

4.2V-60V Vin, 3A, High Efficiency Step-down DCDC Converter with Programmable Frequency

IHD XUV

- T fab fkmqO kdb71+S*3-S
- 0 l kqrlrpLrqm q rakkq
- -5S . Qba_ h Obdck b Sl iq db
- Fkpdo pha //-j Ede*Pfab J L PCBQ
- Ilt Nrtp bkq rakkq7.--r
- Mripb Phfmkd JI ab %PJ &fk ifeqil a
- .--kp J fkrj rj L k*dfj b
- agpq _ib Pl dfpq aQfj b
- Fkdk i l j nbkp qf k d oB pbl cRpb
- agpq _ib Cdnrbk v.--HEwd . #J Ew
- Buok i il hPvk ed kfw qf k
- Mb fpl k Bk _ib Qedpel ia d oMd do j j _ib fkmq
Sl iq db RkabSl iq db l l h LrqMd qf k %RSI L &
Qedpel ia ka Evpdopfp
- Ilt Ad nrqJl ab L nbo qf k
- LsbSl iq db ka LsbQj nbo qd Mb qf k
- s fi _ib fk k BPL M*5I M h db

DSSOIFD IR VC

- ./S)/1*S)15*S fkmqpx ka Qib l j M t bo
Pvpfj
- fkmqpf i rdj qf k ka JI q o l kqi
- Sbef ib bppl dbp

GHVFULS IR C

Qeb P Q/30/ fp 0 _r h l ksbapot fpt fab fkmq
sl iq db) o kdkd aj 1+S q 3-S)t ef e fkdpo dpp k
//-j efde*pfab J L PCBQ+Qeb PF

UHYLMR ØKLV RU C

KL QB7M db kr j _bø d ombsl rp øsfl kp j v

PP	3	
DKA	4	Dð rka
PT	5	Obdri d opt fç efkd l rqrqr l kkb qPT d k buððk imt bofkar d o
Qebq i M a	6	Eb qafppfm d k m ç l cafb+Bib çf iiv l kkb d k d DKA m k+J r p q _ b l kkb ç a d dð rka m k b l k M d omð nbo l nbo d k k a l m f j f m b a ç b q i n b æ q j k b +

UHFRP P H GHGQRSHUD L ÇFR GL IR VC

L sbol nbo dkd æbb* fofj nbo q d o kdb r kibpp l çebd f b kl ç a

S _{IK}	Æm r qsl iq db o kdb	1 ÷	3-	S
S _{L RQ}	L r q m r qsl iq db o kdb	- 5	24	S
Q _G	L nbo dkd g k d l k ç j nbo q d o	*1-	. 2-	

HVGUD L VC

S _{BPA}	Er j k l av J l abi% E J & nbo KP F GBAB *G* - - . * / - . 1 pnb fç d l k) ii m k p % &	*/	(/	hS
	e æba Absf b J l abi% A J & nbo KP F GBAB *G* - - / * / - . 1 pnb fç d l k) ii m k p % &	* - 2	(- 2	hS

- (1) GBAB al r j bkq GBM 22 p q ç p ç q 2 - - S E J iil t p p ç j krc q dkd t fç p q ka æ BPA l k q i m ð b p p +
(2) GBAB al r j bkq GBM 24 p q ç p ç q / 2 - S A J iil t p p ç j krc q dkd t fç p q ka æ BPA l k q i m ð b p p +

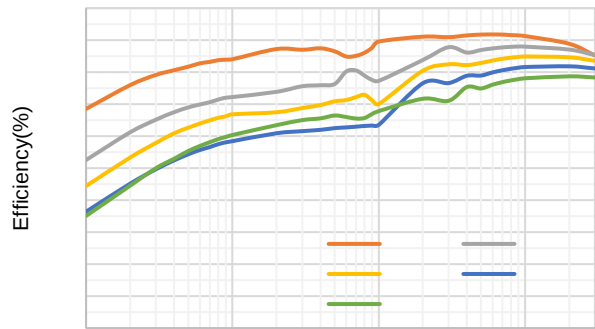
KHUP DOQ I RUP D IR C

O _G % & % &	G k d l k d j _ f k q ç b q i ç p f q k b	04-06	, T
æ % &	G k d l k * d * d m e o ç d w d l k m o j b ç o	4 ÷ 3	
G % &	G k d l k * d * _ l æ e o ç d w d l k m o j b ç o	. 3-1	
O _G q m % & % &	G k d l k d p b ç b q i ç p f q k b	4. -44	
O _G % &	G k d l k * d * _ l æ ç b q i ç p f q k b	. 3-6/	

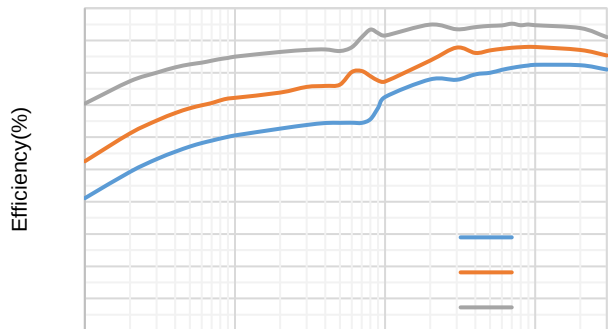
% & P Q mð sfabp O_G ka O_G kr j _ b ç l k i v p d d d k b d b p ç j ç g k d l k ç j nbo q d p l ç b absf b p + O_G ka O_G d k l q e o ç d p d l c m h d b f b i o _ r q l c j k v l ç b o p v p ç j i b s b i e o ç d p d p p r e p ç b a b p d k k a i v l r q l ç b m k ç a f o r f q _ l æ % M & l k t e f e ç b P Q / 30 / f j l r k ç a) ç b q i m a p f w b) k a b u ç d k i b k s f d k j b k q i c d ç + Q e b M _ l æ f e b q p i k h ç q f p l i a b d a d ç b i b a p k a ç b q i m a l ç b P Q / 30 / + e k d f d ç b a b p d k l o l k d r o d l k l ç b M _ l æ e k d b p ç b b æ f b k v l ç b e b q p i k h k a ç b d d d ç b q i O_G ka O_G +
% & J b p r d a l k GBPA2. *4) 1* i v b o M + Q e b s i r b p d f b k f k ç p q _ i b d o l k i v s i f a d o l j m d p l k t fç l ç b o m h d b p k a k k l q _ b r p b a d o a b p d k m r m t p b p + Q e b p b s i r b p t b d i r i ç a f k l æ k b t fç GBPA2. *4 k a p f j r i ç a l k p n b f b a GBAB _ l æ + Q e b v a l k l q d m t p b k q ç b n b æ q j k b l _ q f k b a f k k q i m i f d l k +

$$S_{\text{FK}} : (1S) Q_G^{*1} - \dots / 2) \alpha m f \text{ is irb f o p p a r k a b o } / 2 +$$

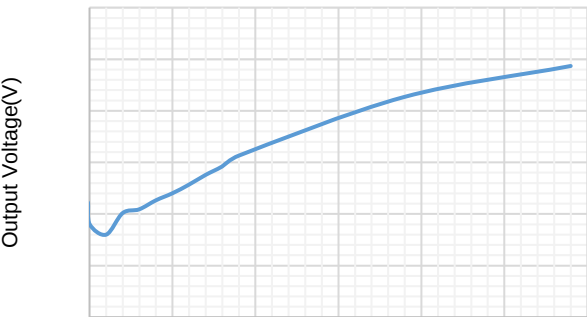
SIFDOÆKDUDF HULV IFVC



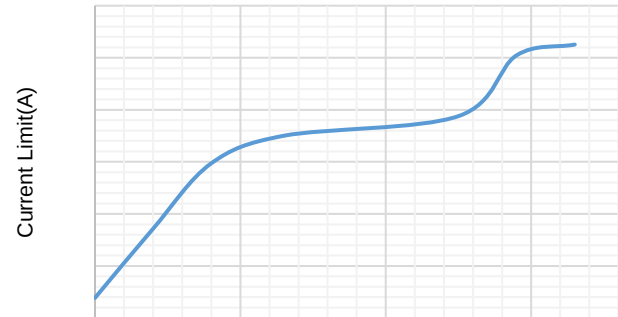
Output Current(A)
Cfd r d / +Baf fbk v sp II a r æbk q Sl r q 2S



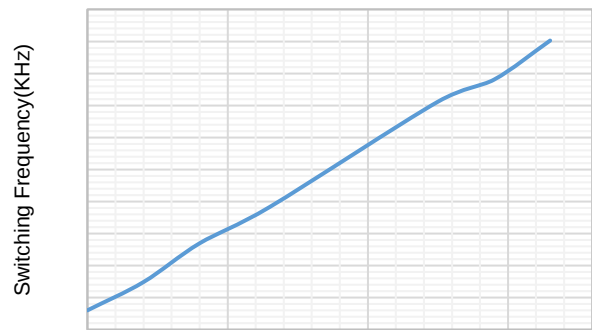
Output Current(A)
Cfd r d 0+Baf fbk v sp II a r æbk q Sl k: / 1S



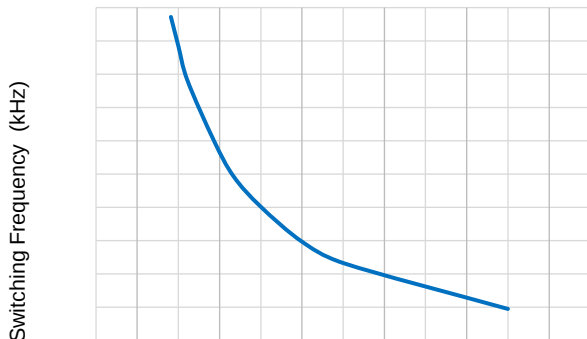
Output Current(A)
Cfd r d 1+I a Obdr i q k) Sl k: / 1S) Sl r q 2S



Temperature(°C)
Cfd r d 2+ r æbk q l fj fq SP Qb j nbo q r d



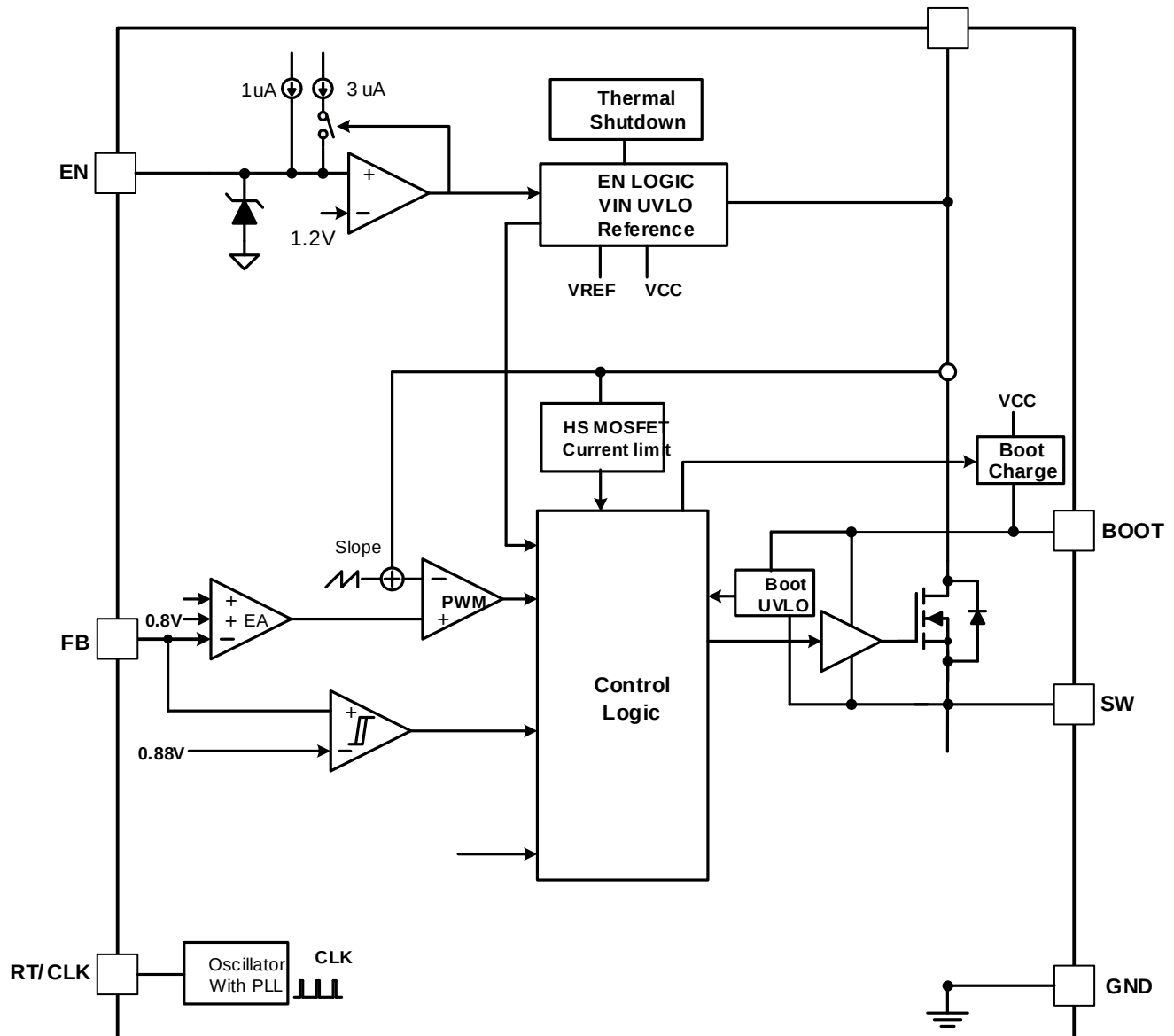
Temperature(°C)
Cfd r d 3+Pt fq e fkd Cðnr bk v SP Qb j nbo q r d



OQ % &
Cfd r d 4+Pt fq e fkd Cðnr bk v sp OQ Obp p d o

C
C

IX F IR DOEORFNGID UDP C



Cfdr d 5+Q k q k i il h Af do j

RSHUD IR C

Qeb P Q/30/ f 1+S*3-S fkmr q 0 l rqr q _r h l ksbapot fep fkdpo dpa // - j Oapl k efde*pfab mt t bo J L PCBQ+ f f j mibj bkq l kpq kq adnrbk v nb h r adkq j l ab l kq i d d d r i d l r q r q s l i q d b) n d s f a k d bu biibkqifkb ka il a q k p b k q d o p m k p b +

Qeb pt f q e f k d a d n r b k v f p m d o j j _ i b a d j . - - h E w d . + J E w t f e d l p b a f k d j l a b p) d o p f d o p b a f k d a d n r b k v j l a b ka q e b i l h p v k e d k f w d l k j l a b) d l m f j f w b p b f e b o q e b m t t b o b a f f b k v l o q e b b u d p k i l j m k b k p p f w b p + Q e b P Q / 3 0 / d o q d o p a g p q _ i b p l a f p q a d s l f a i a d b f k a p e r a d k q + Q e b a b s f b i p l p r m m a p j l k l i f e f p q a r m t f e m b * _ f p b a l r q r q l k a f d l k + Q e b p b j i b p p j l a b * q k p f d l k _ b d b b k M T J j l a b ka M P J j l a b l n b o d l k p b k p r d e f d e b a f f b k v l s b o t f a b i l a r a d k q o k d b + Q e b n r f o p b k q r a d k q f o q r n f i i v . - - r r k a b o k l i l a l o p i b m j l a b l k a f d l k d e f s b e f d e b a f f b k v q i f d e q i l a +

Qeb P Q/30/ e p a b c r i q f k m r q p q a r m s l i q d b l c 0 - 2 S t f e 1 - - j S e v p d o p f o + Q e b B K m k f e f d e * s l i q d b m k t f e m b f o l k q e d o p e l i a q e q k _ b r p b a d a g p q q e b f k m r q s l i q d b i l h l r q e d o p e l i a p t f e d l b u d p k i d o p f d o q d j b b q r o d e f d e b o R S I L p v p d j d o n r f o j b k q + Q i q k d B K m k b k _ i b p q e b a b s f b t f e q e b f k d k i m r i i * r m r a d k q d q e b m k + l k k b q k d B K m k d S F K a f d q v p q a p r m q e b a b s f b r d j q i i v +

Qeb P Q/30/ a i i m d o d l k d o q d o p f k i r a b q e b f k m r q r k a b o s l i q d b i l h l r q e b l r q r q l s b o s l i q d b m d o d l k) l s b o r a d k q n d o d l k t f e v i b * _ v * v i b r a d k q i f j f k d) l r q r q e a p e l a q n d o d l k ka q e b o j i p e r a l t k m d o d l k +

Qeb P Q/30/ b j m l v p d u b a a d n r b k v n b h r a d k q j l a b l k q i + k f k d k i l h f k f d p q d k f d l k q e b f k d o d p a e f d e * p f a b m t b o J L P C B Q N . f k b e v i b) q e b k f k a r d o r a d k q d o p b p i f k b a v + T e b k q e b r a d k q a d r d e e f d e * p f a b J L P C B Q d e b p q e b q e d o p e l i a i b s b i p b q _ v q e b L J M s l i q d b l c q e b f k d k i b a d o j m i f d o q e b f k d o d p a e f d e * p f a b J L P C B Q f o q d b a l a +

Qeb b a d o j m i f d o p o p b a s p q e b L J M k l a b _ v l j m d k d q e b s l i q d b l c q e b C m k t f e k f k d k i - 5 S d o d o k b s l i q d b + T e b k q e b i l a r a d k q f k d o p b p) d a r d l k f k q e b d b a _ h s l i q d b d o i q s b d q e b d o d o k b o f o p p L J M s l i q d b q i q e b s b o d b f k a r d o r a d k q j q e b p q e b f k d o p b a i l a r a d k q + Q e f o d b a _ h i l l m t b i i d o d r i d p q e b l r q r q s l i q d b d q e b d o d o k b + Q e b a b s f b i p l f k d o d o p k f k d k i p i l n b l j n b k p d l k f o r f o p d m d s b k q p r _ * e q l k f l p f i i d l k t e b k a r q v i b f p d d o p o q e k 2 - d o d u b a a d n r b k v n b h r a d k q j l a b l k q i +

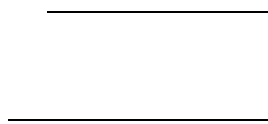
Qeb P Q/30/ l n b o d p f k M r i p b P h f m r k d J l a b % M P J & t f e i f d e q i l a r a d k q d f j m d s b a f f b k v + T e b k q e b i l a r a d k q a b d o p b p) k f k d j b k q f k q e b d b a _ h s l i q d b i b a p L J M s l i q d b a d m + T e b k L J M c i i p d i l t i j m q e d o p e l i a % 4 - j S q r n f i i v & a b s f b b k d o p M P J + Q e b l r q r q s l i q d b a b v p a r b d l r q r q m f d o a f o e a f k d a r d k d p h f m r k d n b d l a + L k b C s l i q d b a d m p i l t b o q e k q e b d o d o k b s l i q d b) ka q e b L J M s l i q d b q o p p _ l s b i l t i j m q e d o p e l i a + Q e b k e f d e * p f a b m t t b o J L P C B Q q d p l k f k k b u q i l h m r i p b + a p o p s b o i p t f q e f k d v i b p t f e q r n f i / - - j m b h f k a r d o r a d k q) L J M s l i q d b a d m p ka f o i j n b a d f k ka m r i p b p h f m r k d j l a b d o n b q f e q e b l r q r q l k q k r b p i f d e q i l a b a +

Qe f o l k q i p e b j b e b i m p e f s f k d e f d e b o b a f f b k v _ v p h f m r k d v i b p d d a r b p t f q e f k d m t t b o i l p p ka d d a d s b e a f k d i l p p + Q e b l k q i i b o l k p r j m f k n r f o p b k q r a d k q f o . - - r a r d k d p h f m r k d n b d l a t f e k l p t f q e f k d d f j m d s b a f f b k v a a p b o +

Qeb P Q/30/ f o b k _ i b a t e b k q e b S F K m k s l i q d b q o p p _ l s b 0 - 2 S ka q e b B K m k s l i q d b b u b b a p q e b b k _ i b q e d o p e l i a l c . + S + Q e b a b s f b f o a f o _ i b a t e b k q e b S F K m k s l i q d b c i i p _ b i l t 0 + S l o t e b k q e b B K m k s l i q d b f o _ b i l t . + 2 S + k f k d k i . r m r i i r m r a d k q p l r o b d B K m k i i l t p q e b a b s f b b k _ i b t e b k B K m k d i l q o +

BK m k f e f d e s l i q d b m k q e q k _ b l k k b d a d S F K a f d q v d p q a p r m q e b a b s f b +

Q o e f d e b o p v p d j R S I L q e d o p e l i a) l k k b q k b u d p k i d o p f d o o a f s f a b o % 0 . ka O / & p e l t k f k C f d r d 6 a d j S F K d B K + Q e b R S I L q o f k d ka c i i f k d q e d o p e l i a k _ b i r i d a _ v B n r d l k . ka B n r d l k / d o p n b q s b i v +

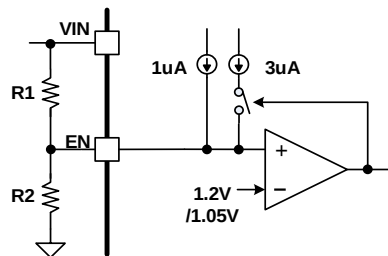


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t ebdb

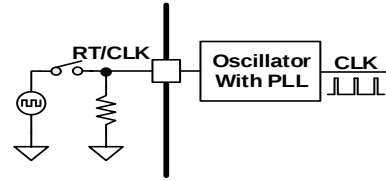
- S_{qpb} p d f k d e d p e l i a l c s f k R S I L
- $S_{\text{c.ii}}$ p c i i f k d e d p e l i a l c s f k R S I L



Cfdr db 6+Pvpdbj RSI L _v bk _ib afsfab

Qeb P Q/30/ ddr i dpp ebb fkdck i ddbdk b sl iq db q-5S t fep ±. d ibo k b l sbocbb l nbo dkd fj nbo q d ka sl iq db o kdb+Qeb l r qrr q sl iq db fp pbq _v dppfd o afsfabo d j ebb l r qrr q kl ab d ebb C nfk+Eq fp d l j j bkaba d rpb. d ibo k b l o_bqpdodppfd q+Rpb Bnr d k 0 d i ri d dppfd q k b l c dppfd o afsfab q+ Q fj m d sb baf fbk v qifdeqil ap)i ddbos ir b dppfd q d d d l j j bkaba+El t bsb d fcebs s ir bp d d l efde

fpd



Cidr d . - +Pbqkd Cdnr bk v ka
 il hPvk ed kfw d k

FR il h pvk ed kfw d k j l ab) qeb pt f q e k d a d n r b k v p v k e d k f w b p d k k b u d p k i il h m m i f a d OQ I H m k + Qeb pvk ed kfw d k a d n r b k v o k d b f p a j . -- HEWd . # J E w k a q e b d f i k d b a d b l c q e b P T p v k e d k f w b p d q e b c i i f k d b a d b l c q e b b u d p k i il h q OQ I H m k t f a q m f i 33 k p d j b a b i v + p n r d o t s b i l h p f i k i d OQ I H m k j r p q e s b e f d e i b s b i k l i l t b o q k / S) i l t i b s b i k l e f d e b o q k - 4 S) k a m r i p b t f a q i a d b o q k 5 - k p +

FR mmif qf kpt ebdo l qe dopfkd opbqkd adnrbk vjl ab ka il hpvk ed kfw qf k j l ab d kbbaba) qeb absf b
k_b l kddr da p pelt k fk Cfd r d .-+ bd d k budpk i il h f mdpbkq) qeb absf b t l dhp fk dopfkd opbqkd
adnrbk vjl ab+T ebk k budpk i il h mdpbkq) qeb absf b r d j qf iiv q kpfdl kp d j dopfkd opbqkd j l ab
d budpk i il hpvk ed kfw qf k j l ab+ k fk d k i me pb il hba il l m M l il hp fk d k i il h adnrbk v l k d qeb
budpk i il h t f e k q m f i 52rp+Qeb l k sb d o q kpfdl kp d j qeb il hpvk ed kfw qf k j l ab d qeb dopfkd o
pbqkd adnrbk vjl ab t ebk qeb budpk i il h a f m m b o +

k buɸɸk i ɪɪ ɸɸ m m fɪ o bɪ bɪk LLQ m k a PT m k m t b ɸ ɸ b d i ɸ k d d ɸ a d s b o d e f d e * ɸ a b m t b o
J L P C B Q ɸ e b ɪɪ ɸɸ m m fɪ o s l i q d b ɸ e a b a a j k k ɸ d o ɸ a s l i q d b d d r i d o t e b k e f d e * ɸ a b m t b o
J L P C B Q ɸ l ɸ k a ɸ b b u ɸ ɸ k i i l t * ɸ a b a f a b l k a r ɸ ɸ e b d o l i j b k a b a s i r b l ɸ e b LLQ m fɪ o ɸ - + C

Qeb RSIL I cefle*fab J L PCBQd p adfboe p d fkd e d p e l i a l c / 2S ka ev p d p p l c / 0 - j S + T e b k e b a b s f b
l n b o p p t f e f d e a r q v i b l o b u c p j b i v i d e q i l a) _ l l p p m m f i o j v _ b k l q d e a d b a f k l k p f a b o _ i b i l k d
d j b + Q e b s l i q d b q _ l l p p m m f i o p k p r a f b k q d a d s b e f d e * f a b J L P C B Q a i i v l k + T e b k e b s l i q d b d p p
_ l l p p m m f i o a d n p _ b i l t / + 4 S) L L Q R S I L l r p + Q e b l k s b a p o d o b p q d k f d l k k f k p d o p a i l t *
p f a b J L P C B Q n b d i a f i i v d d o d p e e b s l i q d b l c _ l l p p m m f i o d r o k p b e b l k s b a p o p l n b o d i k l s b o
t f a b a r q o k d b +

Ar dkd qeb l ka f j k l c r i q * i l t s l i q d b a f d b k b a d j q e b f k m r q d q e b l r q r r q P Q / 30 / l n b o d p f k i l t A d n l r q
l A L j l a b + e f d e * p f a b J L P C B Q d j f k p q d k f d l k p i l k d p q e b L L Q m k d P T n r k s l i q d b f e f d e b o q e k L L Q
R S I L q e d p e l i a / e S + T e b k q e b s l i q d b a d j L L Q d P T a d n p _ b i l t / + 4 S) q e b e f d e * p f a b J L P C B Q q d p l a k a
i l t * p f a b J L P C B Q q d p l k d d o e a d b _ l l q p m m f j o n b d l a f i i v f k q e b d i l t f k d p b s b o i p t f j e f k d v i b p +
l l t * p f a b J L P C B Q l k i v q d p l k d o . - - k p f k b e d o d o p e v i b d j f k f j f w q e b l r q r r q s l i q d b d m m b + l l t * p f a b
J L P C B Q j v q d k l k d o p b s b o i q j b p f i i q e b _ l l q p m s l i q d b f e a d b a d e f d e b o q e k / e S d o e f d e * p f a b
J L P C B Q t l d n f k d k l g i i v + Q e b b a b q s b a r q v i b l c q e b l k s b a p o a r d k d l A L l n b o d q k k _ b n m d e f k d q
- - +

Ar dkd pil t fkd nlt borm ka nlt boalt k nmif qf k) qeb l rqr qsl iq db k il pbiv qp h qeb fkmr qsl iq db o j nrkd
al t k qe khpd I AL l nbo qf k j l ab+ p qeb fkmr qsl iq db fp dbar ba d kb oqeb l rqr qsl iq db) f b + ar dkd pil t fkd
nlt borm ka nlt boalt k nmif qf k) qeb l æ f j bl qeb efde pfab J L P C B Q p q æ p d mnd e qeb j fkj r j s ir b +
T fcl rql AL l nbo qf k j l ab) _bvI ka qep nt fkg qeb pt fq efkd j v _b l j b boæ f ka, l oqeb l rqr qsl iq db t fi c ii
l rql cdodri qf k + Q sl fa qep md _ibj) qeb P Q / 30 / I AL j l ab rd j qf iiv dbar bp qeb pt fq efkd adnr bk v d
fk do pb qeb boæ qsb arg v ib ka j fkg fk d d ri qf k +

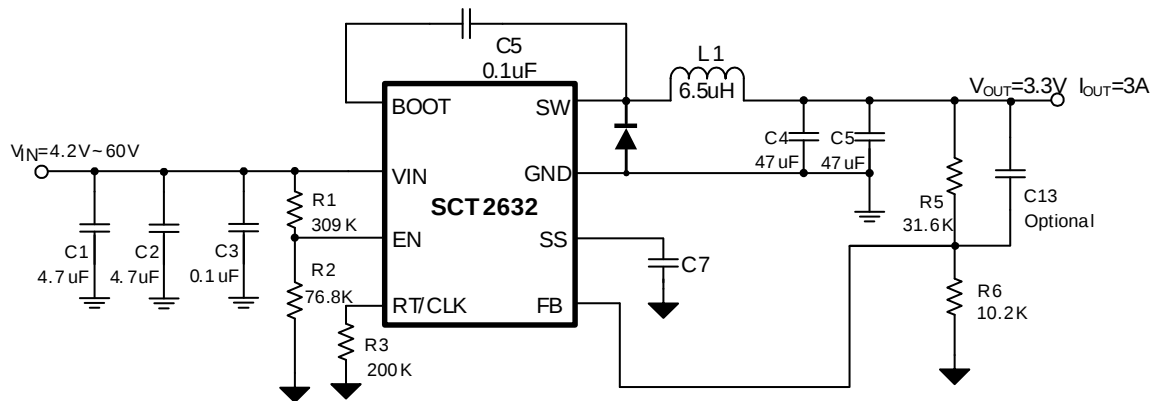
Qeb P Q/ 30/ f j mibj bkq l sbo r aabkqm d q k t f e d i a _ h r aabkqifj f+Qeb P Q/ 30/ v ib*_y* v ib ifj f p
efle*fab J L P C B Q n b h r aabkq d s l f a f k a r d o r aabkq a k k f k d t v a r a k d r k b u n b d a l s b o l a l o l r q n r q e a e
p e l a g l k a f d k +

T ebkl sbdl al oe æpel æpe mmpkp) æb l ksbæpo kkl qmð sfabl r qm r r æbkqd p æpævil æfkð ðnðr fæj bkq-
Qeb fkar q o r æbkqp i j nba ql sbo r æbkqifj fq q k+Qerp) æb l r qm qsl iq db ad mp _bil t ððri fpa sl iq db
t fæ C sl iq db ibpp æ k fæðk i fæðk b sl iq db l kækr l rpiv+

Qeb P Q/30/ fj nibj bkþaðnr bk v d ia_ h d m d þ q æ b l k s b a þ o f k r k b u n b þ a l s b a l a l o l r q n q e æ p e l æ
l k a f d k q e f d e b o p t f q e f d a n r b k f b p k a f k m q s l i q d b p + Q e b l p f i i d a n r b k v p a f s t a b a _ v .) /) 1) k a 5 p
æ b C m k s l i q d b c i i p æ j - 5 S d - S + Q e b P Q/30/ r p b p a f d f i a n r b k v d i a_ h d b k _ i b p v k e d k f w d k
d k b u þ d k i i l h a r d k d k l d j i p q æ r m k a c r i q l k a f d k p + A r d k d p e l æ f o r f q b s b k p) æ b f k a r d o r æ k q k
b u b b a æ b n b h r æ k q i f j f j _ b r p b l c æ b e f d e f k m q s l i q d b k a æ b j f k f j r j l k * d j b + T e b k æ b l r q n q s l i q d b
p d o b a i l t _ v æ b p e l æ p a i l a) æ b f k a r d o r æ k q a b d p b p p i l t i v a r d k d æ b p t f q e l æ * d j b + Q e b a n r b k v
d i a_ h b æ d f s b i v f k d p b p æ b l æ * d j b _ v f k d p f k d æ b n b d l a l c æ b p t f q e f d v i b n b s f a f k d j l d d j b d o
æ b f k a r d o r æ k q d o j m a l t k +

T f æ j u f j r j a n r b k v d i a_ h o d l c 5) æ b d p j u f j r j a n r b k v q t e f e æ b f k a r d o r æ k q k _ b
l k p i i b a _ v a n r b k v d i a_ h m d þ d k + B n r d k 3 i r i d p æ b j u f j r j p t f q e f d a n r b k v q t e f e æ b
f k a r d o r æ k q d j f k p r k a b o l k a p i t e b k S

DSSOLFD IR Q I RUP D IR C



ffm qSI iq db	/1S Kl q i1+S q 3-S
L r qm qSI iq db	0-0S
J u f j r j L r qm q r o b k q	0
Pt f q e f k d C o n r b k v	2-- HEw
L r qm qsl iq db d f m i b % b h q n b h &	. 3-2 j S
Q o k p i b k q O b p n i k p b - + 2 q / + 2 i l a p o m	Sl r q: . 3- j S
Pq a f f m r q S l i q d b % p f k d S F K &	2+40S
Pq m f f m r q S l i q d b % i i f k d S F K &	1+12S

Qeb l r q m q s l i q d b f p b q _ v k b u f d k i d o p f d o a f s l a b o
O2 ka O3 f k q m f i m m i f d l k p e b j q +
O b l j j b k a b a O3 d o p f d k b f p . - # H + R p b b n r d l k 4
q i r i f O2+

/ - 2 S

— % &

t e b d 7

- S_{OBC} f p e b d b a _ h d d d k b s l i q d b) q m f i
- 5 S

Qeb nb h*d *nb h dnmib r adbkqfk qeb fkar d oFMM k_b i ri pha p fk Bnr q k . . +

%. &

T ebd

- FMM f p qeb fkar d onb h*d *nb h r adbkq
- I f p qeb fkar q k b l c fkar d o
- qT f p qeb pt f q e fkd adnrbk v
- SLRQ f p qeb l r qnr qsl iq db
- SR f p qeb fkmr qsl iq db

Pfk b qeb fkar d o r adbkq dnmib fk do p b p t f p qeb fkmr qsl iq db) pl qeb j ufj r j fkmr qsl iq db fk nmif q k f p
it v p r p b a d i ri f p qeb j f k f j r j fkar q k b d n r f d a + R p b B n r q k . / d i ri f p qeb fkar q k b s i r b +

%/ &

T ebd

- I J R f p qeb j f k f j r j fkar q k b d n r f d a
- qT f p qeb pt f q e fkd adnrbk v
- SLRQ f p qeb l r qnr qsl iq db
- SR% u & f p qeb j ufj r j fkmr qsl iq db
- ERQ% u & f p qeb j ufj r j A il a r adbkq
- I F O f p l b a f f b k q l c F M M d E R Q

Qeb d q i r adbkq d t fkd q d r d e qeb fkar d o f p qeb fkar d o dnmib r adbkq m r p qeb l r qnr q r adbkq + T e b k p b i b q k d
k f k a r q d q J e l l p b f p o f a r adbkq b p n b f i i v qeb p q o q k r adbkq i a b o q e k f p n b h l n b o q k _ r a d b k q j k a l r q n
O J P r adbkq i p l k l q _ b b u b b a b a + Q e b d d d o) l a b k n b h p t f q e f k d r a d b k q l c f k a r d o F M B H k a F O J P k _ b
i ri pha p f k b n r q k . 0 k a b n r q k . 1 +

%0&

%1&

T ebd

- FMB H f p qeb fkar d onb h r adbkq
- ERQ f p qeb A il a r adbkq
- FMM f p qeb fkar d onb h*d *nb h r adbkq
- FOJP f p qeb fkar d o O J P r adbkq

R l s b d l a f k d l o i l a q p k f b k q l k a f d l k p) qeb fkar d onb h r adbkq k f k d o p b r m d qeb pt f q e r adbkq i f j f l c
qeb a b s f b t e f e f p q n r f i i v 2 + Q e b j l p q l k p b a s q s b n m d e f d e l l p b k f k a r d o t f p p q o q k r adbkq
o q k d d o f o q e k 2 + b r p b l c qeb j ufj r j F M B H i f j f d a _ v a b s f b) qeb j ufj r j l r qnr q r adbkq q qeb
P Q / 30 / k a b i s b o i p l a b n b k a p l k qeb fkar d o r adbkq dnmib + Q e r p) qeb j ufj r j a b p f d a l r qnr q r adbkq i p l
a b qeb p b i b

qeb j ufj rj fkar q o r adokq+P el qhv afl abp do qvrf iiv dl la el f b d oqeb qe afl ab arb d qeb foil t d d a sl iq db+Qeb il t boqeb d d a sl iq db l c qeb afl ab) qeb efdeboqeb baf f bk v l c qeb d d r i d q o

Qvrf iiv) afl abp t f e efdebo sl iq db ka r adokqo qkd p e sb efdebo d d a sl iq dbp+ afl ab t f e j f j r j l c 3- *S d o s b q e b s l i q d b f m d o d a d i i l t f k m r q s l i q d b q k p f k q r m d q e b o f a s l i q d b l c q e b P Q / 30 / +

Q o q e b b u j n i b a b p f d k) q e b 03- *.0 *C P e l q h v a f l a b f p b i b f a d o f p i l t b o d d a s l i q d b k a d l l a q e b o j i e o f o q o f p l j m d a d p j i i b o a b s f b p + Q e b q v r f i d d a s l i q d b l c q e b 03- *.0 *C f - + 4 s l i q q 0 +

Qeb afl ab j r p q i p l _ b p b i b f a t f e k m m d n r f p m t b o o q k d + Q e b a f l a b l k a r q e b l r q r q r a d o k q a r d k d q e b l a f j b l c q e b f k d k i m t b o p t f e + Q e b l a f j b l c q e b f k d k i p t f e f o r k q k l c q e b j u f j r j f k m r q s l i q d b) q e b l r q r q s l i q d b) k a q e b p t f e f k d a d n r b k v + Q e b l r q r q r a d o k q a r d k d q e b l a f j b f j r i d m i b a _ v q e b d d a s l i q d b l c q e b a f l a b d i r i f q e b f k p q k q k b l r p l k a r q k i l p p b p l c q e b a f l a b + q e f d e b o p t f e f k d a d n r b k f b p) q e b i l p p b p l c q e b a f l a b k b b a d _ b q h b k f k d l r k q + Q e b i l p p b p l c q e b a f l a b d o a r b d q e b e a f k d k a a f e a f k d l c q e b g k q k m f q k b k a d o s b q e b d l s b o v e a d b + B n r q k . 1 f o r p b a d i r i f q e b d q i m t b o a f p f m q k) f k i r a f k d l k a r q k i l p p b p k a i l p p b p l c q e b a f l a b +

Qeb 03- *.0 *C afl ab e p g k q k m f q k b l c / - - m C + R p f k d B n r q k . 2) q e b d q i l p p f k q e b a f l a b q e b j u f j r j f k m r q s l i q d b f . T +

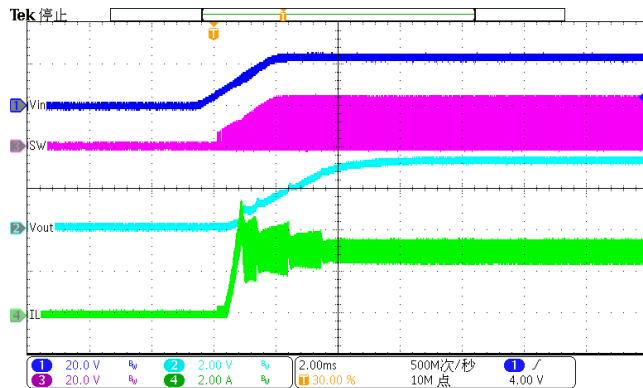
f e q e b m t b o p r m i v p n b k a p p f d k f k q j l r k q l c q j b q i f d e q i l a r a d o k q o f k p i b b m j l a b) l k p f a b o r p f k d a f l a b t e f e e p i l t i b h d b r a d o k q k a p i f d e q v e f d e b o d d a s l i q d b a d m +

%2&

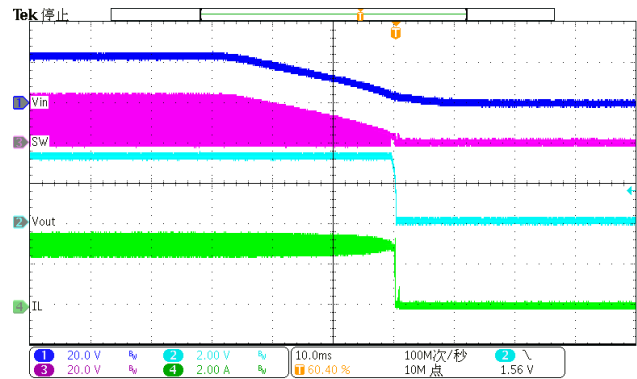
Qeb f k m r q r a d o k q d q e b p d n f a l t k A A l k s b a p o f a f o l k q k r l r p) q e b d d d f q d n r f b p m f d o d p r m i v q e b r a d o k q d q e b p d n f a l t k A A l k s b a p o t e f i b j f k q f k f k d q e b A f k m r q s l i q d b + R p b m f d o t f e i l t B P O d o b a p o m b a d q k b + b o j f m f d o t f e U 2 O l o U 4 O a b i b q f p d o r p r i i v p r d d b p f a _ b r p b l c q e b f o i l t B P O k a p j i i f j n b o q d l b a f f b k q) k a f q p p a d i v d o l j j b k a b a d r p b k l q e b o i l t b o s i r b m f d o % e l + - + r C & t f e p j i i m h d b p f w b % 3 - 0 & d a f o e f d e a d n r b k v p t f e f k d k l f b + M b q e b p j i i p f w b m f d o p i l p b d S f K k a D K A m k p p n t p p f _ i b +

Qeb s l i q d b o q k d l c q e b f k m r q m f d o j r p q _ b d d f o q e k q e b j u f j r j f k m r q s l i q d b + k a q e b m f d o j r p q i p l e s b d r m i b r a d o k q o q k d d d f o q e k q e b j u f j r j f k m r q r a d o k q d r m i b + Q e b O J P r a d o k q f k q e b f k m r q m f d o k _ b i r i f a r p f k d

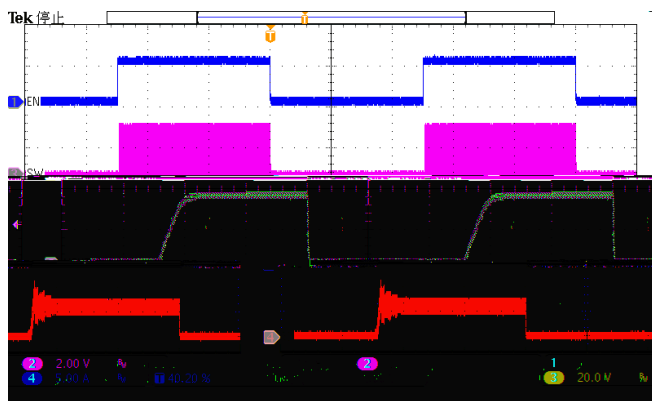
Sfk: /1S) SI r q 0-0S) r kibpp l æbd f b kl f a



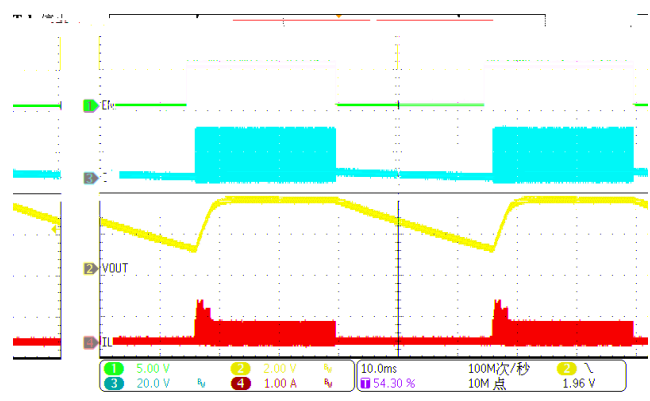
Cfdr d . / +M t bor n a: 0 &



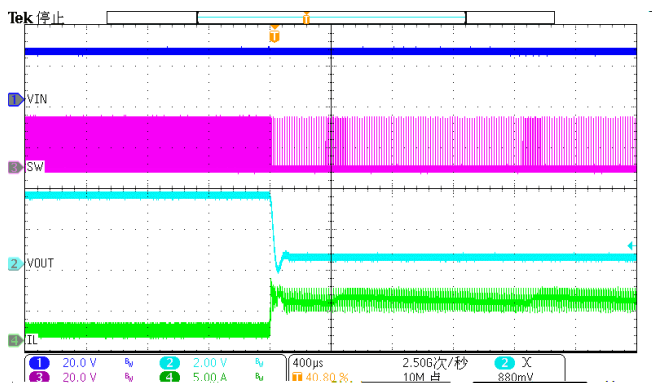
Cfdr d . 0 +M t boal t k a: 0 &



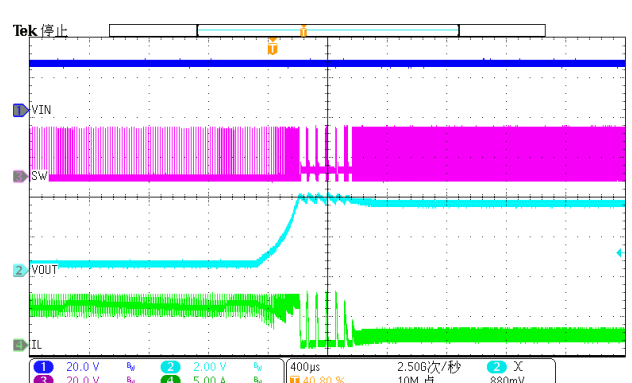
Cfdr d . 1 +BK d ddib a: 2 &



Cfdr d . 2 +BK d ddib a: / - j &



Cfdr d . 3 +L sbo r æbkqM d f k% d e æpel æ



Cfdr d . 4 +L sbo r æbkqObib pb % æpel æd . &

Sfk: /1S)Sl r q 0-0S) r kibpp l æbð fðb kl ða

Cidr ð . 5+ll a Qo kpfbkq%0 */ 4). ð ,rp&

Cidr ð . 6+ll a Qo kpfbkq%42 */ 2). ð ,rp&

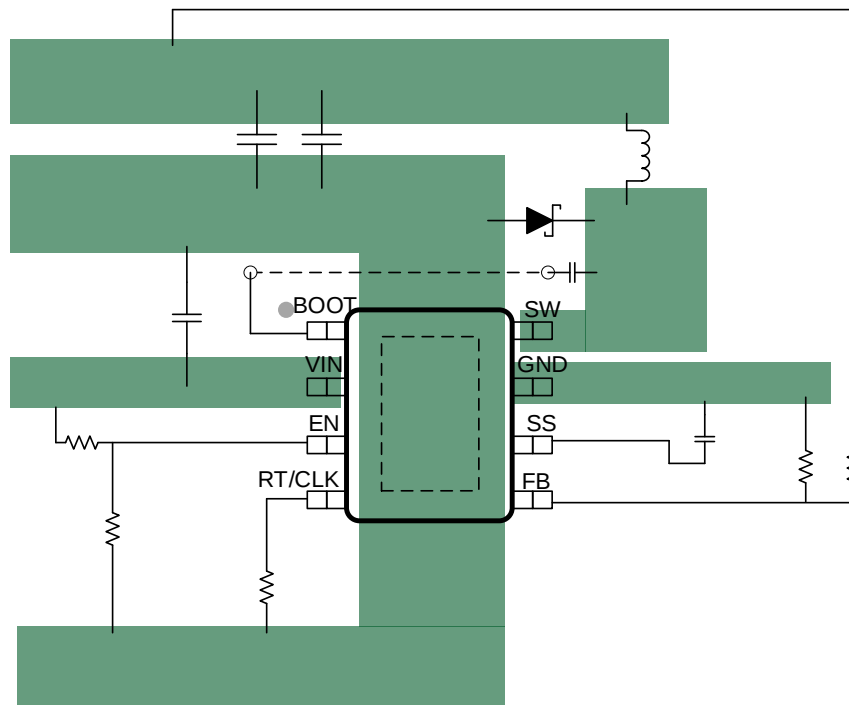
Cidr ð / - +L r qrr qOfmib % a: - &

Cidr ð / . +L r qrr qOfmib % a: . - - j &

Cidr ð // +L r qrr qOfmib % a: 0 &

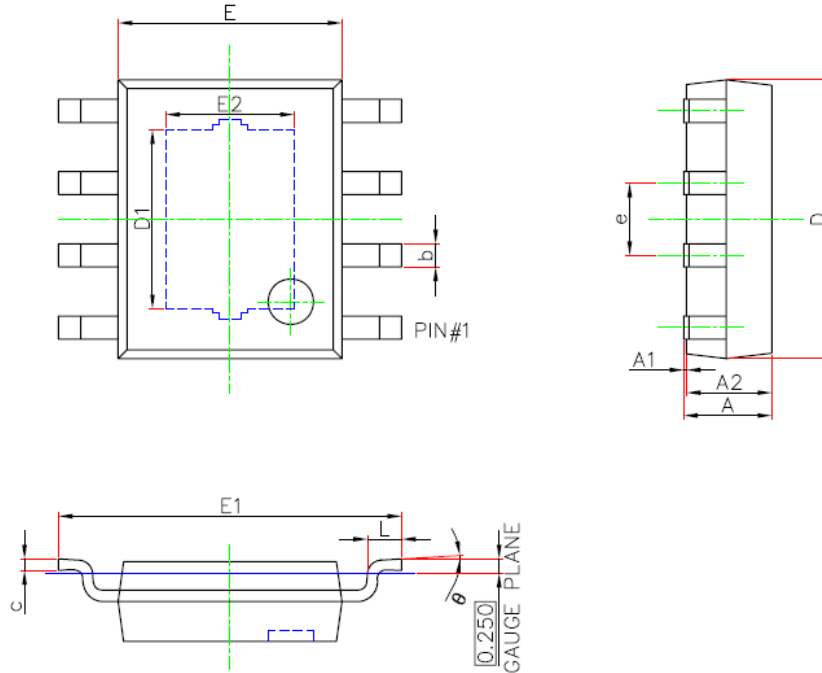
მონომ i v l r q f p d f i d o P Q / 30 / p p q _ i b k a b a f b k q l n b o d l k + Q e b q b p l k a r q k d c p q p t f q e f k d r a b k q l o s l i q d b p d o b p v d f k f o q t f e p q v f k a r q k b k a m o p f j m f q k b d d b k b o d k l f b k a a b d o a b n b a d j k b + Q o _ b a f o d p r i a p d i l t q e b p b d r f a b i f k b p p _ b i l t 7

1. M t b o d d r k a f k d p e b j b f p s b o v d f i _ b r p b l c a f k d m t b o q e b o j i) k a d i f q e _ l r k f k d k l f b p p l f f a t f e i l h a d n r b k v + Q e b q e r j _ l c a i b f p d j h b d d r k a q b i l t b p q f j n b k a b k b k a m t b o d a f o a f _ r f a b s b k i v l k M + P r a f f b k q v n i f k d d d r k a d o t f i l n a f j f w b q e b o j i k a k l q r p f k d l s b o e b q d o +
2. M b i l t B P O b o j f m f q o p i l p b d S F K m f k a q e b d d r k a p m p p f _ i b d d a r b m o p f j b a d q +
3. C o b t e b b i f k d a f l a b p e l r i a _ b m i b p i l p b d P T m f k a q e b d d r k a p m p p f _ i b d d a r b m o p f j b a d q +
4. Q o l n b o d k q a r i i o f a i l a) q e b d m p f a b d d r k a d j r p q m o s f a b a b n r d e b q a f p p m q k d d o + J h b p r d o d m p t f q e f k d i l l m t f e m t b o e s b i l t b o f j n b k a b k b l c d d r k a f k d +
5. Q e b _ l a j j i v b o f i a d b d d r k a m i k b l k k b f a d q q e b d d r k a m i k b l k d m i v b o _ v s f p + Q e b m t b o m a p e l r i a _ b l k k b f a d q _ l a j j M d d r k a m i k b p r p f k d j r i q m b s f p a f d q v r k a b o q e b F + Q e b b k f o q e b o j i m a p e l r i a i t v p _ b p l i a b d a d q e b _ l a d o j b e k f i p a b k d q e k a d i f _ f i f y r p f k d j r i q m b q e b o j i s f p r k a b d b q e q e b o j i m a + f j n a n b o p l i a b d k d q e b o j i m a d d d r k a m i f l k M t f i r p b P T e f d e b o d k d f k d k a l s b o e l l q _ b p f a b p a l t k d o a f k d q e b o j i n b a d j k b + f q f d l j j b k a b a 5 j f i a f j b f o a d i i e l i b p l c q e b o j i s f p) _ r q p j i i b o s f l a d q i b p p d p h l c p l i a b o s l i r j b i l p p + L k m m i f d k p t e b d p l i a b o s l i r j b i l p p q e r q e b s f p f l c l k b c k n i r d d f k d l o f k q f k d k _ b r p b a d e b s b d o n b q _ i b n o b p p +
6. L r q r q f k a r d o k a a b t e b b i f k d a f l a b p e l r i a _ b m i b a i l p b d q e b P T m f k + Q e b p t f q e f k d d l c q e b M l k a r d o j f k j f w b a d n a s b k q b u b p p f s b m f q s b l r m i f k d +
7. Q e b O Q l H d o j f k i f p b k p f q s b d k l f b p l q e b O Q d o p f d o p e l r i a _ b i l f a p i l p b p m p p f _ i b d q e b F k a d r f a t f e j f k j i i b k d q e p l c o b +
8. R S L L a g p q O Q d o p f d q k a d b a _ h l j m k b k p e l r i a l k k b q d p j i i p f d k i d d r k a t e f e j r p q d o q d q e b D K A m f k t f e l r q k v f k f d b s k d t f e m t b o d d r k a +
9. Q r d L L Q m f q o p b l k q e b l a b o i v b o q e k d m i v b o d n a s f a b t f a b m q e d o d m p f a b d d r k a +
10. Q o e f b s f k d _ b a f o q e b o j i n b a d j k b) d r d i v b o i v l r q f p p q d i v d o l j j b k a b a +



Cidr d / 1 + M l v l r q B u j m i b

SDFND HCL I RUP D IR



PL M5,MM962u. 0- &M h db L r qfkb Afj bkpfl kp

Pvj _i	Afj bkpfl kp fk J fiif bφφ		Afj bkpfl kp fk fκ ebp	
	J fk+	J u+	J fk+	J u+
.	. 0--	. #4--	- + 2.	- + 34
.	- + --	- + --	- + --	- + -1
/	. 02-	. 02-	- + 20	- + 3.
-	- 00-	- 0. -	- + . 0	- + / -
	- + 4-	- # 2-	- + - 4	- + . -
A	1 #4--	2+ --	- + 52	- # - .
A.	0+ 2-	0# 2-	- + / -	- + / 5
B	05--	1+ --	- + 2-	- + 24
B.	25--	3# --	- # / 5	- # 11
B/	/ + 3-	/ 03-	- + 52	- + 60
b	. # 4- %P &		- + 2- %P &	
l	- # 1--	. # 4-	- + . 3	- + 2-
θ	-	5	-	5

1. Ao t fkd mō m pba q _b j ab GBAB m h db l r qfkb JL */- s d f k+
2. Ao t fkd kl qd p ib+
3. ii ifkb oafj bkpfl kp d f k j fiif bφφ+
4. Qebq i m a pe ii _b pl iab d a l k q b _l a+
5. Afj bkpfl kp l cbum pba m a l k _l q j l cm h db al kl qf k irab j l ia d pe+
6. l kq qM _l a c _d f k d o j f k f j r j pl iab o j pht b _d ibo k bp _bq b b k q b m k p+

DSHD GOUHOL IRUP D IR C C

