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(TSXZRJW QHNTSHX
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9MJ 8(9 ' NKF KZQQ NSYJLWFYJI MNMJKKHNSH
X SHMWTSTZX XYJUI T S)( )(HTS JWJWHFUFGQ TK
I JQNJWSL & HZWWSY 9MJ I J NHJX TUJWFYJ T JWF
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NSYJLWFYJ MNMXNNJ UT JW 248+ 9X FSI
X SHMWTSTZX 248+ 9X NKM JW QT 7I XTS YT
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< NKM P-_X NKHMSL KWVZJSH QT TZYUZY TQFLJ
WWUQ XRFQU YJWFQNSI ZHNTWFSI HFUFHNTWXNJ FWJ
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YRJ HTSYTQFWMNYJHZWYT FHMNJ JKFXYQFI YFSXNJSY
WXUTSXJXKTWXYJUI T SFUUQNFYNTSX

9MJ 8(9 ' TUJWFYJX NS UT JWXF NSL RTI J
MNHM RFNSYFNSX MNMJKKHNSH I ZWSL QNMY QFI
TUJWFYNTS

.YNSHQI JX KZQQUWTYJHNTS KJFYZWJX XZHM FX T JW
HZWWSY UWTYJHNTS TZYUZY ZSI JW TQFLJ UWTYJHNTS
NSUZYZSI JW TQFLJ QTHPTZY FSI YWJWRFQXWZY T S

9MJ 8(9 ' WVZNWX F RNSNRFQ SZRGJW TK
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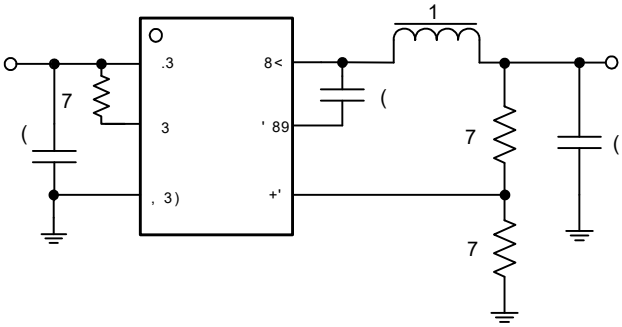

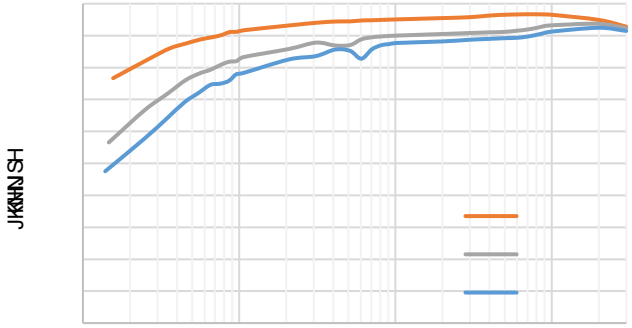

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7J NXNTS 5WT ZHNTS

7J NXNTS : UI FYJ (KTW4(FSI 49 FQZJ

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7J NXNTS : UI FYJ) .(47) 7 .3+472&9.43

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.3			5T JVWXZUUQ NSUZY .3 XZUUQNX YWJ UT JVWT YWJ .(FX JQQFX YWJ XYJ U I T S HTS JVWJ VWX NYHMJX) VWJ .3 NYMF YT UT JVWXTZVWJ ' UFXX .3 YT, 3) NYMF XZNYFGQ QVWJ HFUFHNYTVWT JQQR NSFYJ STNXJ TS YWJ NSUZYYT YWJ .(8JJ .SUZY(FUFHNYTW
8<			5T JVW8 NYHMNSL 4 ZYUZY 8< NX YWJ X NYHMNSL STI J YWFYXZUUQNX UT JVWT YWJ TZYUZY (TSSJHYYWJ TZYUZY1(KQQJ VWXVTR 8< YT YWJ TZYUZYQFI 3 TYJ YWFYF HFUFHNYTVWX VWVZNWM KVTR 8< YT ' 89 YT UT JVWYWJ MNLM XNJ X NYHM
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' 89			5T JVWXZUUQ KTVWYWJ MNLM XNJ UT JVW2 48+ 9 LFYJ I VWJ VW2 ZXYHTSSJHYF Z+ TVWLVWFYJ VWHJ VWR NHHFUFHNYTVWGJY JJS' 89 UNSFSI 8< STI J
3			SFGQ QLNHNSUZY 9MJ I J NHJ MFX UVWHNXNTS JSFGQ YWVXMTQX VWXNSL KFQNSL KTVWJVTL VWR RFGQ: 14 YWVXMTQ FSI M XYJ VWXNX
+'			' ZHP HTS JVWJ VWTZYUZYKJJI GFHP XJSXNSL TQFLJ (TSSJHYF VWXNXYTVW NNJ VW KVTR 4: 9 YT +' YT XJYZU TZYUZY TQFLJ 9MJ I J NHJ VWLZQYJX +' YT YWJ NSYJ VWFQVWKJ VWSHJ TK YUNHFQ

4 JVWTUJ VWYNSL KVWJ FNYYJR UJ VWYZVW VWSLJ ZSQXX TYWJ W NXJ STYJI

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7 /&	/ ZSHNTS YT FR GNJ SYYWJ VWR FQVWXNXYFSHJ		(<
7 /(	/ ZSHNTS YT HFXJ YWJ VWR FQVWXNXYFSHJ		

8(9 UVT NJX 7 /& FSI 7 /(SZR GJ VWXTSQ FX VWKJ VWSHJ YT JXYRFYJ QZSHNTS YJR UJ VWYZVWX TKYWJ I J NHJX 7 /& FSI 7 /(FVWJ STYF HMFVWHYJ VWXYHTKUFHPFLJ NXJQQ GZYTKRFS TYWJ VWX XYJR QJ QHMFVWHYJ VWXYHX XZHMFX YWJ I JXNLSFSI GQ TZYTKYWJ UVWSYJI HNNZNY GTFVW 5(' TS MNHMYWJ 8(9 ' FVWJ RTZSYJI FSI J YJ VWFQJS NVTSRJ SYFQFHYTVWX 9MJ 5(' GTFVWNXF MJFYXNSP YWFYNXXTQJ VWI YT YWJ QFI XFSI YWJ VWR FQUFI TKYWJ 8(9 ' (MFSLNSL YWJ I JXNLS TVWHTSKNZVWNTS TKYWJ 5(' GTFVWHMFSLJ XYWJ JKNNNSH TKYWJ MJFYXNSP FSI YWJ VWKTVWJ YWJ FHYZFQ7 /& FSI 7 /(

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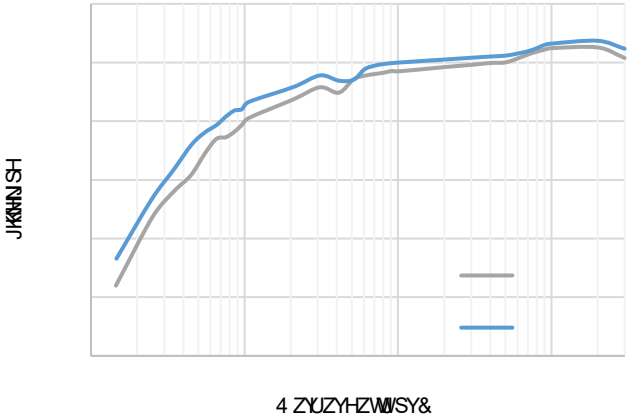
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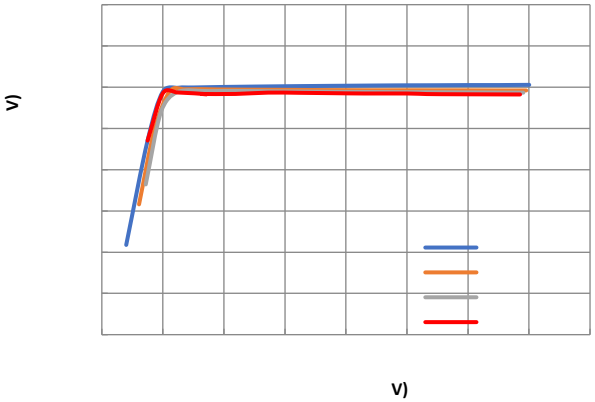
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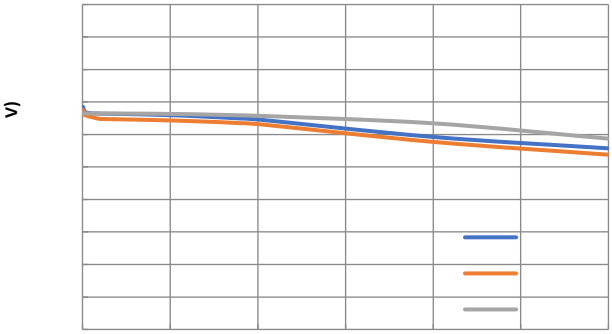
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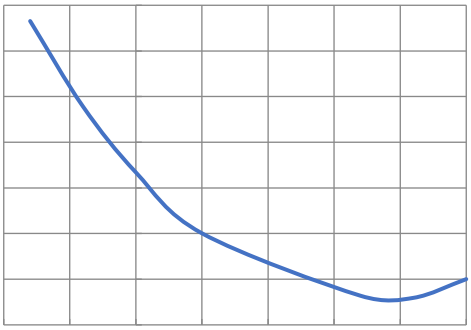

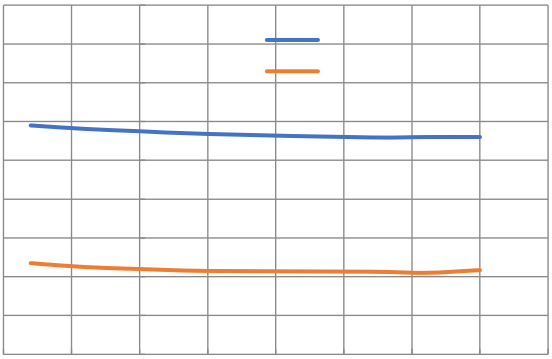

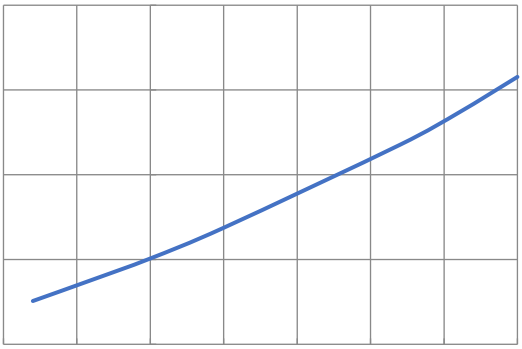

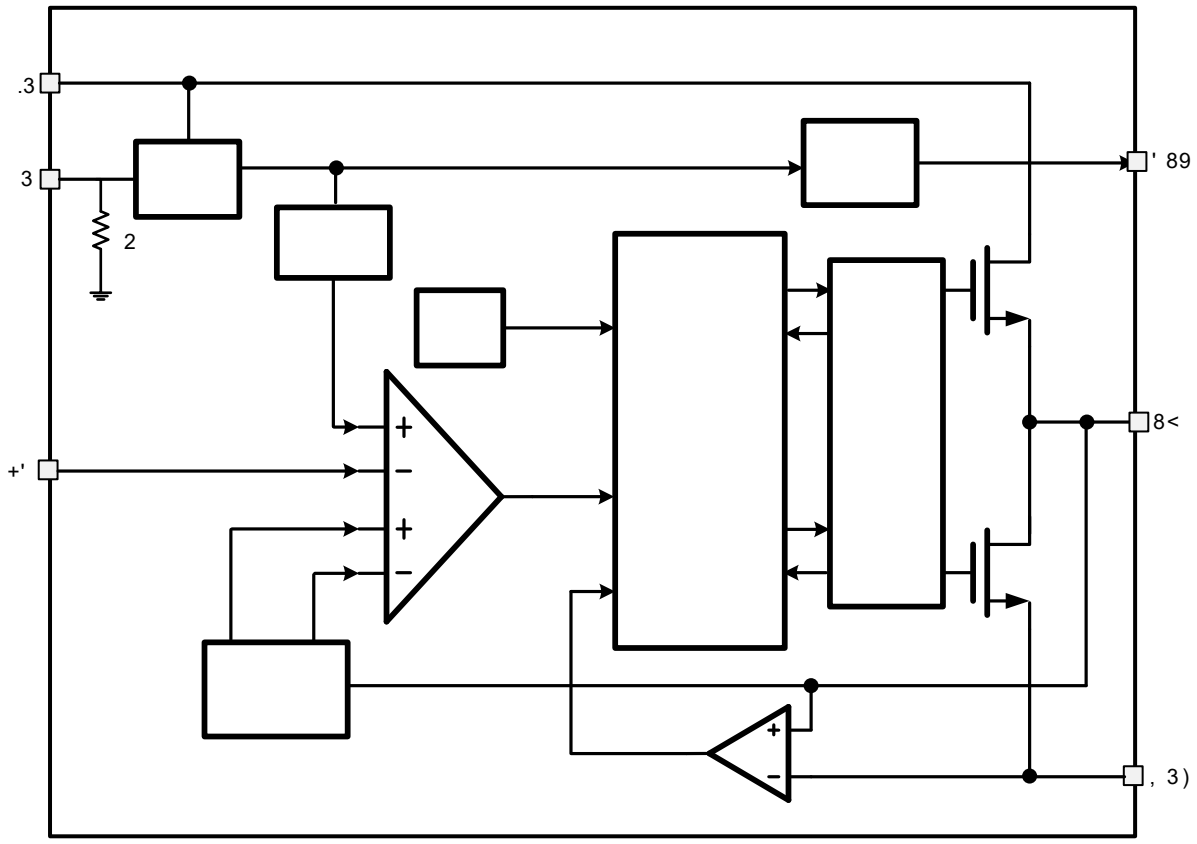
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INXHMFWJI XZHMYWFYTZYUZYNX 9MJSYWJ IJ NHU NQHTZSYKTW H HQXTKXTKYXYFWYRJKTWWNHZU FNYSL YRJ
FSI WXYFWYSTWRFQQFKYW H HQX XTKYXYFWYUJWT

&SJ YWFQGTTYXYFWUHFUFHNYTWGJY JJS'89 FSI 8< UNSUT JWXKQFYSL MLMXNJ UT JW248+ 9LFYJ IWJW
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4SHJ YWJ QZSHNTS YJRUJWFYZWJ NS YWJ 8(9 ' J HJJI X °(YWJ YWJWRFQXJSXSL HNWZNYXYTUX HTS JWWW
X NYHMSL FSI WXYFWX NYMYWJ QZSHNTS YJRUJWFYZWJKFQSL GJQT °(9MJWRFQXMZYT SUWJ JSYXYWJ IFRFLJ
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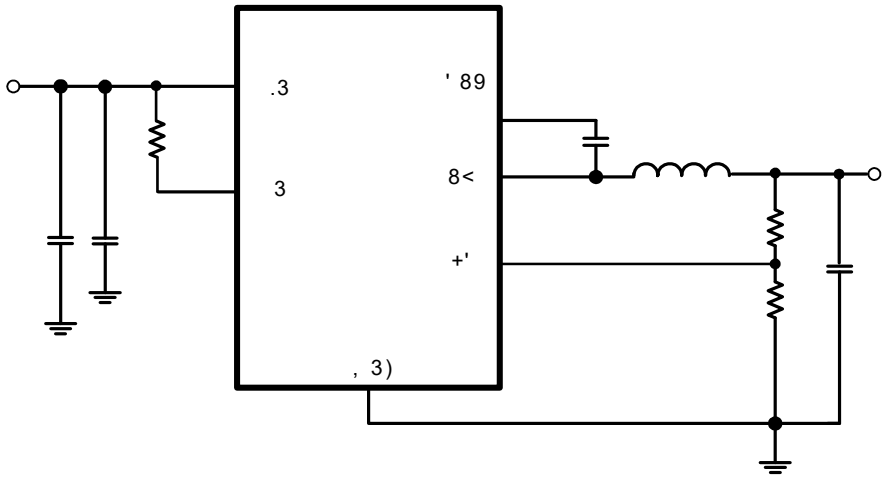

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4 ZYUZY TQ[FLJ	
4 ZYUZY(ZWUSY	&

8 NY[HMSL +WVZJSH

+TWLTTI NSUZY TQFLJ KQJWSL HMTTXJ QT 87 HJWFRNHHFUFHNTWX & HJWFRNHHFUFHNTW + NXWHTRRJSIJI KTWYWJ IJHTZUQSL HFUFHNTWFSI F + HJWFRNHIG UFXXHFUFHNTWNXWHTRRJSIJI YT GJ UGHJI FXHQXJ FX UTXXNQQ YT YWJ .3 UNS TKYWJ 8(9 '

: XJ VZFYNTS YT HFGZGYJ YWJ NSUZY TQFLJ WUUQ

$$K_C \quad \frac{DKI}{C} \quad \frac{JI}{} \quad \frac{K_{DKI}}{K_C}$$

< MJWV

(.3 NXYWJ NSUZYHFUFHNTWFQZJ

Kx NXYWJ HTS JWJWX NYHMSL KWVZJSH

.4:9 NXYWJ RF NRZR QFI HZWWSY

) ZJ YT YWJ NSI ZHYTWHZWWSYWUUQ YWJ NSUZY TQFLJ HMFSLJXNKYWJWNXUFWXNYHNSI ZHYFSHJ FSI WXXXYFSHJ GJY JJS YWJ UT JWXZUUQ FSI YWJ .3 UNS .YNXWHTRRJSIJI YT MF J JSTZLMNSUZYHFUFHNYFSHJ YT RFPJ YWJ NSUZY TQFLJ WUUQ QXXYWFS R , JSJWFQQ F Z+ NSUZYHJWFRNHHFUFHNTWNXWHTRRJSIJI KTWR TXYTKFUUQNFYNTSX (MTTXJ YWJ WLMYHFUFHNTW FQZJ HFWXZQQ NYMHTSXNJWSL MLMHFUFHNYFSHJ HJWFRNHHFUFHNTWX) (GNTX JKKJHY MHMMFXF XYTSL NSKZJSHJ TS YWJ KSFQJKKJHYNJ HFUFHNYFSHJ

& + HJWFRNHHFUFHNTWRZXYGJ HTSSJHYJI GJY JJS ' 449 UNS FSI 8< UNS KTWJWTUJWTUJWFYNTS & HJWFRNH HFUFHNTW NYM= 7 TWGJYJWLWFJ I NJQHYWHNXWHTRRJSIJI 9MJ HFUFHNTWXMTZQ MF J F TWWLMJW TQFLJ WFYSL

9MJ UJWXTWRFSHJ TKNSI ZHYTWFKJHYX YWJ UT JWXZUUQ X XYJFI XFYJ TUJWFYNTS YWSXNJSYGJMF NTWQTU XFGNY FSI GZHP HTS JWJWJKKHNJSH 9MJ NSI ZHYTW FQZJ) (WXXXYFSHJ) (7 FSI XFYZWFYNTS HZWWSYNSKZJSHJX GTYM JKKHNJSH FSI YWJ RFLSNZI J TKYWJ TZYUZY TQFLJ WUUQ 1FWJWSI ZHYFSHJ FQZJ WI ZHJX NSI ZHYTWHZWWSYWUUQ FSI YWJWXTWJQFI XYT QT JWTZYUZY TQFLJ WUUQ +TWF KNJI) (7 F GWJWFQZJ NSI ZHYTW NJQX MLMJWJKKHNJSH NT WI ZHJI 728 FSI HTWJQXXJX - T J JWF GWJWSI ZHYTW NXMSF LNJS NSI ZHYTWFRNQ NQLJSJWFQQ MF J F LWFYJWXJWX WXXXYFSHJ YWJWG HTZSYJWFHYSL YMXJKKHNJSH FI FSYFLJ

.SI ZHYTWFQZJXHFSMF J TWJ JS YTQWFSHJ NXMSTHZWWSYGNFX < MJSYWJ NSI ZHYTWHZWWSYFUUVTFHMJX XFYZWFYNTS QJQNXNSI ZHYFSHJ HFSI JHWFXJ YT KVTR YWJ FQZJ FY & HZWWSYI JUJSI NSL TS MT YWJ NSI ZHYTW JSI TW JKSJX XFYZWFYNTS < MJSXJQHYSL FSI NSI ZHYTWHMTTXJ NXWFYJI HZWWSYJXUJHNFQQ YWJ XFYZWFYNTS HZWWSYGWJWXMFSNXUJFPHZWWSYI ZWSL YWJ TUJWFYNTS

9T HFGZGYJ YWJ HZWWSYNS YWJ TWXYHFXJ ZXJ YWJ RF NRZR NSUZY TQFLJ RNSNRZR TZYUZY TQFLJ RF NR QFI HZWWSYFSI RNSNRZR X NYHMSL KWVZJSH TKYWJ FUUQNFYNTS MNQ HTSXNJWSL YWJ NSI ZHYFSHJ NXM YTQWFSHJ FSI QT UT JWHTS JWXNTS JKKHNJSH

+TWF GZHP HTS JWJWHFGZGYJ YWJ NSI ZHYTWRNSNRZR FQZJ FXXMT SNSJVZFYNTS

$$c \quad c \quad \frac{K_{DKI} \quad K_C \quad K_{DKI}}{K_C \quad C \quad DKI}$$

< MJWV

0.3) NXYWJ HTJKKHNJSYTKNSI ZHYTWWUUQ HZWWSYWGYNJ YT YWJ RF NRZR TZYUZYHZWWSY

9MJWXTWJ YWJ UJFPX NYHMSL HZWWSYTKNSI ZHYTW.15 &0 NXHFGZGYJI FXNSJVZFYNTS

$$AE \quad DKI \quad C \quad \frac{DKI}{1}$$

8JYYWJ HZWWSYQRNYTKYWJ 8(9 ' MNMJWYWFSYWJ UJFPHZWWSY.15 &0 FSI XJQHYYWJ NSI ZHYTW NYWJ XFYZWFYNTS HZWWSYMNMJWYWFSYWJ HZWWSYQRNY9WJ NSI ZHYTWX)(WXNXYFSHJ)(7 FSI YWJ HTWWQXXXNSNKNFSYQFKJHYYWJ JKKHNJSH TKUT JWYHTS JWXNTS (TWWQXXNXWWQYJI YT YWJ HTWWRFYJWFQFSI INKJWWSYNSI ZHYTWXMF JINKJWWSYHTWW QXX +TWF HJWYFNSNSI ZHYTWQWWJWYHZWWSYWUUQLJSJWYJXMNMJW)(7 FSI 87 HTSI ZHYNTSQXXJXFSI MNMJWYHTWW QXX

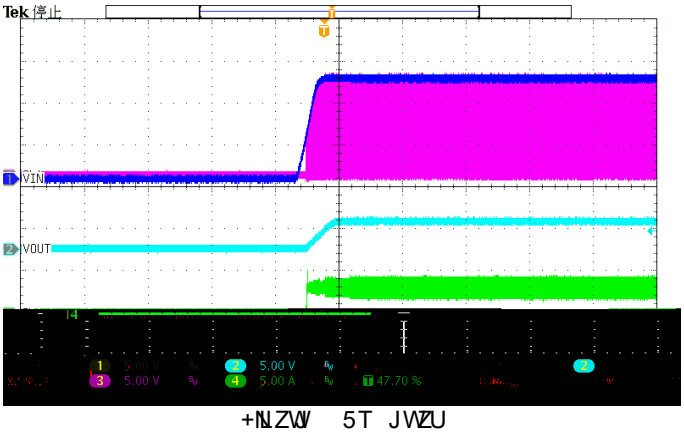
9FQQ QXYXWHTRRJSI JI NSI ZHYTWXKTWYWJ 8(9 ' JWK MJYWJWYWJ WHTRRJSI JI NSI ZHYTWYFSXZUUTWYYWJ ZXJWXYFWWJYFUUQNFYNTS NYWJ UWWNTZXHFQZQYNTSXFSI GJSHMJ FQZFYNTS .SYWXFUUQNFYNTS YWJ < XNSI ZHYTW NXZXJI TS8(9 ' J FQZFYNTS GTFWW

					< ZWM QHYTSNP

9MJ 8(9 ' KJFYZWXJ YJWFQUWLWRRFQQTZYUZY TQFLJ G ZXNL F WXXXYTW NNJWSJY TWW7 FSI 7 FX XMT SNSYWJ YUNFQFUUQNFYNTSHNWZNY+NZWW : XJ JVZFYNTS YTHFQZQYJ YWJ WXXXYTW NNJWFQZJX

$$\frac{K_{DKI} \quad K_P}{K_P}$$

NS TZY ZSQXX TYWJ WNXJ STYJI



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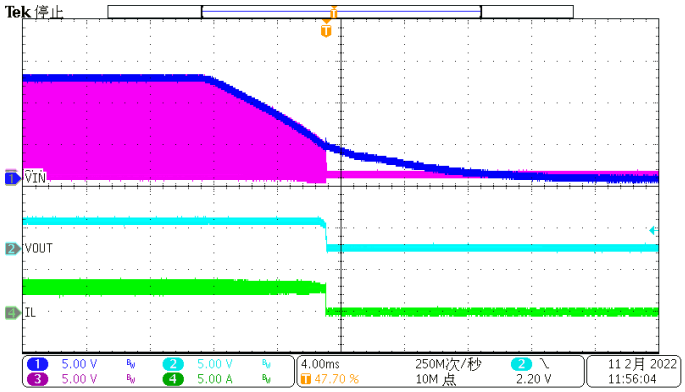

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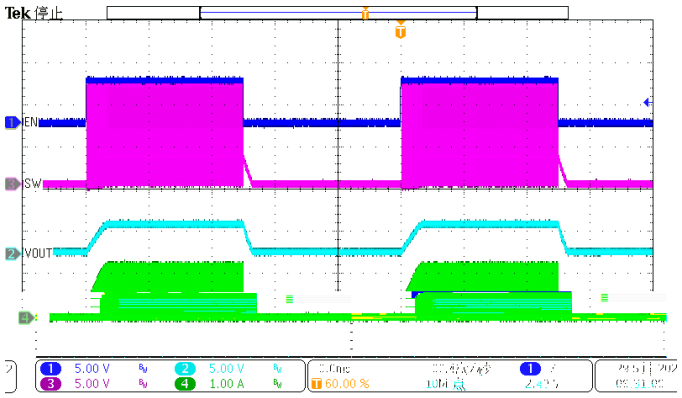

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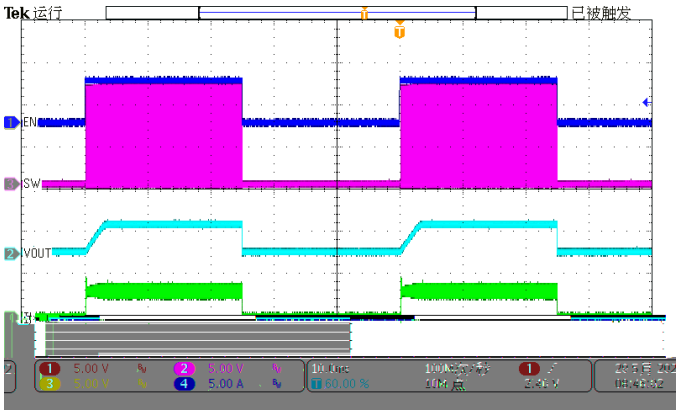

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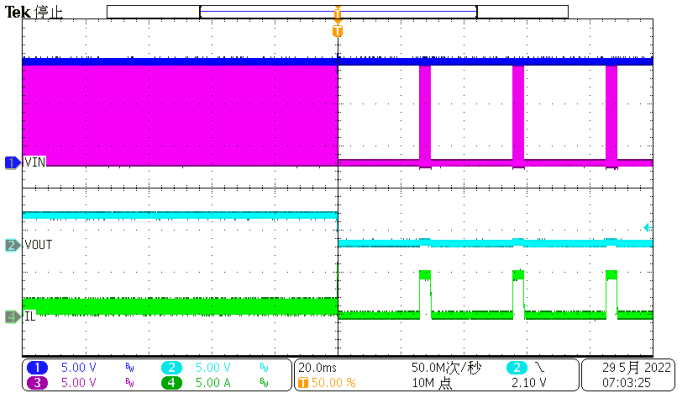

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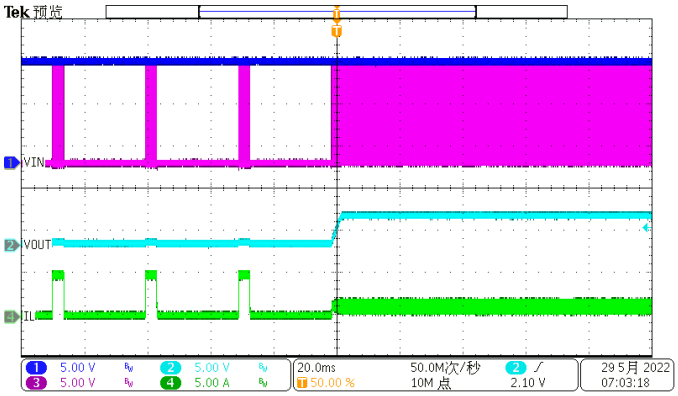

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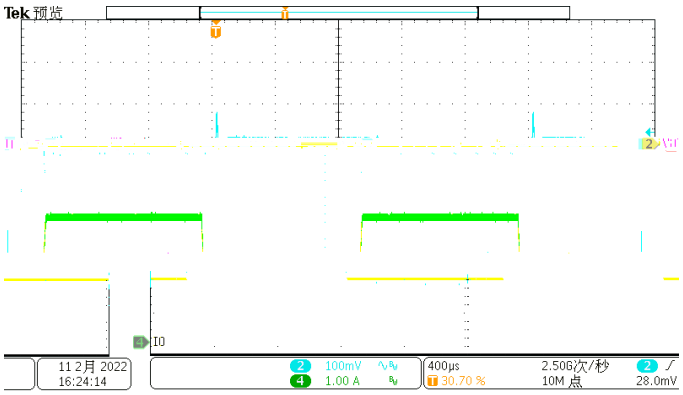

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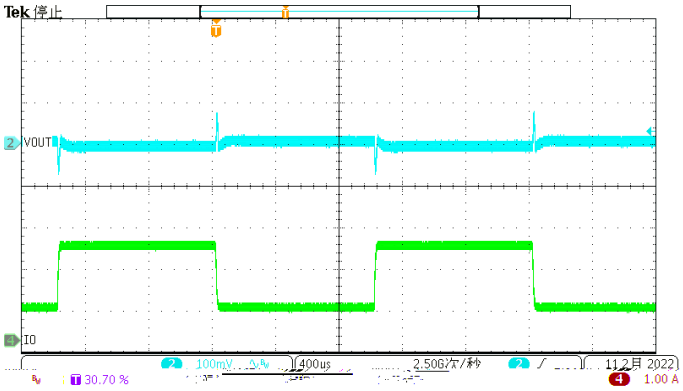

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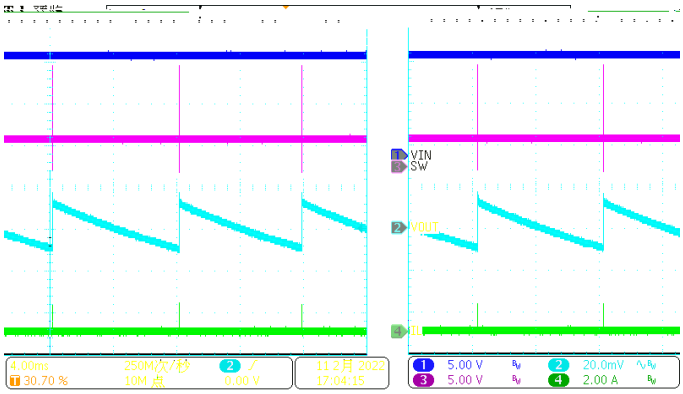

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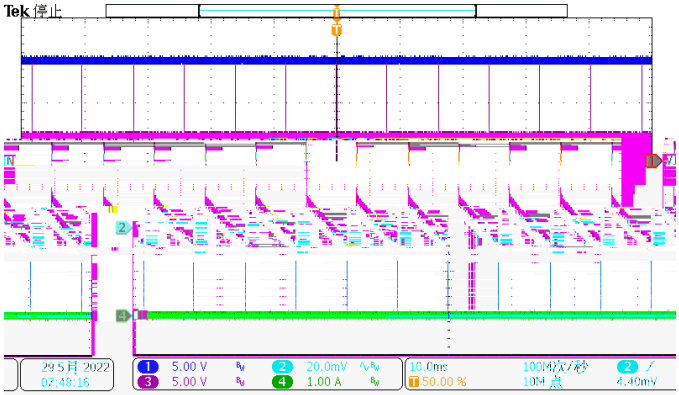

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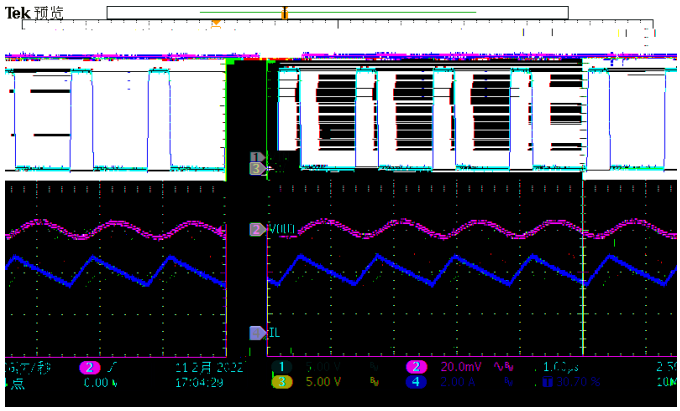

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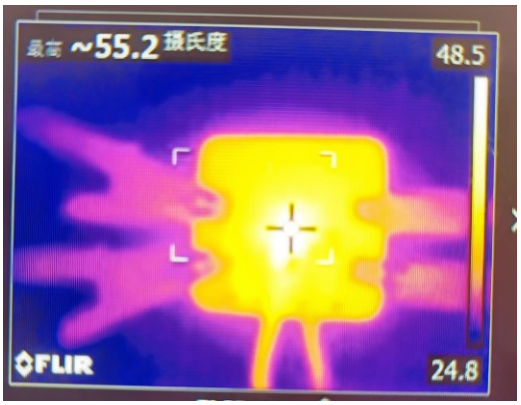

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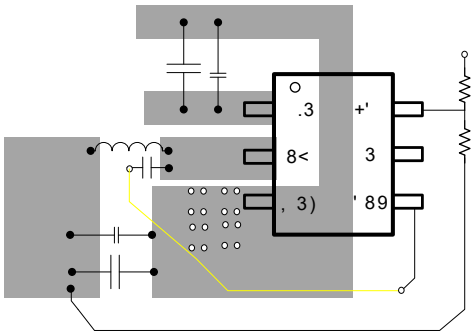

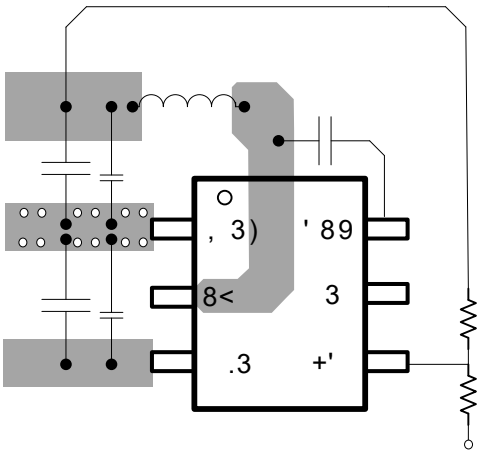

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RF NR ZR UT JWJ NXXNJFYNTS QJR NYNXI JYJ WR NSJI ZXNSL VZFYNTS

1 *I*

MJ WJ

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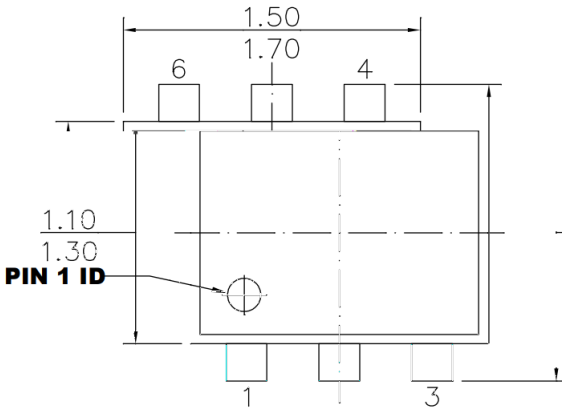

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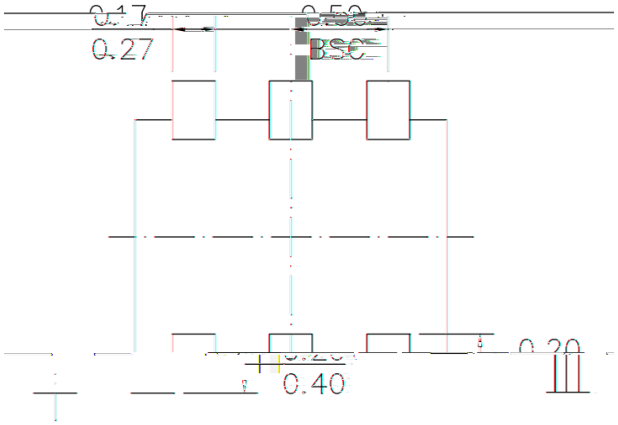

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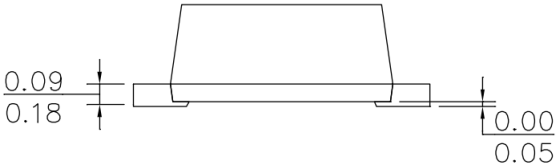

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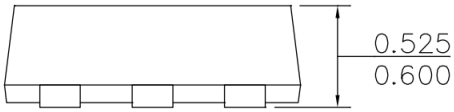

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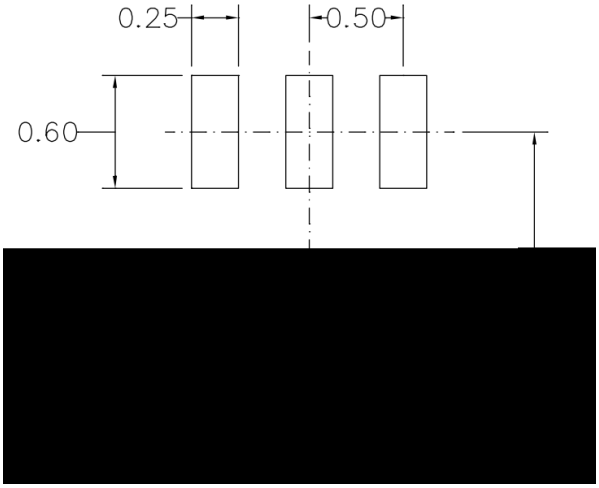

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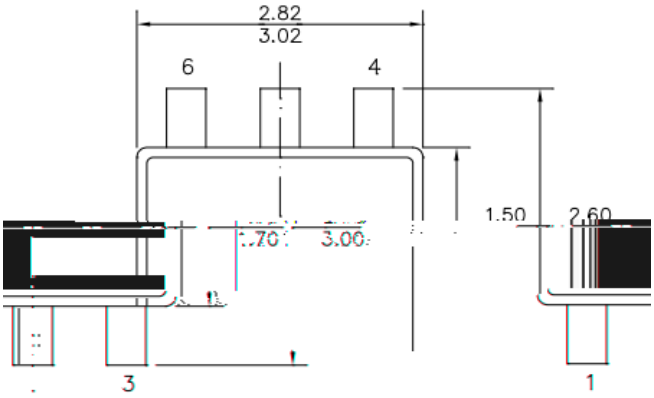

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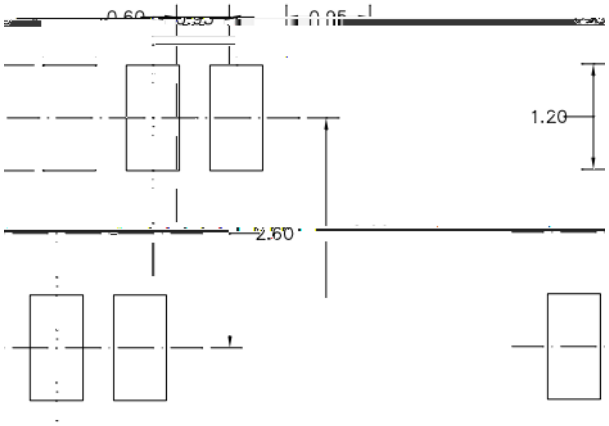

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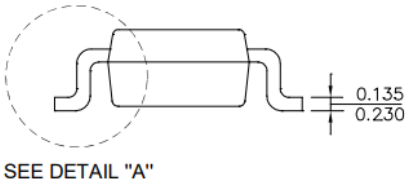

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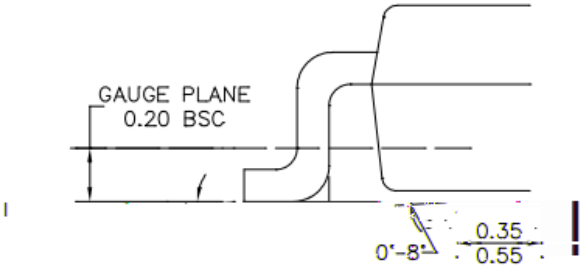

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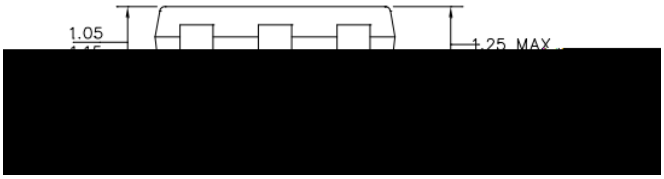

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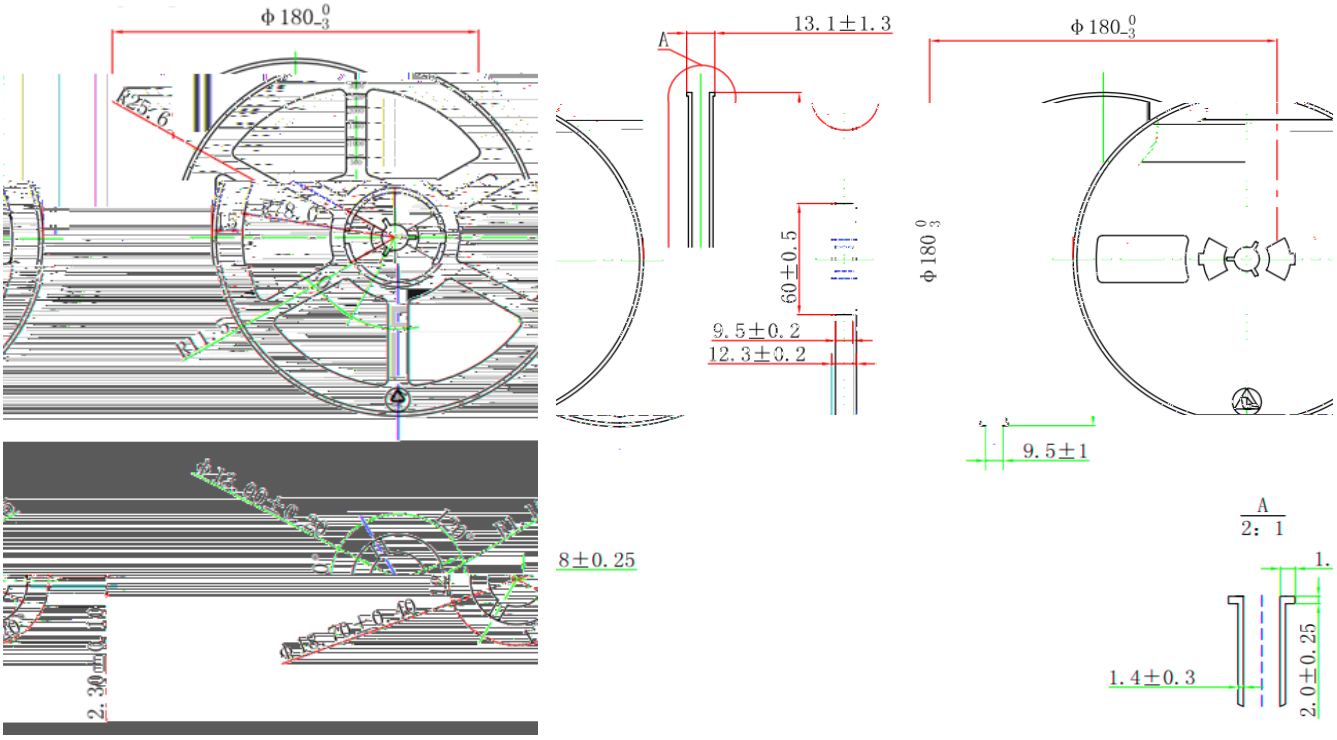
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R1
13.1±1.3
A
60±0.5
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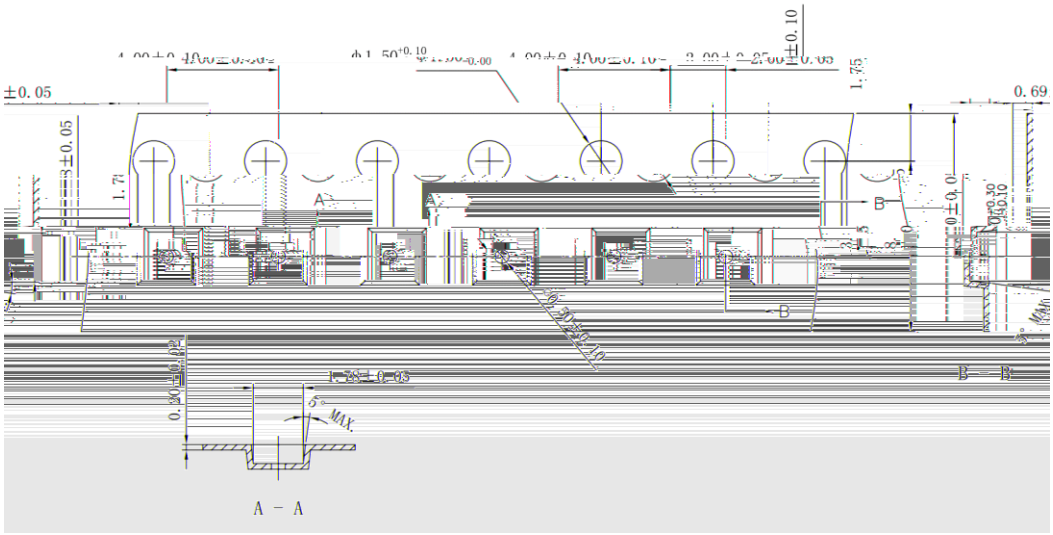
±0.05
±0.05
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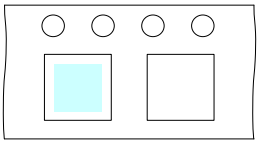
±0.10
1.75
0.69
A
B
B
B — B
5° MAX.
A — A



9&5).2 38.438