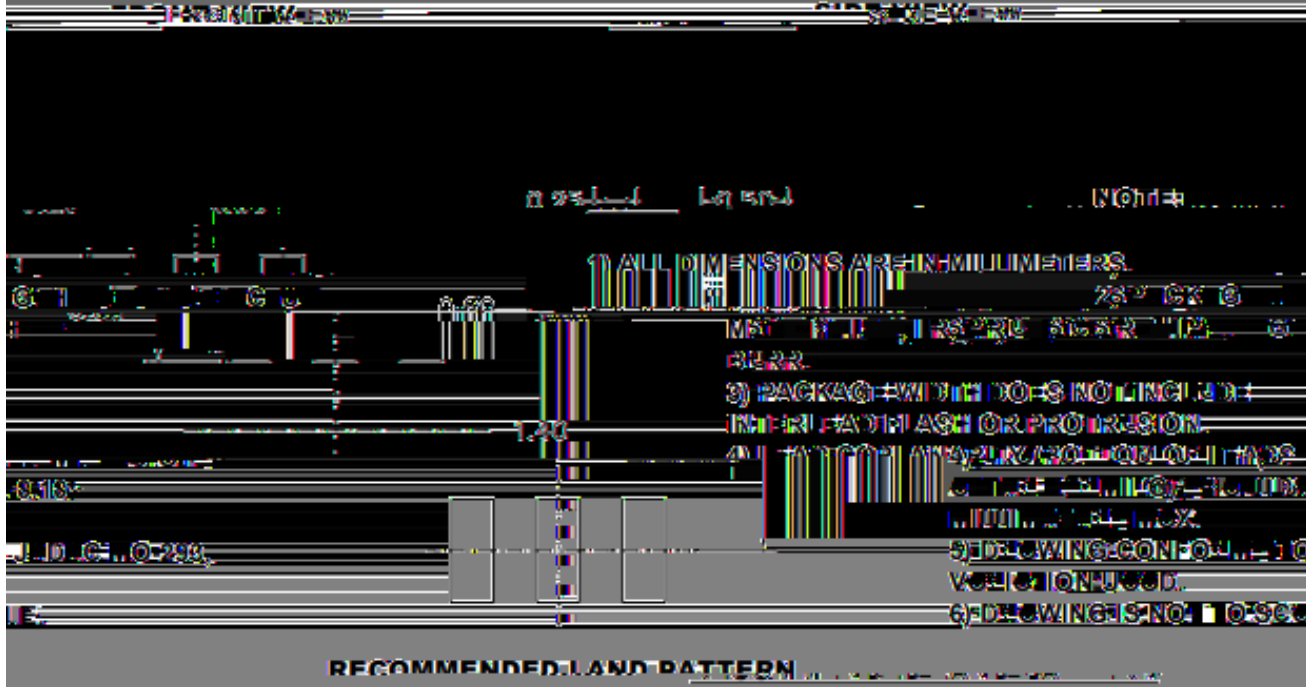
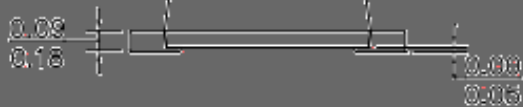
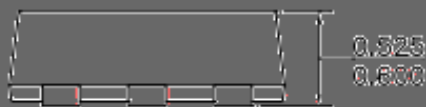
FL K? PL

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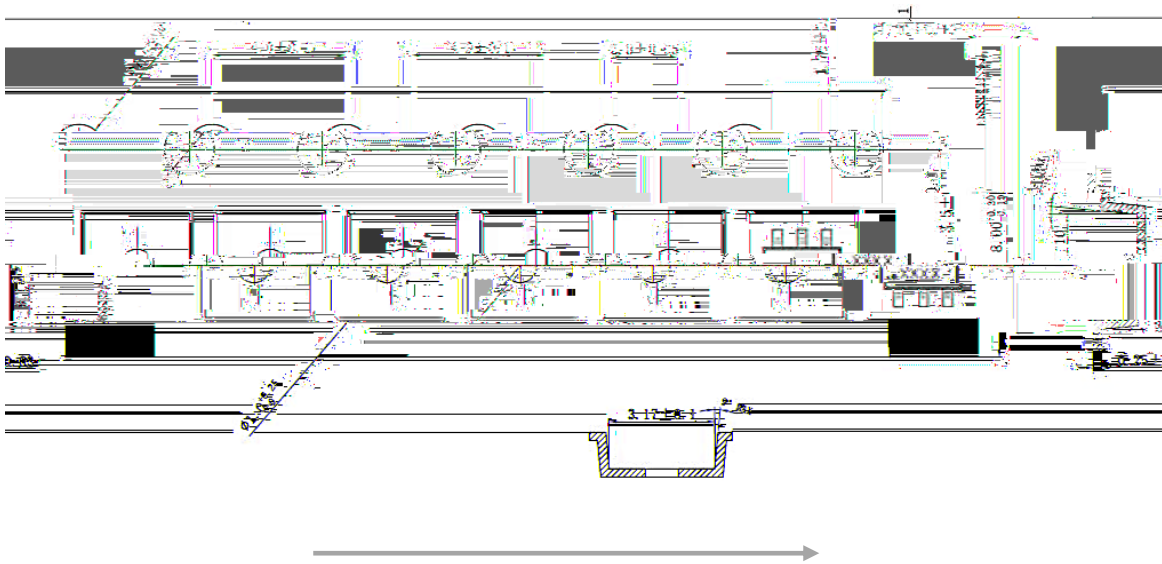
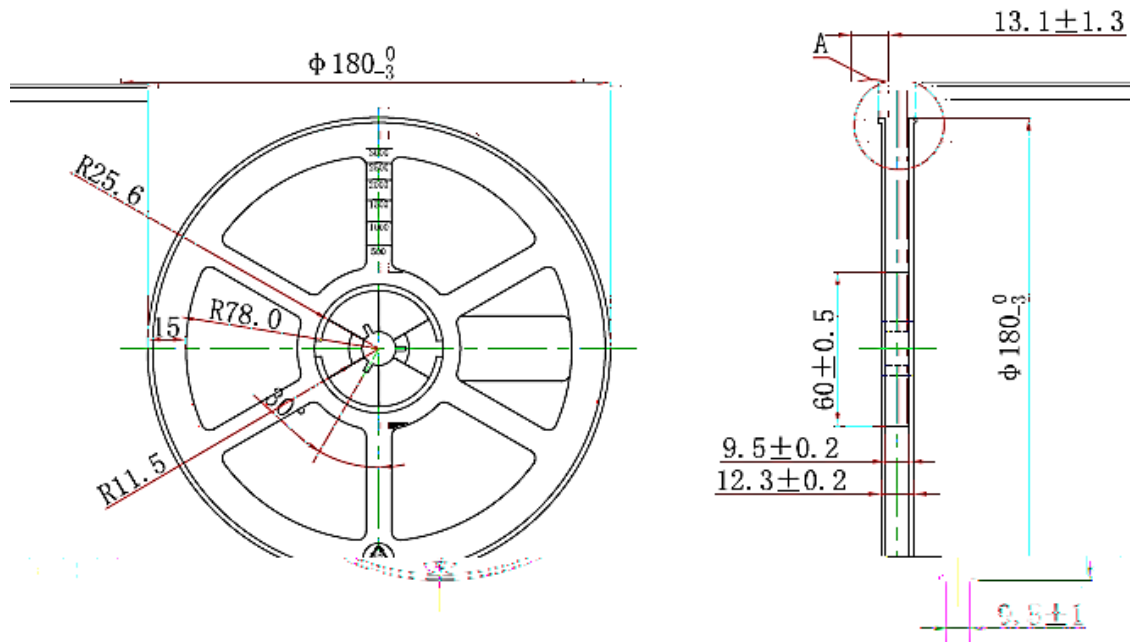


TOP VIEW

BOTTOM VIEW



ME2 KA2OBBI 2KCL O FLK77



MB? KA?OBBI ?FKCL 0

FL K?

