

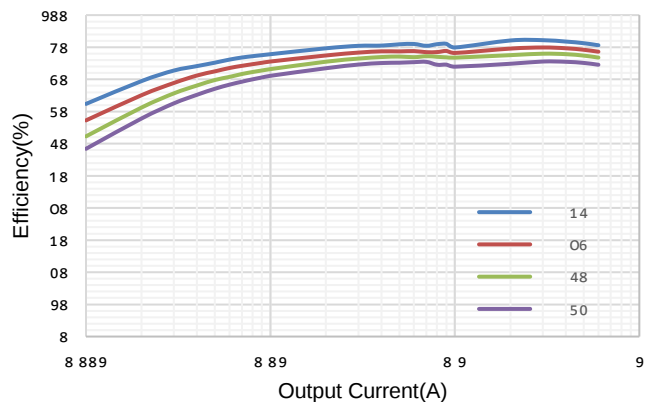
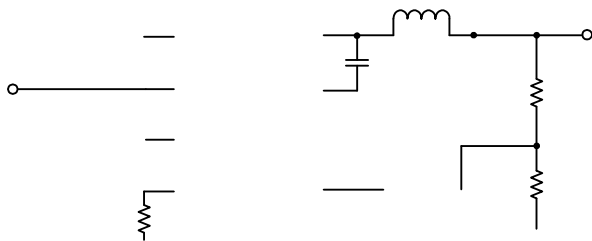
4.5V-100V Vin, 0.6A, High Efficiency Synchronous Step-down DCDC Converter with Programmable Frequency

- R_d DkpoM i b 5/)0Q, ++Q
- +)l j i d p j p n J p d k p o p m i o
- +)3Q , A _ f M a m i Q j g b
- D o b m o _ 20+h C d c (N d _ i _ 0++h G r (N d _ K j r m H J N A O n
- K p g A m l p i t H j _ p g a j i K A H r d e , ++p L p d n i o p m i o d N g k H j _
- / h n D o m g N j a (n o m O d h
- _ p n o g A m l p i t . ++F C u g 3++F C u
- K m d d i i g O c m n c j g _ a j m K n j b m h h g D k p o Q j g b P i _ r f Q j g b G j f J p o K n j o a j i P Q G J O c m n c j g _ i _ C t n o m n d h
- t g (t (t g p m i o G h d d b
- J q r f Q j g b K n j o a j i
- J q r f O h k m p m K n j o a j i
- q g g d i N J K (3 K f b
- (Q j g
- (d N j j o m
- B K N O m f m

Oc N O _ , + d h +) l n t i c n j i j p n p f j i q m m r d e r d _ d k p o q j g b m i b d b a n j h /) 0 Q d j , ++Q r c d c d o b m o n i 20+h c d c (n d _ H J N A O i _ 0++h g r (n d _ H J N A O) O c N O _ , + _ j k a d b a j i n o i d j i d h J O h j _ j i o n j g n p k k j n a K A H r d e d k d g , ++p g r l p d n i o p m i o r c d c n n d h a j i q m m j i c d q d b c d c a d d i t o g u c o g _ j m o i _ t j i _ d j i)

Oc N O _ , + a p m n k n j b m h h g n r d c d b a m l p i t a n j h . ++f C u g 3++f C u r c d c k n j q d _ n a a g s d d h g j k a d h d e m a d d i t j m s o m g j h k j i o n d h)

Oc N O _ , + j a m t g (t (t g p m i o G h d i _ c d p k j q m p m i o k n j o a j i a r h g n c p o j r i k n j o a j i j p d k p o j q r f q j g b k n j o a j i i _ d k p o q j g b p i _ r f q j g b k n j o a j i) O c _ q d d q g g d i 3 (k d a r h g u i c i _ N J K (3 k f b)



I J O qđpn m qđj i n h t _đ i ph m i o q mđi)
M o h q)
M o r q đ n)
M o M- gpgđi q g
M o)
M o J M MĐ AJ MH

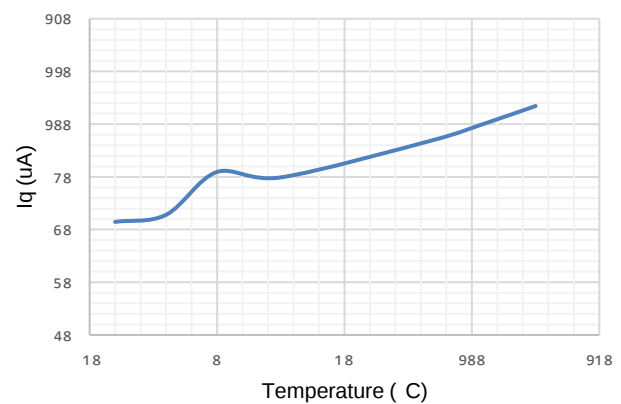
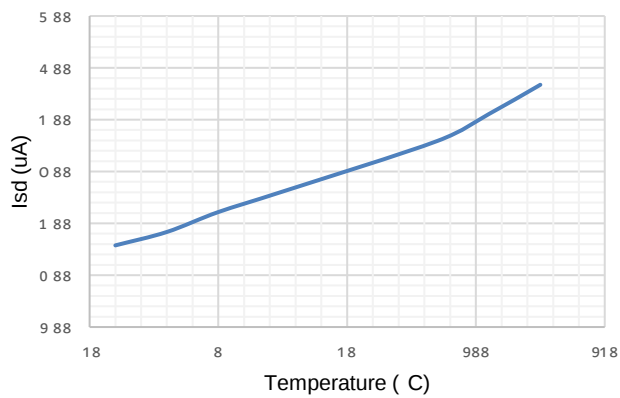
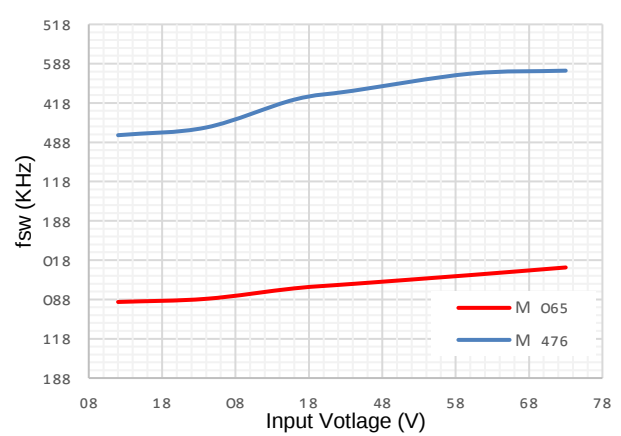
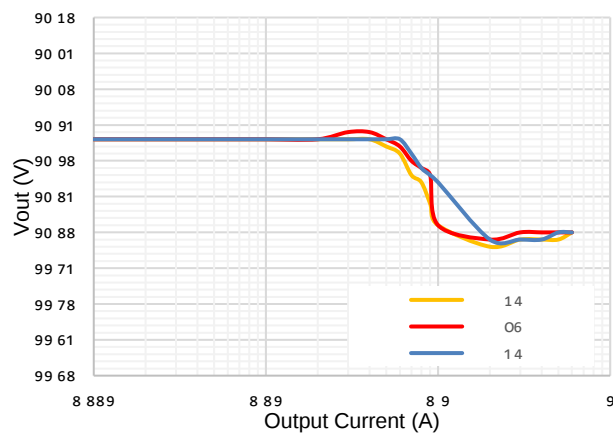
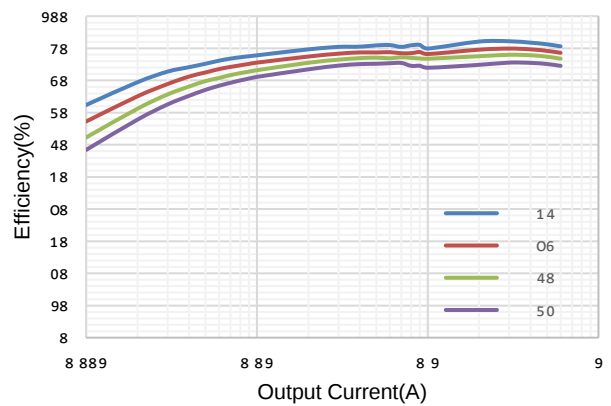
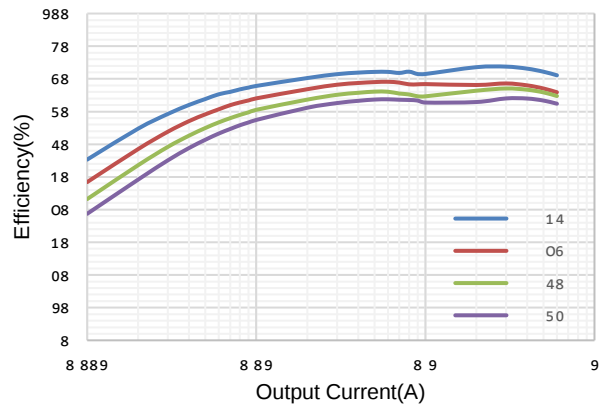
!	M	g		NJ K(3

J o m pi g n n j æ m

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(+)	
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(+)	
(+)	1

\$ 38 % Spao < / BDC q 28472 C 3956 D W 12.1398.71 0.480021.87 Tm 0 G [()]212.1398.

M NJ I ZG	G r (nd_ HJNA Oji (mntho i		0++	h
Q _M A	M a mi qjϑ b jaA=		+)24- +)3 +)3+3	Q
Q I ZC	i g cϑc æmncj g_		, > ,	Q
Q I ZG	i g g r æmncj g_		,)+0	Q
D I ZG	i g kð kpϑpk pmi o	I 8, Q	,	
D I ZC	i g kð kpϑpk pmi o	I 8,)0Q	/	p
Q _h n	Do m_ gnj æno mæth		/	h n
A _M I B ZMO	Aml p i t mi b pnð b MOh j_		. ++ 3++	f Cu
A _{NR}	Nr ϑ cð b aml p i t	M _{MD} 80++ f ,	/ - + 0++ 1++	f Cu
Q _J AAZHð	Hð ðh ph j æðth	Qð 8, - Q	- ++ - 1+	i n
D _h I ZK	GNHJNA Okjnðð pmi oðh ϑ	Anjh njpm g_ mð	+)3	
O _{CD} PK	Cd pk r æð b æth	I ph m janjaðno m t gn	2	t gn
CD PK	Cd pk _pð t g		, -)0	
Q _J QK	A _ f j q rjϑ b r æ mnk oq ma mi qjϑ b	Q _A =*Q _M A nðð b Q _A =*Q _M A a ϑð b	, , + , +0	
Q _N	Oc m_ gnepo_j r i æmncj g_	Q _E nðð b Ct no mnð	, 12 . 0	



Oc N O-, + a /)0Q, ++Q d kpo +)l j p d k p o d i o m g j h k i n o _ n t i c n i j p n p f j i q n o m r d e p d d
20+h M_nji c d c (n d _ i _ 0 ++h M_nji g r (n d _ k j r m H J N A O h) d d k g h i o j i n o i o j i a h j i o g g j
m b p g o j p d k p o q j o b k n i q d d b s g i o g i _ g _ o m i n d i o m n k j i n)

Oc n r d c d b a n l p i t d k r i b m h h g a r h . ++f C u j 3 ++F C u r d e m n d j m a i b g j k o d i n d e n e k j r m
a d d i t j n e s o m g j h k j i o n d n) O c N O -, + a o m n i d o m g / h n n j a (n o r o a h g j q d g r b
d r p n c p m i o i _ j p d k p o q j o b j q m c j j o _ p n i b n o r p k) O c _ q d g j n p k k j r n h j i j g d n o r p k r d e k m (
d n _ j p d k p o j i _ d j i) O c n h g n n h j _ (o m i n d j i o i K R H h j _ i _ K A H h j _ j k m d j i n i n p m
c d c a d d i t j q n r d _ g _ p m i o m i b) O c l p d n i o p m i o d d k d g , ++p p i _ m j g _ i j i (n r d c d b
j i _ d j i g c d q c d c a d d i t o g d c o g _)

Oc N O-, + c n _ a p d d k p o n o r p k q j o b j a .) 0 Q r d e / ++h Q c t n o m n d) O c l k d d c d c (q j o b
k d r d e k m d j i a m n c j g a o i p n _ g _ e n o a d k p o q j o b g f j p o a m n c j g n r d e o j s o m g
m n d j m g h o p m o c d c n P Q G j n t n o h m l p a n h i o) A g a i b l k d i g n a _ q d r d e a d o m g
k p g p k p m i o g a e k d) j i i a i b l k d g Q D _ d n g n o r n p k a _ q d p g h a d g)

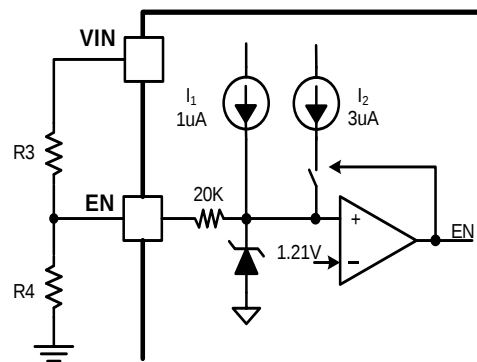
Oc N O-, + a g r i o d j i a o m n d g _ a d k p o p i _ r q j o b g f j p o a j p d k p o j q r q j o b k r i o d j i
j q m p m i o k r i o d j i r d e t g (t (t g p m i o g d d b i _ c d p k h j _ j p d k p o c m _ n c j r n k r i o d j i i _
a r h g n c p o _ j r i k r i o d j i)

Oc N O-, + h k g t n j i n o i d j i (O d h H j _ j i o g k n i q d d b a n o m i n d i o r d e k n p _ j a s _ n r d c d b
a n l p i t) o a b d i d b j a c n r d c d b t g a c d c (n d _ H J N A O L , d o m _ j i a m a s _ d o m g
i _ a d _ p g m p m i o n d n g c r b p k a j p d k p o q j o b) R c i a c d c (n d _ H J N A O L , d o m _ j a i _
a g r (n d _ H J N A O L - d o m _ j i a m _ _ a h _ p m d j i) R c i n i n _ a q g t p m i o k n n d b j i a
g r n d _ H J N A O g r n e i a J H K p m i o a m n c j g a _ q d o m n j i l , i _ a g r (n d _ H J N A O L -
o m n j a) = n _ j i Q d i _ Q j o q j o b a _ q d k m _ d o m l p a n _ j a (a h i _ o m n j a g r (n d _ H J N A O L -)
O d m k o j i t g (t (t g n _)

Oc N O-, + a i g _ r c i a Q D k d q j o b n n j p o /) Q i _ a l k d q j o b s _ n a i g
a m n c j g j a ,) , Q) O c _ q d d _ a g _ r c i a Q D k d q j o b a g g r .) 3 Q j m r c i a l k d q j o b d
g r ,) + 0 Q) i d o m g , p k p g p k p m i o n j p m g l k d g r n a _ q d i g r c i l k d a j o)

l k d d c d c q j o b k d a o i j i i o _ g Q D _ d n g n o r n p k a _ q d)

A j m c d c m t n o h P Q G j a m n c j g j i i o i s o m g m n d j m d d m M i _ M n c j r i d A d p m 4 a r h Q D
g l) O c P Q G j n d b i _ a g g b a m n c j g i g p g o _ t l p d j i , i _ l p d j i - m n k a d g)



R c m

Qno r5Qdī mē æmncj g_dj i g æ _ qd
Qnj k5Qdī a æmncj g_dj _th g æ _ qd
D8, p
D8. p
Q_IM8,)-, Q
Q_{HA}8,)+0Q

Oc N O- ,+ mbpgonæ ðom gmami qjᵘᵇ o+3Qr æ±, qgmi jq næ jk mæibohk mᵠm
i_ qjᵘᵇ mi b)Oc jpkpoqjᵘᵇ ð n o t mnᵠqj m_ᵠᵠ mæjh æ jpkpoi j_ q æ A= kᵠ)ᵠᵠ
m jhh i_ _q pn , qgmi jm æ mnᵠqj m)Pn lp æji . q gpgo mnᵠoi jamᵠqj m_ᵠᵠ m)
Q ᵠ knjq æddi t oᵠᵠcoᵠ _n grb mᵠᵠ mnᵠqj m m m jhh i_ _)Cjr q mææ q ᵠ n m qj cᵠc
æ mbpgq m_ᵠᵠ hjm npn kᵠg q i jᵠ æ æib jpkpoqjᵘᵇ pm t)

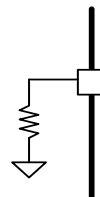
r c m

- $M_{A=Z_{O,K}}$ စစ်ဆေးမှုများကို $M_{A=Z_{O,K}}$ နှင့် $M_{A=Z_{O,K}}$ ကို ဖော်ပြသည်။
- $M_{A=Z_{O,K}}$ စစ်ဆေးမှုများကို $M_{A=Z_{O,K}}$ နှင့် $M_{A=Z_{O,K}}$ ကို ဖော်ပြသည်။

Oc N O- ,+ dlobmon i dlo m gnja(nono dnpðæ omh kn æ mami qjgub anj h u nj qjgub +)3Q
mami qjgub d /h n)ðæ I kð d k p g g r ,)+0Q nr d cð b n g k n i _æ dlo m gnja(nono m n o n)
Oc njæ(nono nj m n o n p n d b n c p o j r i _p q æ m g j q n g _d b)

Oc nr d c d b a m l p i t j a c c N O- ,+ d n o t k g d b m n d q m o i M O k d i _ c b n p i _)

D mndqrm ~~ad~~banlp i t h j_ mndqmkg _ σ i MOkd q æ bripi_ n σ æ nr ~~o~~cdbanlp i t
jq m r d_ mi b a n h . +FCu q 3++FCu)MOkd ~~hi~~jo g r _ q_ g a a j ~~ad~~b j m c j r o _ q æ bripi_)Pn
l p ~~ad~~i / j m æ k g o d A b p m , +) q _ o r h d æ m n d o i a m nr ~~o~~cdbanlp i t i _)



R c m

anr ɒ nr ɒ cɔɪb ɡj f aml p i t

Adpm, +)N oib Aml p i t

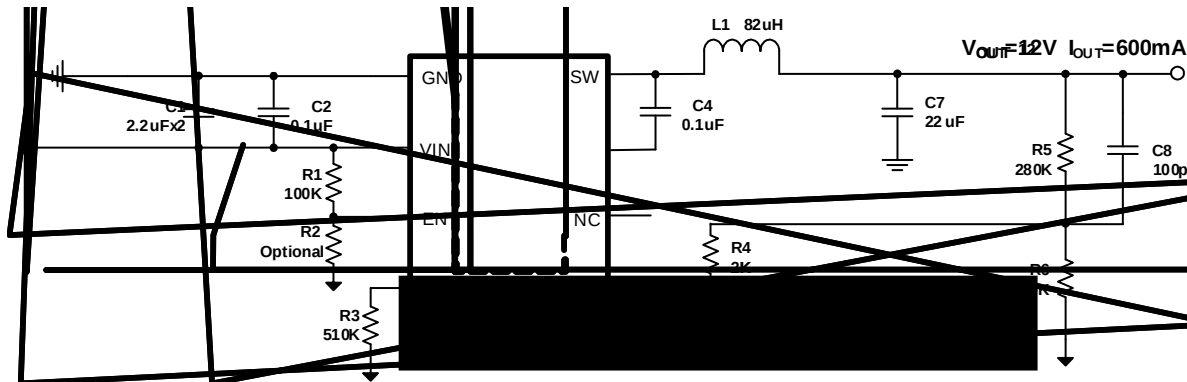
)

i so m g j j o m k k d i m o i = J J O k d i _ N R k d k j r m a e a j a i b b o _ n d m j c d c (n d k j r m H J N A O) O c j j o m k k d m j q u b d c r b _ a n h i d o b m o _ q j u b m b p g d m r c i c d c (n d k j r m H J N A O d j a i _ g r (n d k j r m H J N A O d j i)

O c d i _ p q m p m i o d h j i d i m _ p n d b g r (n d H J N A O L - j i) O c N O , + d k g h i o j q m p m i o k n j o a j i r d t g (t (t g d i b g r (n d H J N A O q u t p m i o i _ g r (n d H J N A O q u t p m i o q q j d d i _ p q m p m i o p i i d b r t _ p n d b p i s k o _ j q n j _ j m j p d k p o c m n c j r j i d j i)

O c N O , + d k g h i o a J q r (q j u b K n j o a j i J Q K d n p d n q h d d d j p d k p o q j u b j q m c j j o _ p n d b g _ o m i n d i o m j q n d b a n h j p d k p o a p u j i d j i j m g d c o g _ o m i n d i o) O c j q r q j u b j h k m q m d J Q K d n p d j h k m n a A = k d q j u b q a d o m g m a m i q j u b) R c i A = q j u b s _ n , , + j a d o m g +) 3 Q m a m i q j u b a c d c (n d H J N A O p r n j a q q j d j p d k p o q j u b j i a i p q d m n) R c i a A = k d q j u b a u g r , + 0 j a c +) 3 Q m a m i q j u b a c d c (n d H J N A O i p r n j i b d)

O c N O , + k n j o o a _ q d a n h a _ h b _ p n d b s n n d c o i _ k j r m d n d a j i j i d j i n) J i a e p i a j i o h k m q m s _ n , 12 a d o m g a r h g n i n j m q k n k j r m H J N A O n r d c d b) R c i a e p i a j i o h k m q m a u g r , . - a _ q d m n o r n r d d o m g n j a n o r a k c n)



DkpoQj ɸ b	/3Ql j m g -/Qg , ++Q
J pdkpoQj ɸ b	, - Q
H s d h p h J pdkpo p m i o	1++h
Nr ɸ c d b A m l p i t	0++ F C u
J pdkpoqj ɸ b n k k g k f g k f	0+h Q
Q m i n d i o M n k j i n 1+h g 0/ +h g _ n o k	Qj p o 8 / ++h Q

Oc jpdqpoqj b d n o t i s o m g m n d j m d d m
M0 i _ M1 d d k d g k k d d i n c h d)
M j h h i _ M1 m n d o i d , +) F) P n l p d i
0 d g p g o M0)

**Table 1. Rs, R₆ Value for Common Output Voltage
(Room Temperature)**

.) Q	1.)0 F	- + F
0 Q	, +0 F	- + F
, - Q	- 3+ F	- + F
- / Q	03+ F	- + F

— 0
r c m5

- Q_M A d d a _ f m a m i q j d b d k d g
+) 3 Q

i s o m g q j d b _ d d m i s j n j a M, a j h d d k p o d l k d

- Q_{PO} ණය j p d k p o q j ් b
- Q_h ණය ධ k p o q j ් b

Nධ ණය ධ_p q j r p m i o n k k g ධ m n n r ණය ධ k p o q j ් b n j ණය h s ධ p h ධ k p o q j ් b ධ k k ් ට j ධ ් t n p n _ q j g p g o ණය h ධ p h ධ_p o i m l p ධ n _) P n l p ට j 4 q j g p g o ණය ධ_p o i q ් ්)

4

R c m

- G_h ණය h ධ p h ධ_p o i m l p ධ n _
- a_r ණය n r ධ c ධ b a n l p i t
- Q_{PO} ණය j p d k p o q j ් b
- Q_{h s} ණය h s ධ p h ධ k p o q j ් b
- D_{PO h s} ණය h s ධ p h ් _ p m i o
- G_M ධ j a d d i o j a ධ k k q j D_{PO}

O c q o g p m i o a j r ධ b a n p b c ණය ධ_p q m ණය ධ_p q m k k g p m i o k ් n ණය j p d k p o p m i o R c i n g ධ b i ධ_p q m c j j n ධ m o _ p m i o n k d ් ් ණය n ් m ට j p m i o g r b m a i ධ k f j k m ට j p m i o i _ M H N p m i o ් j i o s _) O c m a j m ණය k f n r ධ c ධ b p m i o j a ධ_p q m ධ k f i _ ධ M H N i g p g o _ n ධ l p ට j , + i _ l p ට j , ,)

, +

R c m

- ධ k f ණය ධ_p q n k f p m i o
- D_{PO} ණය ් _ p m i o
- ධ k k ණය ධ_p q n k f (q (k f p m i o
- ධ M H N ණය ධ_p q n M H N p m i o

D j q n ් _ ධ b j m ් _ o n i n d i o j i _ ට j i n ණය ධ_p q m ් ් p m i o i ධ m n p k q ණය n r ධ c p m i o ් ් ට j a ණය _ q d r c d c ධ k d ් ් + 3) O c h j n o j i n m ් ් k k n ් c ධ q c j j n i ධ_p q m ණය n ් m ට j p m i o m a i b b m o m a i + 3) = p n j a c h s ධ p h ධ k k ් ් ් ් t _ q d ණය h s ධ p h j p d k p o p m i o a c o a N O _ , + i _ ් ් m ් ් k i _ n j i a ධ_p q m p m i o n k k g) O c p n ණය h s ධ p h _ n ධ _ j p d k p o p m i o ් ් a ් ් n g ට j j a ධ_p o i) O c n h ් ් m ධ_p q m n p ් ් g r b m ධ_p q m p m i o n k k g g _ ධ b q c ධ c m h s ධ p h j p d k p o p m i o)

A j m a ් _ n ධ i p n G M 8 +) - j m +) . i _ ණය ධ_p q m ් ් ් g p g o _ q . . p C) O c M H N ධ_p q m p m i o ් ් 1 + + h i _ ණය i _ k f i _ q ් ් ් ධ_p q m p m i o ් ් 3 1 + h i _ . / + h m n k ් ් ්) O c c j n i ධ_p q m R 2 / 2 2 , / . . + r c d c c n n ් m ට j p m i o m a i b j a -) 4

O c ධ k p o p m i o q ණය n o k (j r i j i q n o m ් ් ් j i a i p j p n ණය m a j m ධ m l p ධ n k ට j m ් n p k k ් ් ණය p m i o q ණය n o k (j r i j i q n o m c ් ් h ධ o ධ ධ b ණය ධ k p o q j ් b) P n k ට j m r ණය g r N M a j m ් n k r a j r h i) m h d k ට j m r ණය S O M j n S 2 M _ d g ් ් n m p n p ් ් n p b b n o _ p n j a c ් ් r N M i _ n h ් ් h k m q m j a d d i o i _ ධ n ් i b ් m j h h i _ _ q j p n i j a m ් r m ් ් k ට j m) b +) , p A r ණය n h ් ් k f b n ් + 3 + 0 q a ් m c ධ c a n l p i t n r ධ c ධ b i j ්) K g ණය n h ් ් n ් k ට j m n ් n q j Q D i _ B l k ධ n n k j n d g)

Oc qjgub maibjaac dikpo k djm pno bm omac i ac h sdhph dikpoqjgub) i_ ac k djm pno
gjc q nkgg pmiomab bm omac i ac h sdhph dikpo pmiomnkg) Oc MHN pmiomac dikpo
k djm i gpgp_ pndb lp dji , -)

Oc rjmo n ji_ dji j pm oQd8- %QJPO r c m5

Ajmdkgd dji cjjn i dikpo k djm ac i MHN pmiomab bm omac i c gjaac h sdhph g _
pmio)

Rc ing adb mhd k djm di _nq jind_ mac aa ad qg ja k djm_ mndb nac
dnqjgub njnn k djm m n n)

Oc dikpo k di qg _ omd nac dikpo nkg qjgub jaac mbpgjnh Oc dikpoqjgub nkgg i
gpgp_ pndb lp dji , / i_ ac h sdhph dikpoqjgub nkgg j pm o0+ _pd t g)

Ajmad s hkg am -)- AS2M mhd k djm mo_ ajm, ++Qd k mgg m pn _) i_ +), Ajmad c(
anl p i t adndb k djm nkg _ n gn nkjndg qj ac _ qd kdn)

+, A mhd k djm pno jii o_ o i =JJO kd i_ NR kd ajmknk mjk madi) mhd
k djm ac S0Mjm onbm_ _dg ad am jh h i_ _) Oc k djm cjpg_ c q -0Qjmadc rjgub
madb)

Oc n g dji jajpkpo k djm ad aa ojpkpoqjgub nkgg dno _t no o i_ g _ amindiok rjrh i)

Oc jpkpndkg dnniadg jhkjn _jaaj k m) Ji d pn _ t ac d_p g m pmiomnkg bjd b ac n pbc
ac lp d gioN ndn Mndoi NMjaac jpkpo k djm i_ ac jaam pn _ t ac d_p g m pmiomnkg
c rdb i_ _d c rdb ac jpkpo k djm) Qj cdq nh g jpkpoqjgub nkgg cjjn gr (NM jpkpo
k djm mhd k djm Ajm mhd k djm ac k di _ jhd on ac jpkpo nkgg) Ajm
ndkgd dji ac jpkpoqjgub nkgg i nnd o_ t lp dji , 0_ nd _)

R c m

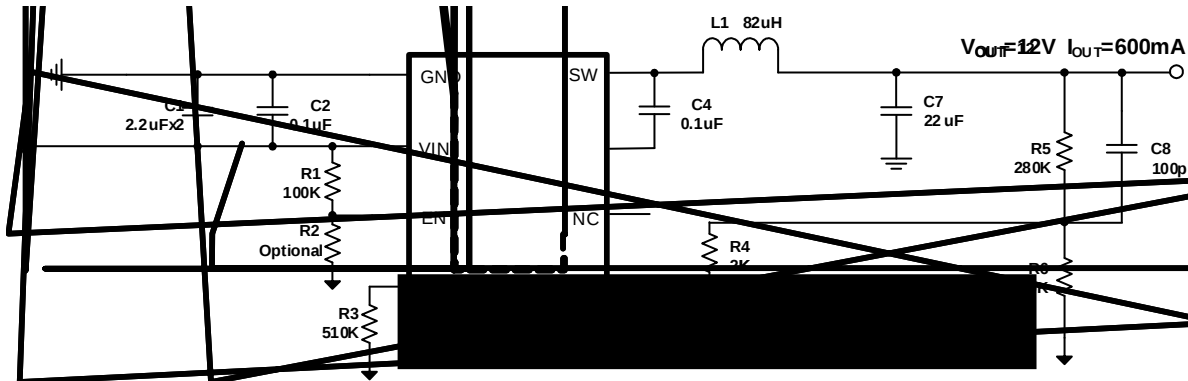
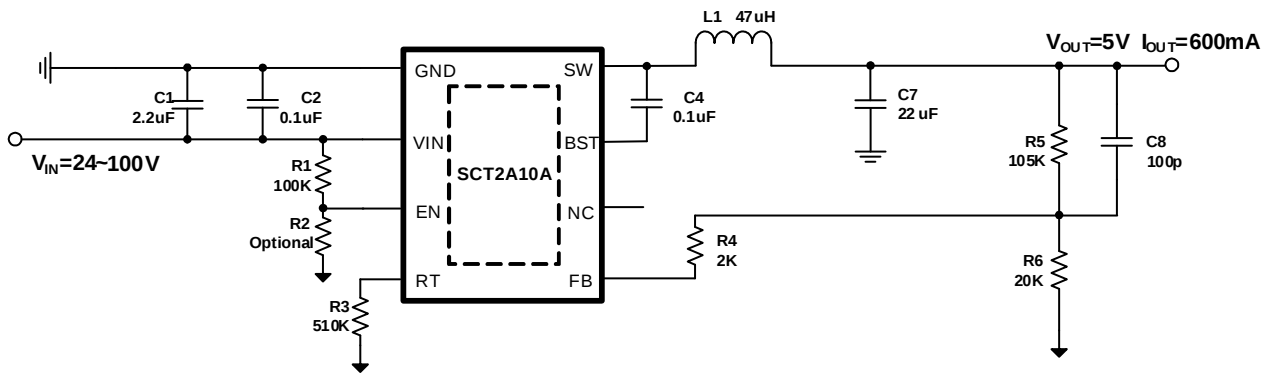
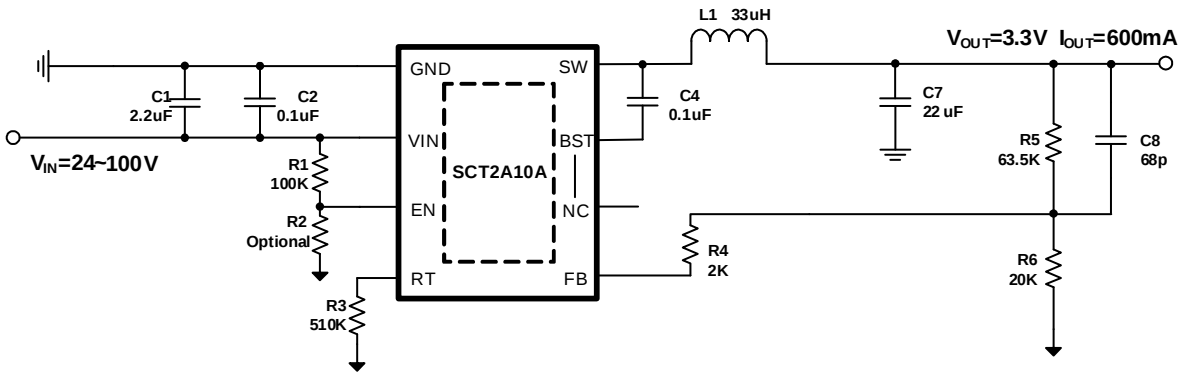
- ad jpkpoqjgub nkgg
- ar ad nr d cdb anl p i t
- Gac d_p oi jad_p g m
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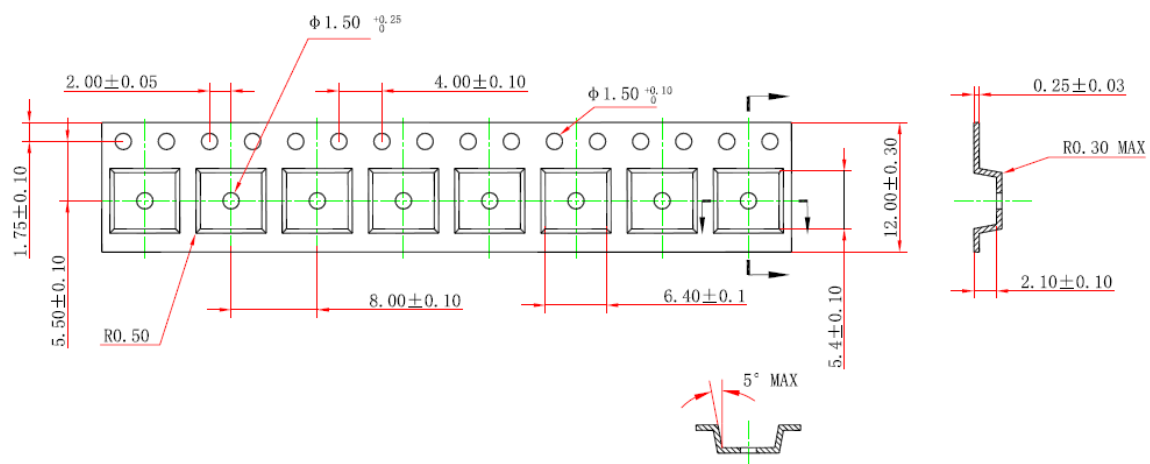
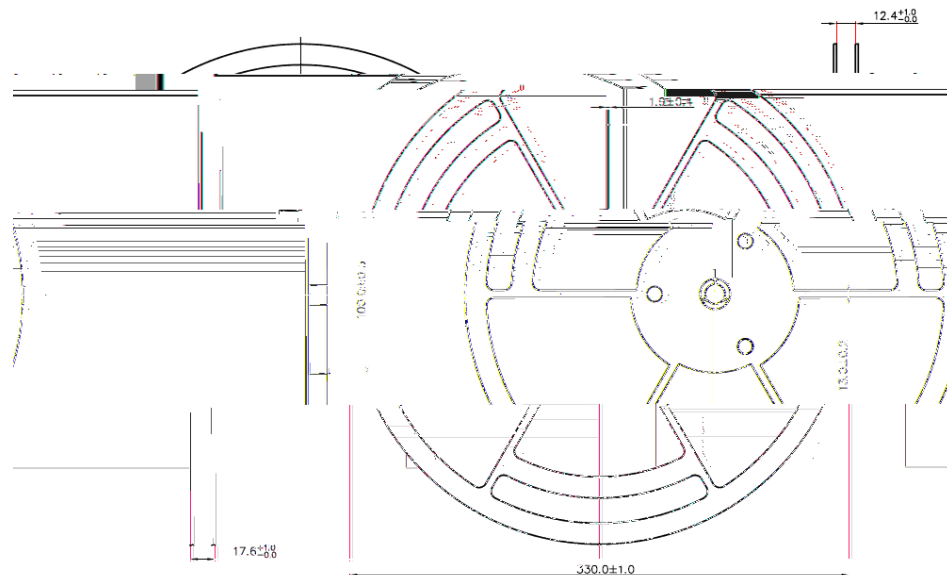
p g k djm _bm_ db pi_ m dn ac dnqjgub i ndi ad i d m_p k di) mhd
k djm i gn hjnojaac d k di omo_ qjgub) Oc majm g q h rdb ji ac qjgub maib d
inpm _lp o aa ad k di) Qkd g jji -- A mhd jpkpo k djm rjrh ajrh jno kkg dji n)

Tek 停止
 LTM SW
 VOUT
 IL
 2.00ms 500M次/秒 14.0 V
 1 20.0 V 2 20.0 V 3 10.0 V 4 500mA 5 0.088000ms 6 10M点

20.0mV 20.0V 500mA 2.00μs 2.506次/秒 10M点 3. -149mV







Oc dajrh aji d aad j ph i o d n p e o g c i b r a d j p o i j a d) P n m n c j p g r m i o i _ b p m i o a c a d n
 k n d D o g g p g k r n k n d n b c n m i j o d a n b _ p k j i r c i d o b m a i b N d j i j i o i o c i j g b t N O k n p o d g i t
 k k g a j i) N O r a j j o n n p h i t g b g m n k j i n d a d a m i t n d k k g a j i n)