4.2V-60V Vin, 1A, High Efficiency Step-down DCDC Converter with Programmable Frequency

MNK L

- V hcd Hmot s Q mf d93-1U,5/U
- 0 Bnmshmt ntr N t sot s B t qpdms
- / -7U 0 Eddca bj Qdedqdmbd Unks f d
- Hmsdf q sdc 11/l ° Ghfig,Rhcd L NREDS
- Knv P t hdr bdms B t qpdms90//t
- Ot kr d Rjhoohmf L ncd ORL (hmkhfigs kn c
- 0//mr L hmh t l Nm,sh d
- 3l r Hmsdqm kRnes,r s qs Sh d
- Hmsdqm kbnl odmr shmmenqD r d ne Tr d
- cit r s akd Eqdpt dmbx 0//J Gy sn 0-1L Gy
- Dwsdqm kB knbj Rxmbgqnmhy shmm
- TU mc NU Onv dqF nnc N t sot s
- Oqdbhrhmm Dm akd Sgqdr gnkc enqOqnf q l l akd Hmot s Unks f d Tmcdq Unks f d Knbj N t s Oqnsdbshmm TUKN(Sgqdr gnkc mc Gxr sdqdr hr
- Knv Cqnont s L ncd Nodq shmm
- Nudq unks f d mc Nudq Sdl odq st qd Oqnsdbshmm
- u hk akd hm mDRNO,7K O bj f d

I I EB MBHGL

- 01,U+13,U+37,U Hmct r sqx mc Sdkdbnl Onv dq Rxr sdl
- Hmct r sqh k t snl shmm mc L nsnqB nmsqnk
- Udghbkd bbdr r nqhdr

L KBI MBHG

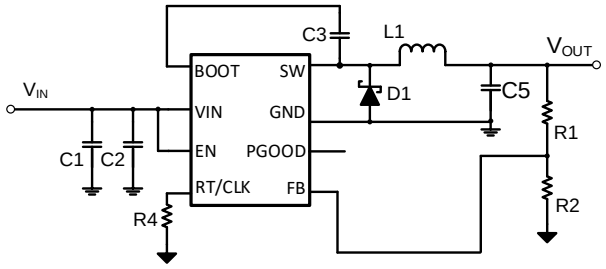
Sgd RBS1501 hr 0 at bj bnmudqsdq v hsg v hcd hmot s unks f d+q mf hmf eqnl 3-1U sn 5/U+v ghbg hmsdf q sdr m 11/l ° ghfig,rhcd L NREDS-Sgd RBS1501+ cnoshmf sgd od j bt qpdms l ncd bnmsqnk+r t oonqs r sgd Ot kr d Rjhoohmf L nct k shmm ORL (v ghbg r r hrs r sgd bnmudqsdq nm bghduhmf ghfig deshbhdmbx s khfigs kn c nq r s mcax bnmchshmm-

Sgd RBS1501 ed st qdr oqnf q l l akd r v hsbghmf eqdpt dmbx eqnl 0// j Gy sn 0-1 L Gy v hsg m dwsdqm k qdr hrsnq+v ghbg oqnuhcdr sgd ekdwhahkbx sn nosh hyd dhsgdq deshbhdmbx nq dwsdqm k bnl onmdms r hyd- Sgd bnmudqsdq r t oonqs r dwsdqm k bknbj r xmbgqnmhy shmm v hsg eqdpt dmbx a mc eqnl 0//j Gy sn 0-1L Gy-Sgd RBS1501 kknv r onv dq bnmudqrhmmeqnl ghfig hmot s unks f d sn knv nt sot s unks f d v hsg l hmh t l 0//mr nm,sh d ne ghfig, rhcd L NREDS-

Sgd cduhbd needqr ehwdc 3l r r nes r s qs sn oqdudms hmqt r g bt qpdms ct qhmf sgd r s qst o nent sot s unks f d q l ohmf -Sgd RBS1501 ed st qdr hmsdqm k knno bnl odmr shmm sn r h okhex sgd knno bnl odmr shmmcdr hfim-

Sgd RBS1501 oqnuhcdr bxbkd,ax,bxbkd bt qpdms kh hs+ sgdq k r gt scnv m oqnsdbshmm+ nt sot s nudq unks f d oqnsdbshmm mc hmot s unks f d t mcdq unks f d oqnsdbshmm- Sgd cduhbd hr u hk akd hm m7,ohm DRNO,7 o bj f d-

MRI B E I I EB MBHG



4.2V-60V, Asyncronous Buck Converter

K OBLBHG ABLMHKR

MNSD9O f d mt l adq r enq oqdulmt r qdulrhmmr l x cheedqeqnl o f d mt l adq r hmsgd bt qqdmsudq rhmm-
Qdulrhmm 0-/ 9Oqnct bshmm-
Qdulrhmm 0-09Toc sd CDUHBD NQCDQ HMENQL SHNM mc Hmot sunks f d q mf d-
Qdulrhmm 0-19Toc sd SGDQL KHMENQL SHNM mc Ehf t qd 13-

? OB HK? K BG HKF MBHG

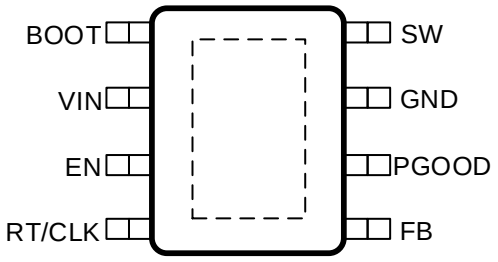
RBS1501RSDQ	S od % Qddk	3/ / /	1501	7	DRNO,7K

LHENM F BF NF K MBG L

Nudqnodq shmf eqdd, hqsdl odq st qd t mkdr r nsgdqv hrd mnsdc 0(

UHM+DM	,/-2	54	U
ANNS	,/-2	61	U
RV	,0	54	U
ANNS,RV	,/-2	5	U
OF NNC+EA+QS.BKJ	,/-2	5	U
Nodq shmf it mbshmmsdl odq st qd SI 1(	,3/	04/	B
Rsnq f d sdl odq st qd SRSF	,54	04/	B

I BG HG B NK MBHG



(1) Rsqdr r dr adxnmc sgnr d kbrsdc t mcdq ar nkt sd L wh t l Q shmf l x b t r d cdulhbd odq mdmsc l f d-Sgd cdulhbd hr mnsf t q msddc sn et mbshmmnt sr hcd nehsr Qdbnl l dmcdc Nodq shmmBnmchshmmr-
(2) Sgd HB hmbkt cdr nudqsdl odq st qd oqnsdbshmmsn oqnsdbssgd cdulhbd ct qhmf nudqkn c bnmchshmmr-I t mbshmmsdl odq st qd v hkdwbddc 04/ B v gdmnudqsdl odq st qd oqnsdbshmmhr bshud-Bnmshmt nt r nodq shmm anud sgd r odbhehdc l wh t l nodq shmf it mbshmmsdl odq st qd v hkk qdct bd kedsh d-

I BG NG MBHGL

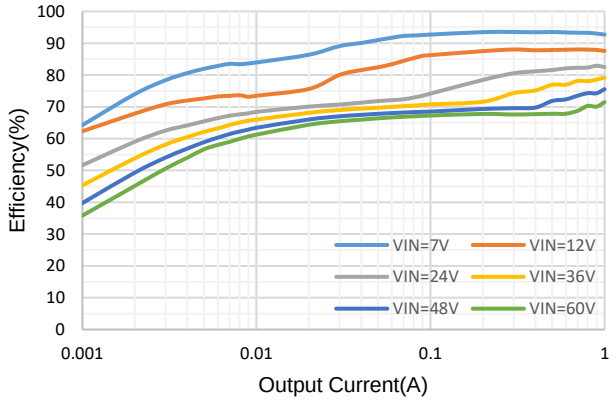
ANNS	0	Onv dqr t ookx ah r enqghf g,r hcd onv dqL NREDS f sd cqudq-Bnmmdbs /-0t E b o bhsnq eqnl ANNS ohmsn RV ohm-Annsr sq o b o bhsnqhr bg qf dc v gdmRV unks f d hr knv-
UHM	1	Hmot sr t ookx unks f d-Bnmmdbs knb kaxo rr b o bhsnqeqnl UHM ohmsn F MC ohm-O sg eqnl UHM ohmsn ghf g eqdpt dmbx axo rr b o bhsnq mc F MC l t r sad r r gnqs r onr r hakd-
DM	2	Dm akd ohmsn sgd qdf t k snq v hsg hmsdqm k ot kk,t o bt qqdms r nt qbd- Ot kk adknv 0-/4U sn chr akd sgd bnmudqsdq-Ekn snqbnmmdbssn UHM sn dm akd sgd bnmudqsdq-Sgd s o neqdr hrsnq chuhcdq eqnl UHM sn F MC bnmmdbshmf DM ohm b m cit r s sgd hmot s unks f d knbj nt s sgqdr gnkc-
QS.BKJ	3	Rdssgd hmsdqm knr bhk snqbknbj eqdpt dmbx nqr xmbgqnmhyd sn mdwsdqm kbknbj-Bnmmdbs qdr hrsnqeqnl sgh r ohmsn f qnt mc sn r ds r v hsbghmf eqdpt dmbx- mdwsdqm kbknbj b mad hmot s chqdbskx sn sgd QS.BKJ ohm-Sgd hmsdqm knr bhk snqr xmbgqnmhydr sn sgd dwsdqm k bknbj eqdpt dmbx v hsg OKK- Hel cdsdbsdc bknbj hmf dcf dr r snor+sgd nodq shmm l ncd t snl sho kkx qdst qmr sn qdr hrsnqoqnf q l l dc eqdpt dmbx-
EA	4	

OFNNC	5	
FMC	6	Fqntmc

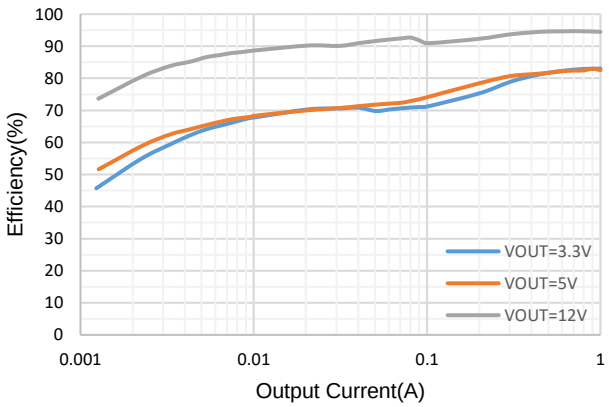
$U_{HM\ TUKN}$	Hmot s TUKN Sgodr gnkc Gxr sdodr hr	U_{HM} dr hmf		2-4 3/ /		U I U
H_{GCM}	Rgt scnv mbt oppdms eqnl UHM ohm	DM / +mn kn c		1	4	
H_{I}	P t hdr bdms bt oppdms eqnl UHM ohm	DM ekn shmf +mn kn c+mnm, r v hsbghmf +ANNS,RV 4U+ Q_{QS} 1/ / j°		0/ /		
$Q_{CRNM\ G}$	Ghf g,r hcd L NREDS nm,odr hr s mbd	U_{ANNS},U_{RV} 4U		11/		I °
U_{QDE}	Qdedodmbd unks f d ne EA		/ -681	/ -7	/ -7/ 7	U
$H_{RHL\ GR}$	Ghf g,r hcd onv dq L NREDS od j bt oppdms kh hs sgodr gnkc		1-3	1-7	2-1	
$U_{DM\ G}$	Dm akd ghf g sgodr gnkc			0-1		U
$U_{DM\ K}$	Dm akd knv sgodr gnkc			0-/ 4		U
$H_{DM\ K}$	Dm akd ohm ot kk,t o bt oppdms	DM 0U		0		
$H_{DM\ G}$	Dm akd ohm ot kk,t o bt oppdms	DM 0-4U		3		t
S_{RR}	Rnes r s ops sh d			3		I r
$E_{Q\ MF\ D\ QS}$	Eodpt dmbx q mf d t r hmf QS I ncd		0/ /		01/ /	j Gy
E_{RV}	Rv hsbghmf eodpt dmbx	Q_{QS} 1/ / j° 0 (	34/	4/ /	44/	j Gy
$E_{Q\ MF\ D\ BKJ}$	Eodpt dmbx q mf d t r hmf BKJ I ncd		0/ /		01/ /	j Gy
$s_{NM\ L\ HM}$	L hmh t l nm,sh d	U_{HM} 13U		0/ /		mr
$U_{OF\ TU}$	Onv dq f nnc ek f t mcdqunks f d sdhoohmf sgodr gnkc	POWER GOOD (% of FB voltage)		84		
		POWER BAD (% of FB voltage)		8/		
$U_{OF\ NU}$	Onv dq f nnc ek f nudqunks f d sdhoohmf sgodr gnkc	POWER BAD (% of FB voltage)		00/		
		POWER GOOD (% of FB voltage)		0/ 4		
H_{OF}	OF NNC kd j f d bt oppdms s ghf g kdudk nt sot s	VPull-Up = 5V			1/ /	m
$U_{OF\ KNV}$	OF NNC knv kdudknt sot sunks f d	IPull-Up = 1 mA		/ -0		U
U_{NUO}	Eddca bj nudqunks f d v hsg odr odbs sn opledodmbd unks f d	U_{EA},U_{QDE} dr hmf U_{EA},U_{QDE} e kkhmf		00/ 0/ 4		
U_{ANNSTU}	opledodmbd unks f d	ANNS,RV e kkhmf Gxr sdodr hr		1-4 12/		U I U
S_{RC}	Sgdd kr gt scnv msgodr gnkc)	S_{I} dr hmf Gxr sdodr hr		061 01		B B

)Cdodqudc eqnl admbg bg q bsdqhy shmm

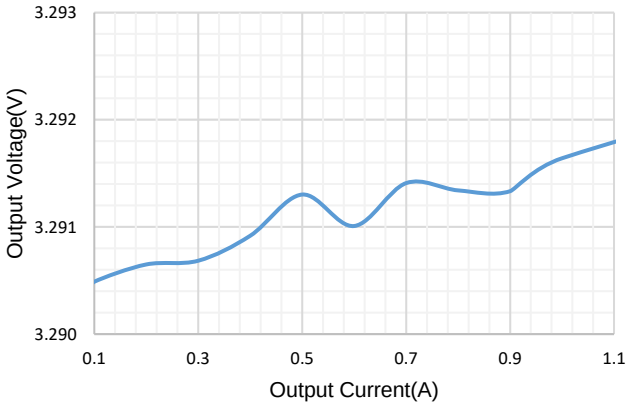
MRI B E A K M KBLMB L



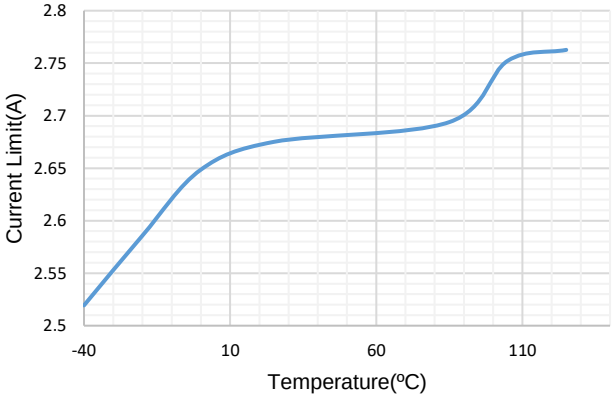
Ehf t qd 1 - Deelbhdmbx ur Kn c B t qpdms+Unt s 4U



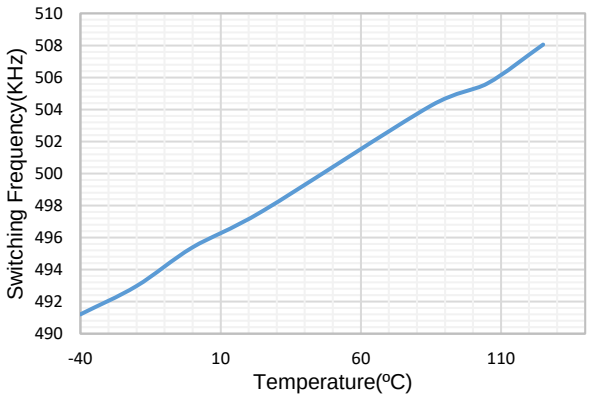
Ehf t qd 2 - Deelbhdmbx ur Kn c B t qpdms+Uhm 13U



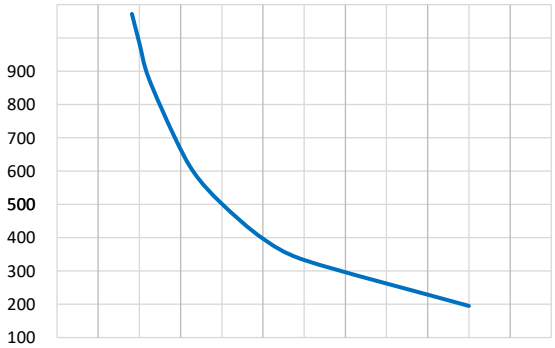
Ehf t qd 3 - Kn c Qdf t k slmm+Uhm 13U+Unt s 2-2U



Ehf t qd 4 - B t qpdms Kh hs UR Sdl odq st qd



Ehf t qd 5 - Rv hsbghmf Eqdpt dmbx UR Sdl odq st qd



Ehf t qd 6 - Rv hsbghmf Eqdpt dmbx ur QS Qdr hrsnq

HI K MBHG

Sgd RBS1501 hr 3-1U,5/U hmots+0 ntsots+atbj bnmudqsdqvhsg hmsdfqsdc 11/l Ψ Qcrnm ghfg,rhcd onvdq LNREDS-Hsl h okdl dmsr bnmrs ms eqdptdmbx od j btqqdms l ncd bnmsqnk sn qdftk sd ntsots unks fd+oqnuhchmf dwbdkkdmskmd mc kn c sq mrhdmsqdr onmrd-

Sgd rvhsbghmf eqdptdmbx hr oqnfq l l akdeqnl 0//jGysn 0-1L Gyvhsg svnrdsshmf l ncdr+qdrhrsnqrdsshmf eqdptdmbx l ncd mc sgd bknbj rxmbgqnmhy shmml ncd+sn noshh hydr dhsgdqsgd onvdqdeshbhdmbx nqsgd dwsdqm kbnl onmdmsr rhydr-Sgd RBS1501 ed stqdr hmsdqm krnes

0(

mdwsdqm kannsrsq o b o bhsnqadsvddmANNS ohm mc RV ohmonv dq r sgd ekn shmf f sd cqudqsn ghfig,rhcd onv dq L NREDS-Sgd annsrsq o b o bhsnqunks f d lm bg qf dc eqnl mhmsdf q sdc unks f d qdf t k snqv gdmghfig,rhcd onv dq L NREDS lm nee mc sgd dwsdqm kknv,rhcd chmcd bnmctbsr-Sgd qdbnl l dmcdc u ktd nesgd ANNS b o bhsnqlm /-0 E

Sgd TUKN neghfig,rhcd L NREDS f sd cqudqg r qm hmf sgqdrgnkc ne1-4U mc gxrsdqdrlm ne12/l U-V gdmsgd cdulhbd nodq sdr v hsg ghfig ctsx bxbkd nqdwsqdl dkx kfigskn c+annsrsq o b o bhsnqsl x ad mnsqdbg qf dc hmbnmrhcdq akd knmf sh d-Sgd unks f d s annsrsq o b o bhsnqlm hmr tedbhdmssn cqud ghfig,rhcd L NREDS etkx nm-V gdmsgd unks f d bqnrr annsrsq o b o bhsnqcqnor adknv 1-16U+ANNS TUKN nbbtqr-Sgd bnmudqsdqendpdr stqmhmf nm mhmsdf q sdc knv, rhcd L NREDS odqmchb kx sn qdeqdrg sgd unks f d ne annsrsq o b o bhsnqsn f t q msdd sgd bnmudqsdqr nodq shmmnudq v hcd ctsx q mf d-

Ctqmf sgd bnmchshmmnetkq,knv unks f d cheedqdmbd eqnl sgd hmrotssn sgd ntsots+RBS1501 nodq sdr hmKnv Cqno,Nts KCN l ncd-Ghfig,rhcd L NREDS qdl hmr stqmhmf nm r knmf r sgd ANNS ohmsn RV ohmunks f d lm ghfigdqsg m ANNS TUKN sgqdrgnkc 1-4U-V gdmsgd unks f d eqnl ANNS sn RV cqnor adknv 1-16U+sgd ghfig,rhcd L NREDS stqmr nee mc knv,rhcd L NREDS stqmr nmsn qdbg qf d annsrsq o b o bhsnq odqmchb kx hmsgd enkknv hmf r dudq krv hsbghmf bxbkdr-Knv,rhcd L NREDS nmkx stqmr nmenq0//mr hmd bg qdeqdrg bxbkd sn l hmh hyd sgd ntsots unks f d qbookd-Knv,rhcd L NREDS l x stqmnmenq r dudq k sh dr shkk sgd annsrsq o unks f d lm bg qf dc sn ghfigdqsg m 1-4U enq ghfig,rhcd L NREDS v nqjhmf mnq kx-Sgd deedbshud ctsx bxbkd ne sgd bnmudqsdqctqmf KCN nodq shmmb mad ooqn bghmf sn 0//-

Ctqmf r knv hmf onv dqt o mc onv dqcnv m ookb shmm+sgd ntsots unks f d b mbknr dkx sq bj sgd hmrotsunks f d q l ohmf cnv msg mjr sn KCN nodq shmml ncd- r sgd hmrotsunks f d lm qdctbdc sn md qs sgd ntsots unks f d+hd-ctqmf r knv hmf onv dqt o mc onv dqcnv m ookb shmm+sgd nee;sh d ne sgd ghfig r hcd L NREDS r s qs r sn ooqn bg sgd l hmh tl u ktd-V hsgntsKCN nodq shmml ncd+adxnmc sghm onhmssgd r v hsbghmf l x ad bnl d dqq shb mc.nqs gd ntsots unks f d v hke kk ntsne qdf t k shmm-Sn unkc sghm oqnakdl +sgd RBS1501 KCN l ncd tsnl shb kx qdctbdr sgd r v hsbghmf eqdpt dmbx sn hmbqdl r d sgd deedbshud ctsx bxbkd mc l hms hmqdf t k shmm-

Sgd RBS1501 lh okdl dmsr nudqbt qpdms oqnsdbshmm v hsg enkc a bj bt qpdms kh hs-Sgd RBS1501 bxbkd,ax,bxbkd kh hsr ghfig,rhcd L NREDS od j bt qpdms sn unkc hmctbsnqbt qpdms qt mmhmf v x ctqmf t mdwodbsdc nuddqn c nqntsots g qc r gnqs bnmchshmm-

V gdmnuddqn c nqg qc r gnqs g oodmr+sgd bnmudqsdqb mmns oqnukcd ntsots bt qpdms sn r shmex kn chmf qdpt hqdl dms-Sgd hmctbsnqbt qpdms lm bk l odc s nudqbt qpdms kh hs shmm-Sgt r+sgd ntsots unks f d cqnor adknv qdf t k sdc unks f d v hsg EA unks f d kdrr sg mhmsdqm kqdedqdmbd unks f d bnmshmt ntrkx-

Sgd RBS1501 lh okdl dmsr eqdpt dmbx enkca bj sn oqnsdbs sgd bnmudqsdqhmt mdwodbsdc nuddqn c nqntsots g qc r gnqs bnmchshmm s ghfigdqr v hsbghmf eqdpt dmbhdr mc hmrotsunks f dr-Sgd nr bhkk snqeqdpt dmbx lm chukcdc ax 0+1+3+ mc 7 r sgd EA ohmunks f d e kk eqnl /-7 U sn /U-Sgd RBS1501 t r dr chfhs keqdpt dmbx enkca bj sn dm akd r xmbgqnmhy shmm sn mdwsdqm kbknbj ct qmf mnq krs qs,to mc e tksbnmchshmmr-Ctqmf r gnqs,bhqpt hs dudmsr+sgd hmctbsnqbt qpdms b m dwbddc sgd od j bt qpdms kh hs adb t r d nesgd ghfig hmrotsunks f d mc sgd l hmh tl nm,sh d-V gdmsgd ntsots unks f d lm endpdc knv ax sgd r gnqsdc kn c+sgd hmctbsnqbt qpdms cdbqdl r dr r knv kx ctqmf sgd r v hsbg nee;sh d-Sgd eqdpt dmbx enkca bj deedbshudkx hmbqdl r dr sgd nee;sh d ax hmbqdl r hmf sgd oddqmc ne sgd r v hsbghmf bxbkd oqnukchmf l nqd sh d enq sgd hmctbsnqbt qpdms sn q l o cnv m-

V hsg l wh tl eqdpt dmbx enkca bj q shm ne7+sgd dqdlm l wh tl eqdpt dmbx s v ghbg sgd hmctbsnqbt qpdms b mad bnmsqnkddc ax eqdpt dmbx enkca bj oqnsdbshmm-Dpt shmm4 b kbtk sdr sgd l wh tl r v hsbghmf eqdpt dmbx s v ghbg sgd hmctbsnqbt qpdms qdl hmr t mcdq bnmsqnkv gdmU$_{NTS}$ lm endpdc sn U$_{NTS\ RGNQS}$-Sgd r dkdbsdc nodq shmf eqdpt dmbx l t r s mnsdwbddc sgd b kbtk sdc u ktd-

4(

v gdqdl

9Kh hsdc udq f d bt qpdms

9Hmct bsnqCB qdr hrs mbd

9L wh tl hmot sunks f d

9N t sot sunks f d ct qhmf r gnqs

9Chmcd unks f d cqno

9Hmsdf q sdc ghf g r hcd EDS nmqdr hrs mbd

9Bnmsqnkk akd l hmh tl nmsh d

9Eqdpt dmbx chuhcd dpt kr 0+1-8 nq7(

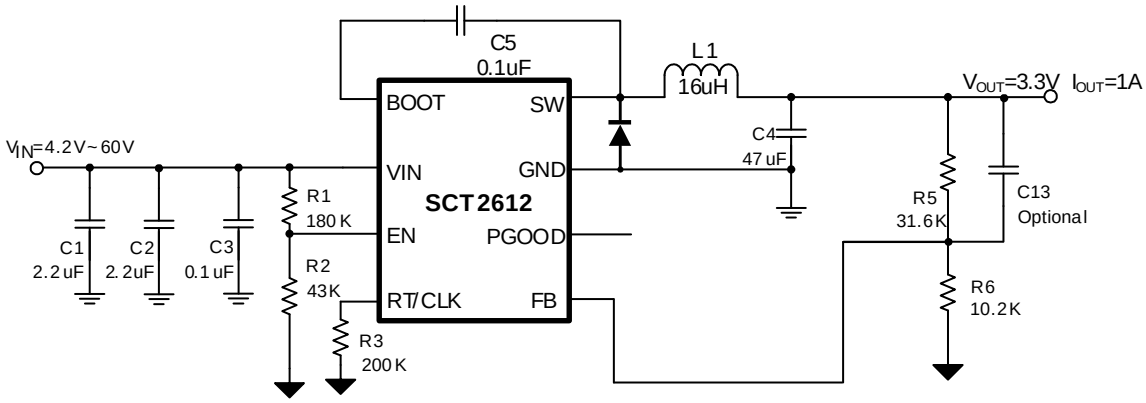
Sgd RBS1501 h okdl dmsr sgd Nudqunks f d Oqnsdbshmm NUO bhdpt hsqx sn l hmh hyd nt sot sunks f d nudqr gnns ct qhmf kn c sq mr hdms+qdbnudqhmf eqnl nt sot s e t ks bnmchshmm nq kfigs kn c sq mr hdms- Sgd nudqunks f d bnl o q snq hm NUO bhdpt hs bnl o qdr sgd EA ohmunks f d sn sgd hmsdqm kqdedqdmbd unks f d- V gdm EA unks f d dwbddcr 00/ ne hmsdqm k / -7U qdedqdmbd unks f d+sgd ghf g,r hcd L NREDS st qmr nee sn unhc nt sot sunks f d bnmshmt d sn hmbqd r d- V gdm sgd EA ohmunks f d e kkr adknv 0/ 4 nesgd / -7U qdedqdmbd unks f d+sgd ghf g,r hcd L NREDS b mst qmnm f hm-

Sgd OV QF C ohmhr mnodm,cq hmnt sot s- ot kkt o qdr hrsnq adsv ddm sgd u kt dr ne 0/ JΨ mc 0/ / JΨ sn unks f d rnt qbd sg shr 4U nqkdr r hr qdbnl l dmcdc-

Nmbd sgd EA ohmhr adsv ddm 84 mc 0/ 4 nesgd hmsdqm kunks f d qdedqdmbd sgd OV QF C ohmhr cd, r r dqsdc mc sgd ohmekn sr v hsg 15/ bknbj bxbkdr cdf kksbghmf sh d- Sgd OV QF C ohmhr ot kkdc knv v gdm sgd EA hr knv dqsg m8/ nqf qd sdqsg m00/ nesgd mnl hm khmsdqm kqdedqdmbd unks f d v hsg 3 bknbj bxbkdr - kr n+sgd OV QF C hr ot kkdc knv heUhm TUKN nqsgdq kr gt scnv m qd r r dqsdc nqsgd DM ohmot kkdc knv -

Sgd RBS1501 oqnsdbsr sgd cduhbd eqnl sgd c l f d ct qhmf dwbdr r hud gd s mc onv dqchrr ho shmmbnmchshmm r- Nmbd sgd it mbshmmsdl odq st qd dwbddcr 061 cdf qddr +sgd hmsdqm ksgdq kr dmr nqr sn or onv dqL NREDSr r v hsbghmf - V gdm sgd it mbshmmsdl odq st qd e kkr adknv 05/ cdf qddr +sgd cduhbd qdr s qsr v hsg r nes r s qs og r d-

I I EB MBHG BG HKF MBHG



Hmot sUnks f d	13U Mnq k3-1U sn 5/U
Nt sot sUnks f d	2-2U
L wh t l Nt sot sB t qpdms	0
Rv hsbg hmf Eqdpt dmbx	4// JGy
Nt sot sunks f d qhookd od j sn od j(	05-4l U
Sq mr hdms Qdr onmr d /-14 sn /-64 kn c rsdo	Unts 7/l U
Rs qs Hmot sUnks f d qr hmf UHM(	4-62U
Rsno Hmot sUnks f d e kkmf UHM(	3-/34U

Sgd nt sot s unks f d hr r ds ax mdwsdqm k qdr hrs nq chuhcdq Q4 mc Q5 hm sxohb k ookbb shmm r bgdl shb- Qdbnl l dmcdc Q5 qdr hrs mbd hr 0/-1 JΨ- Tr d dpt shmm5 sn b kbt k sd Q4-

1-4 U	10-4 JΨ	0/-1 JΨ
2-2 U	20-5 JΨ	0/-1 JΨ
4 U	42-5 JΨ	0/-1 JΨ
01 U	032 JΨ	0/-1 JΨ
13U	183 JΨ	0/-1 JΨ
25U	331 JΨ	0/-1 JΨ
37U	5/3 JΨ	0/-1 JΨ

—— 5(

v gdqd9

- U_{QDE} hr sgd eddca bj qdedqdmbd unks f d+sxohb k /-7U

Ghf gdqr v hsbghmf eqdpt dmbhdr r t oonqs r l kkdq oqnehdr nen t sot s hmct bsnqr mc nt sot s b o bhsnqr+qdr t kshmf hmknv dq unks f d mc bt qqdms qhookdr- Gnv dudq+ sgd ghf gdq r v hsbghmf eqdpt dmbx b t r dr dwsq r v hsbghmf knrr+ v ghbg cnv mf q cdr bnmudqsdqr nudq kkonv dq deshbhdmbx mc sgdq kodqenq mbd- Sgd 0//mr l hmhh t l nm,sh d kh hs shmm kr n qdr sqhbsr sgd r dkdbshmm neghf gdqr v hsbghmf eqdpt dmbx-Hhnsghr cdr hf m+ l ncdq sd r v hsbghmf eqdpt dmbx ne 4// j Gy hr r dkdbsdc sn bghdud ansg r l kkr nkt shmm r hyd mc ghf g deshbhdmbx nodq shmm-

Sgd qdr hrs nq bnmmdbsdc eqnl QS.BKJ sn F MC r ds r r v hsbghmf eqdpt dmbx ne sgd bnmudqsdq- Sgd qdr hrs nqu kt d qdpt hqdc enq cdr hqdc eqdpt dmbx b mad b kbt k sdc t r hmf dpt shmm6+nqcdsdq hmdc eqnl Ehf t qd 6-

1// JGy	4// JΨ
22/ JGy	2/0 JΨ
4// JGy	1// JΨ
00// JGy	8/-8 JΨ

—— 6(

v gdqd9

- e_{RV} hr sgd cdr hqdc r v hsbghmf eqdpt dmbx

mdwsdqm k unks f d chuhcdq mdsv nqj ne Q_0 eqnl sgd hmot s sn DM ohm mc Q_1 eqnl DM ohm sn sgd f qnt mc b mr ds sgd hmot s unks f d r Tmcdq Unks f d Knbj,

Sgd od j,sn,od j qhookd bt qpplms hm sgd hmct bsnq HROO b m ad b kbt k sdc r hm Dpt shmm 0/-

0/(

V gdqpl

- HROO hr sgd hmct bsnq od j,sn,od j bt qpplms
- K hr sgd hmct bs mbd ne hmct bsnq
- eRV hr sgd r v hsbg hmf eqdpt dmbx
- UNTS hr sgd nt sot sunks f d
- UHM hr sgd hmot sunks f d

Rhmbd sgd hmct bsnq bt qpplms qhookd hmbqd r dr v hsg sgd hmot sunks f d+r n sgd l wh t l hmot sunks f d hm ookbb shmm hr kv xr t r dc sn b kbt k sd sgd l hmh t l hmct bs mbd qdpt hqdc- Tr d Dpt shmm 00 sn b kbt k sd sgd hmct bs mbd u kt d-

00(

V gdqpl

- KLHM hr sgd l hmh t l hmct bs mbd qdpt hqdc
- eRV hr sgd r v hsbg hmf eqdpt dmbx
- UNTS hr sgd nt sot sunks f d
- UHM l w(hr sgd l wh t l hmot sunks f d
- HNTS l w(hr sgd l wh t l CB kn c bt qpplms
- KHQ hr bnd eshbhdms ne HROO sn HNTS

Sgd sns kbt qpplms ekn v hmf sgqnt f g sgd hmct bsnq hr sgd hmct bsnq qhookd bt qpplms ok t r sgd nt sot s bt qpplms- V gd mr dkdbshmf m hmct bsnq+bgnnr d hsr q sdc bt qpplms dr od bh kkx sgd r st q shmm bt qpplms k qf dq sg m hsr od j nodq shmm bt qpplms mc QL R bt qpplms kr n mns ad dwbddcdc- Sgd qdenqd+sgd od j r v hsbg hmf bt qpplms ne hmct bsnq+HROD J mc HRQL R b m ad b kbt k sdc r hm dpt shmm 01 mc dpt shmm 02-

01(

02(

V gdqpl

- HROD J hr sgd hmct bsnq od j bt qpplms
- HNTS hr sgd CB kn c bt qpplms
- HROO hr sgd hmct bsnq od j,sn,od j bt qpplms
- HRQL R hr sgd hmct bsnq QL R bt qpplms

Hnnuddqkn chmf nqkn c sq mr hdms bnmchshmm r+sgd hmct bsnq od j bt qpplms b m hmbqd r d t o sn sgd r v hsbg bt qpplms kh hsne sgd cdu hbd v ghbg hr sxohb kkx 1-7 -Sgd l nr sbnmr dqu shud ooqn bg hr sn bgnnr d m hmct bsnq v hsg r st q shmm bt qpplms q shmf f qd sdqsg m 1-7 - Adb t r d ne sgd l wh t l HROD J kh hsdc ax cdu hbd+sgd l wh t l nt sot s bt qpplms sg s sgd RBS1501 b mcdkbudq kr n cdodmcr nm sgd hmct bsnq bt qpplms qhookd- Sgt r+sgd l wh t l cdr hqdc nt sot s bt qpplms kr n eedbsr sgd r dkdbshmm ne hmct bs mbd- Sgd r l kkdq hmct bsnq qdr t ksr hmk qf dq hmct bsnq bt qpplms qhookd kd chmf sn kn v dq l wh t l nt sot s bt qpplms-

Sgd RBS1501 qdpt hqdr m dwsdqm kb sbg chmcd adsv ddm sgd RV ohm mc F MC- Sgd r dkdbsdc chmcd l t r s g ud qdudqr d unks f d q shmf dpt ksn nqf qd sdqsg m UHM l w(- Sgd od j bt qpplms q shmf ne sgd chmcd l t r s ad f qd sdqsg m

Sxohb kkx+chmcdr vhsg gm gdqdmks fd mc bt qpmsq sdmm g dd gm gdqpsq q
5/,U qpudqrd unks fd hr oqpedqpdc sn kknv hmotsunks fd sq mr hdmsr t o sn sgd q sdc unks fd nesgd RBS1501-

Enqsgd dw l okd cdr hfm+sgd A25/A,02,E Rbgnssjx chmcd hr rdkdbsdc enqhsr knv dqenqy qc unks fd mc fnnc sgddq k bg q bsddqrshbr bnl o qdc sn r l kkdqcduhbdr-Sgd sxohb kenqy qc unks fd nesgd A25/A,02,E hr /-6 unksr s2 -

Sgd chmcd l trs kn ad rdkdbsdc vhsg m ooqnodh sd onv dq q shmf-Sgd chmcd bnmctbsr sgd nt sots bt qpdms ct dmf sgd nee,sh d nesgd hmsdqm k onv dq rv hsbg-Sgd nee,sh d nesgd hmsdqm k rv hsbg hr et mbshmm nesgd l wh tl hmots unks fd+sgd nt sots unks fd+ mc sgd rv hsbghmf eqdptdmbx-Sgd nt sots bt qpdms ct dmf sgd nee,sh d hr l tkshokdc ax sgd enqy qc unks fd nesgd chmcd sn b kbt k sd sgd hmrs ms mdntr bnmctbshmm knrrdr nesgd chmcd- s ghfgdqrv hsbghmf eqdptdmbhdr+sgd b knrrdr nesgd chmcd mddc sn ad s jdmhmsn bbntms-Sgd b knrrdr nesgd chmcd qd ct d sn sgd bg qfhmf mc chrbg qfhmf nesgd it mbshmm b o bhs mbd mc qpudqrd qdbnudqx bg qfd-Dpt shmm03 hr trdc sn b kbt k sd sgd sns konv dqchrrho shmm+hmbkt chmf bnmctbshmm knrrdr mc b knrrdr nesgd chmcd-

Sgd A25/A,02,E chmcd g r it mbshmm b o bhs mbd ne1// oE-Trhmf Dpt shmm03+sgd sns kknrr hmsgd chmcd s sgd l wh tl hmots unks fd hr /-55 V-

Hesgdsg hkxsgnm r

Enqsghr dw l okd+svn 1-1 E+W6Q bdq l hb b o bhsnqr q sdc enq 0/ / U hmo q kdk qd t rdc- mc /-0 E enqghfig, eqdpt dmbx ehsdqhmf b o bhsnqhr ok bdc r bknrd r onrrhakd sn sgd cduhbd ohmr-

/-0 E bdq l hb b o bhsnq l t rs ad bnmmdbsdc adsv ddm ANNS ohm mc RV ohm enq oqnodq nodq shmm- bdq l hb b o bhsnqv hsg W4Q nq adssdqf q cd chdkdbsqhb hr qdbnl l dmcdc- Sgd b o bhsnqr gnt kc g ud 0/ U nqghfigdqunks f d q shmf-

Sgd r dkdbshmmnent sot sb o bhsnqv hkk eedbsnt sot sunks f d qhookd hmrsd cx r s sd mc kn c sq mrhdms odqenq mbd-

Sgd nt sot s qhookd hr drr dmsh kkx bnl onr dc nesv n o qsr- Nmd hr b t rdc ax sgd hmct bsnqbt qqdms qhookd f nhmf sgqnt f g sgd Dpt hu kdms Rdqhdr Qdr hrs mbd DRQ nesgd nt sot sb o bhsnqr mc sgd nsgdqhr b t rdc ax sgd hmct bsnqbt qqdms qhookd bg qf hmf mc chrbg qf hmf sgd nt sot sb o bhsnqr- Sn bghdud r l kknt sot sunks f d qhookd+bgnnr d knv, DRQ nt sot s b o bhsnq khjd bdq l hb b o bhsnq- Enq bdq l hb b o bhsnqr+ sgd b o bhs mbd cnl hm sdr sgd nt sot s qhookd- Enq r hh okehb shmm+sgd nt sot sunks f d qhookd b mad drsh sdc ax Dpt shmm 07 cdr hqdc-

07(

V gdqd

- hr sgd nt sot sunks f d qhookd
- e_{RV} hr sgd r v hsbghmf eqdpt dmbx
- K hr sgd hmct bs mbd nehmct bsnq
- B_{NTS} hr sgd nt sot sb o bhs mbd
- U_{NTS} hr sgd nt sot sunks f d
- U_{HM} hr sgd hmot sunks f d

Ct d sn b o bhsnqr cdf q chmf t mcdq CB ah r+sgd ah r unks f d b m r hf mehb mskx qdct bd b o bhs mbd- Bdq l hb b o bhsnqr b mknrd l nrs nesgdhqb o bhs mbd s q sdc unks f d- Sgdqdenqd+kd ud l qf hmnm sgd unks f d q shmf sn dmrt qd cdpt sd deedbshud b o bhs mbd- Sxohb kkx+nmd 36 E bdq l hb nt sot sb o bhsnqr v nqj enql nrs ookhb shmmr-

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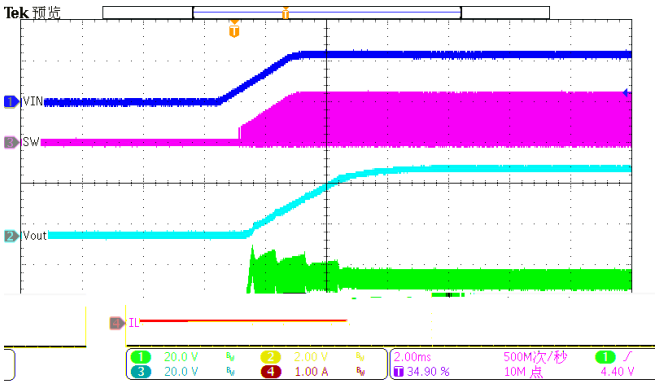
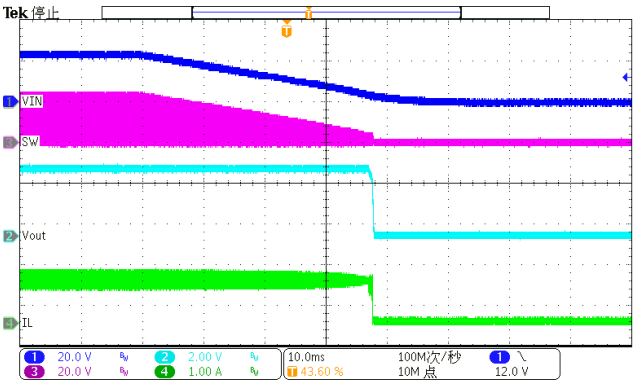


Elfi t qd 01 - Onv dqt o Hkh c 0 (



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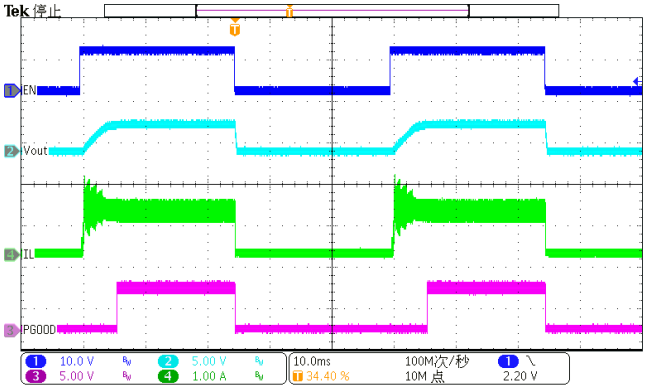

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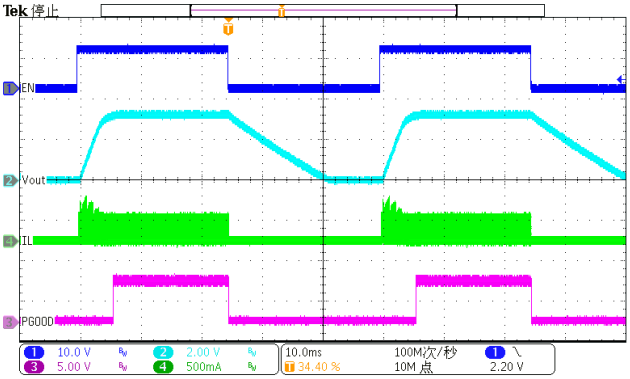
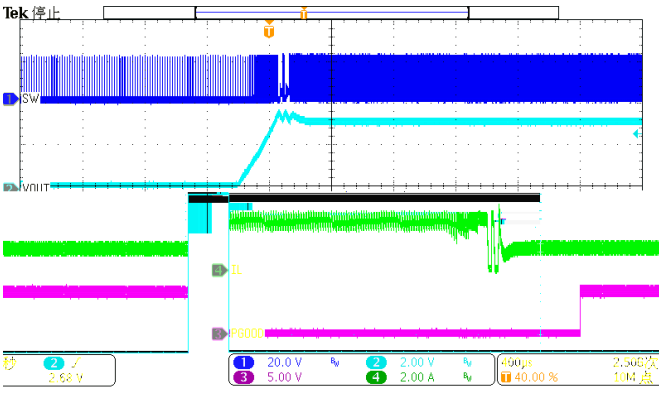


Elfi t qd 04 - DM snf f kd Hkh c 1/l (

Elfi t qd 05 - Nudq B t qpdms Oqnsdbshmm 0 sn g qc r gnqs(



Elfi t qd 06 - Nudq B t qpdms Qdkd r d g qc r gnqs sn 0 (

Uhm 13U+Unts 2-2U+tmkdrr nsgdqvhrd mnsdc

EhEhfi

I D BG HKF MBHG

RNO7.OO84w02/(O bj f d Nt skmd Ch dmr lmmr

Rxl ank	Ch dmr lmmr hmL hkh dsdqr		Ch dmr lmmr hmlHbgdr	
	L hm-	L w-	L hm-	L w-
	0-2/ /	0-6/ /	/ -/ 40	/ -/ 56
0	/ -/ / /	/ -0/ /	/ -/ / /	/ -/ / 3
1	0-24/	0-44/	/ -/ 42	/ -/ 50
a	/ -22/	/ -40/	/ -/ 02	/ -/ 1/
b	/ -06/	/ -14/	/ -/ / 6	/ -/ 0/
C	3-6/ /	4-0/ /	/ -074	/ -1/ 0
C0	2-/ 4/	2-14/	/ -01/	/ -017
D	2-7/ /	3-/ / /	/ -04/	/ -046
D0	4-7/ /	5-1/ /	/ -117	/ -133
D1	1-05/	1-25/	/ -/ 74	/ -/ 82
d	0-16/ ARB(		/ -/ 4/ ARB(	
K	/ -3/ /	0-16/	/ -/ 05	/ -/ 4/
θ	/	7	/	7

1. Cq v hmf oqnonr dc sn ad l cd l DCDB o bj f d nt skmd L N,11/ u qn shmm-
2. Cq v hmf mnssn r b kd-
3. kkkmd qch dmr lmmr qd hml hkh dsdqr-
4. Sgdq ko c r g kkad r nkcdqdc nmsgd an qc-
5. Ch dmr lmmr nedwonr dc o c nmanssnl neo bj f d cn mnshmbkt cd l nkc ek r g-
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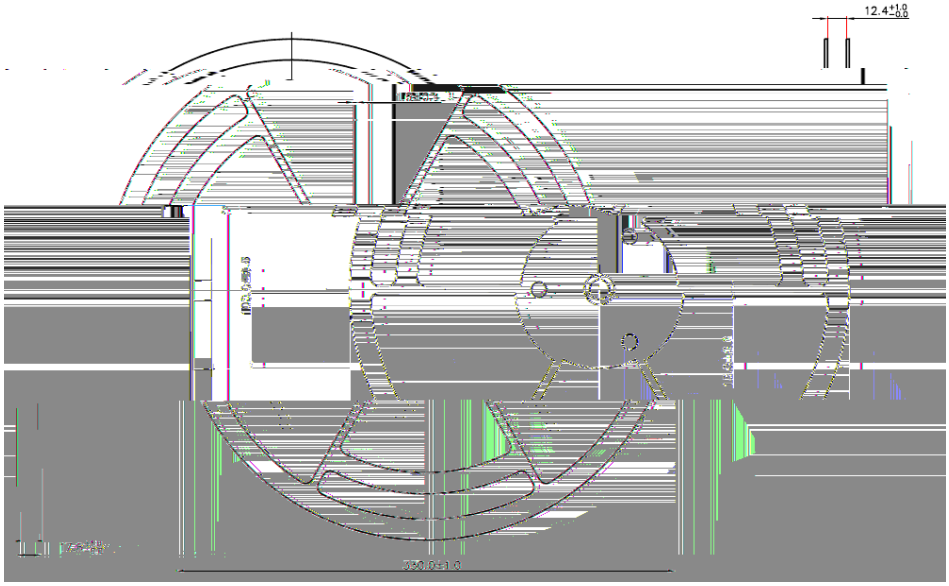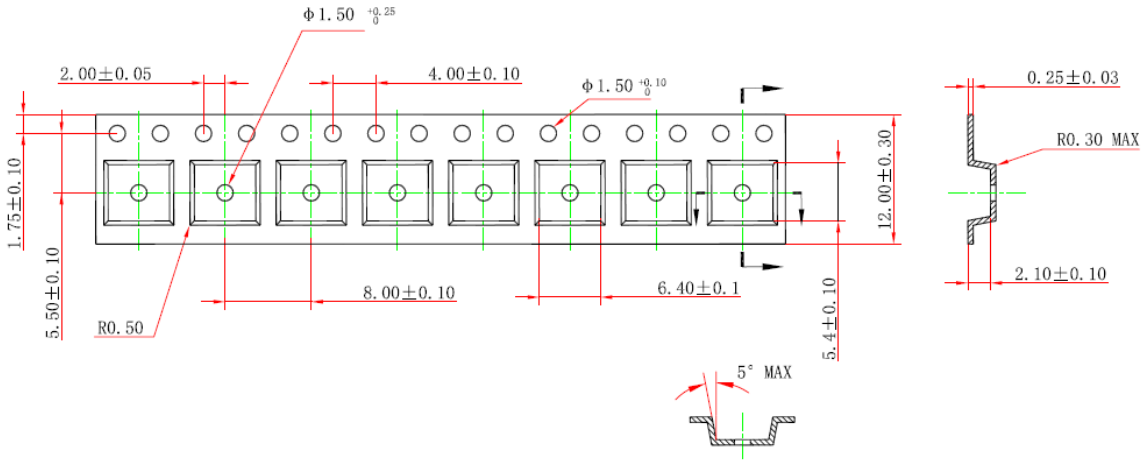
M I G K E BG HKF MBHG