

3.8V-40V Vin, 3.5A, High Efficiency Synchronous Step-down DCDC Converter with Internal Compensation

FEATURES

- N eglkl Xe 1*%M+ M
- Lgkf *%8: fekl flj Flklk: lli ek
- %M (= YXZbl i eZ MfđX
- ek iXk / d _J Xe , d Ćn J Gfn i DFJ= Kj
- Glđ Jbgge Df GJD n k_), l8 Hl jZ ek : lli ek eJc gDf
- Fixed Frequency 570kHz
- (ej D edld Fekd
-)dj ek ieXcjf kjkXkKd
- =i hl eZpJgi X Jg Zild =JJ Df lđkfe fi D l lZke
- Gi Zjfe eXYc K_j j_fc fi Gf iXd d XYc LMCf K_j j_fc Xe pjki jj
- Ćn ifgflkDf FgiXke
- imXYc emike MfđX l lđfi
- FmimfđX Xe FmiK dgiXli Gfk Zke
- 8mXđYc eXe JFG/ GXZbX

APPLICATIONS

- 9Xkip GXZb Gfn i Jpjk d : fi cjj Gfn i Kffđ : fi cjj fd 8ggcXeZ ife 8 if Df œ GJ KiXZb i kZ%
- : Xi k C_ki8 Xgkij : _Xi ij
- C jgđp
- LJ9Kpg : Gfn i cmip LJ9: _Xi e
- eljki XcXe D ZXc jki Yk Gfn i Jlggc j
- FgkZXc: fddleZXkeXe E knfibe Jpjk d
- 8lkdfkm Jpjk d

DESCRIPTION

K_ J: K)+** j *%8 jpeZ_ifel j Yl Zb Zfemik ij n k_n eglknfđX iXe e ifd *%M kf + M n_Z_ek iXkj Xe / d _j DFJ= K Xe X , d đn j DFJ= K%K_ J: K)+* (X fgke k_g XbZii ekdf Zekifcjl ggfikj k_ Glđ Jbgge Df lđkfe GJD n k_kpgZXc), l8 đn hl jZ ek Zii ekn_Z_Xjjkj k_ Zfemik i fe XZ_ me _ _ Z eZp Xkc_kđX fi jkXe Yp Zfe kfe%

K_ J: K)+** Xli j ek ieXcjf kjkXkn k_, . b q jn kZ_e i hl eZp%K_ Zfemik i Xđnj gfn i Zfemij fe ifd _ _ eglknfđX kf đn flklk mfđX n k_X d edld (ej fep

REVISION HISTORY

EFKj fEX el dYij fi gi mfl j i mj fej dXp i ifd gX el dYij ek_ Zi i ekmij fe%
l mj fe(%1l i n X T

ME	.	egl k j l g g p m f d X % f e e Z k X d Z X c Y p g X j j Z X g X Z k f i i f d M E g e k f E g e % G X _ i f d M E g e k f _ _ _ i h l e Z p Y p g X j j Z X g X Z k f i X e E d l j k Y X j j f i k X j g f j j Y c %
JN K_ id Xc GX	/	l l d k f i j n k Z _ e f l k g l k % f e e Z k J N k f X e o k i e X c g f n i e l Z k f i

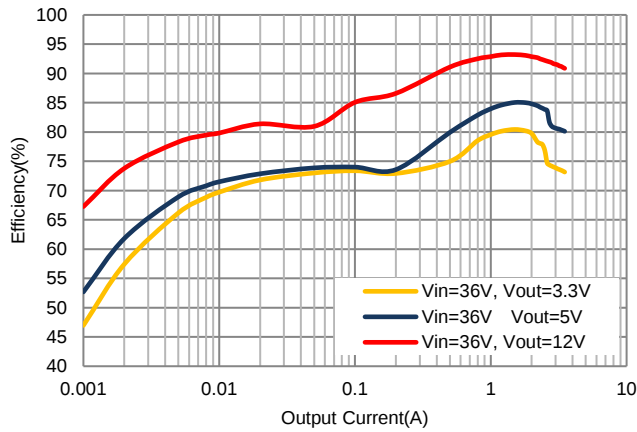
ELECTRICAL CHARACTERISTICS

M_{E4}) +M K_{A4} + : u(), : lpg Z_{Xm}X_t j k j k l e i), : %

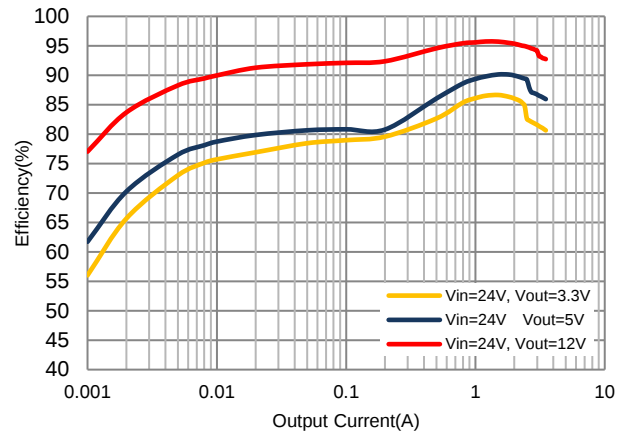
--	--	--	--	--

M _E	F g i X _{ke} egl knf ϕ X		* % +	M
M _{EVLMCF}	egl kLMCF K _i j _f c pjk i j j	M _E i j e	* % +	M dM
J E	J _i k fne Z _{ii} ek if d ME ge	E4 ef ϕ X E ϕ X _{ke} ef ϕ X efe jn kZ _e 9FFK JN 4, M	(	8
H	HI jZ ekZ _{ii} ek if d ME ge		) ,	

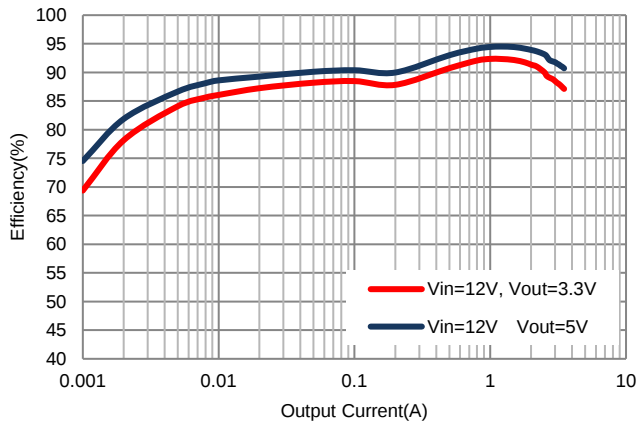
TYPICAL CHARACTERISTICS



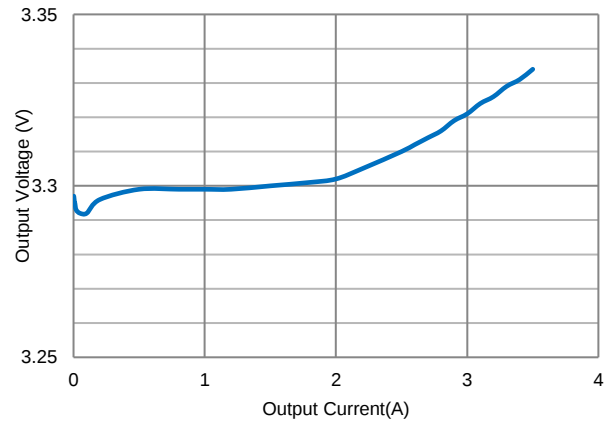
= I i) % Z eZp mj Cf X : I ii ek Me4* -M



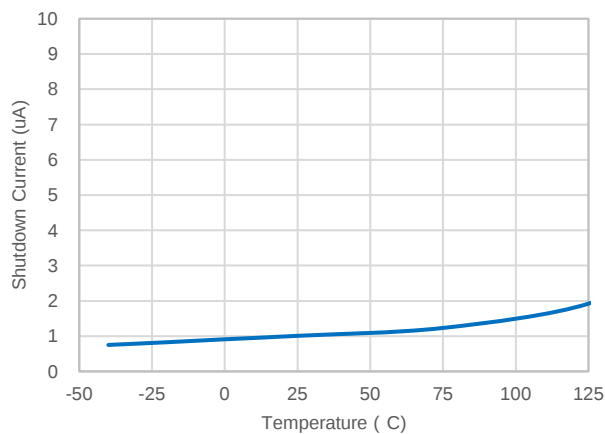
= I i * % Z eZp mj Cf X : I ii ek Me4) +M



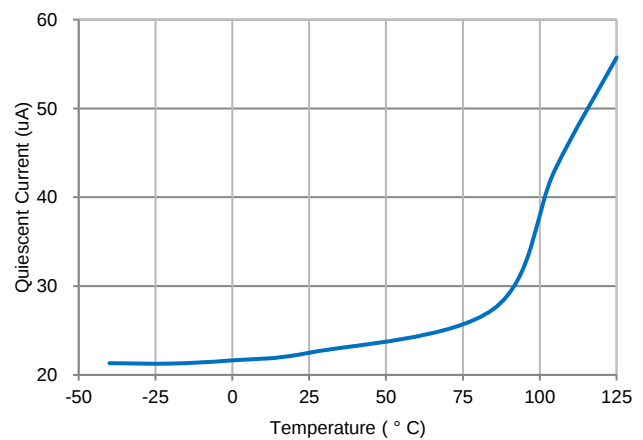
= I i + % Z eZp mj Cf X : I ii ek Me4() M



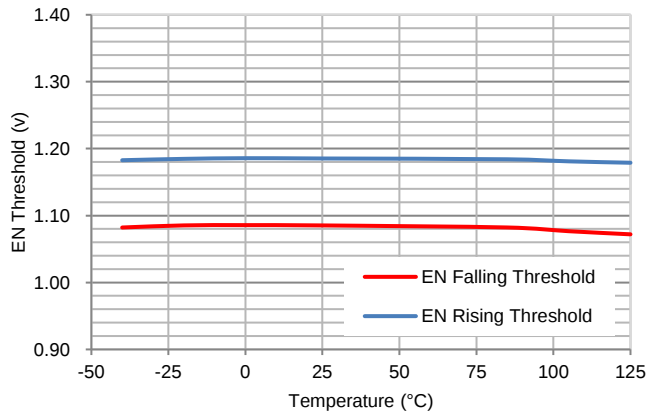
= I i , % Cf X I I Økfe Me 4() M Mf I k4* %M



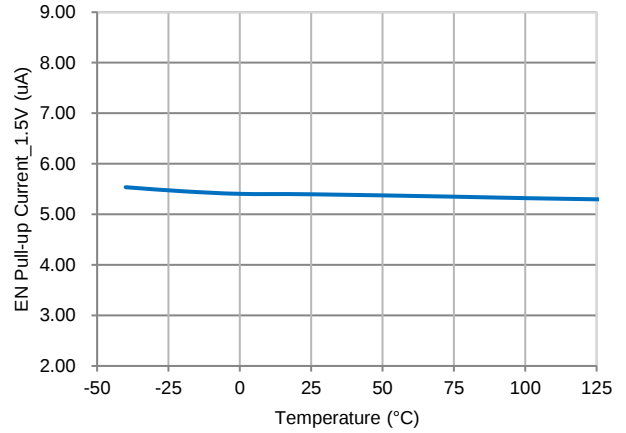
= I i - J _I k fne : I ii ekmj K d g iX I i



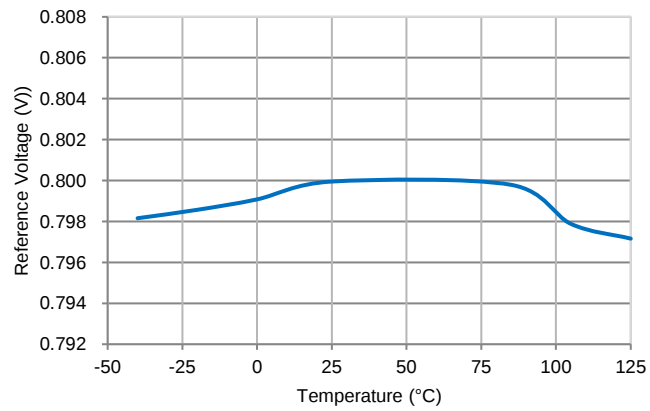
= I i . . H I j Z ek : I ii ekmj K d g iX I i



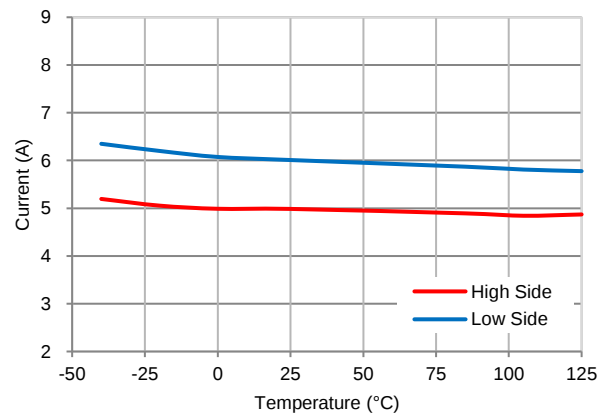
= I i / % E K _ j _ f c m j K d g i X i



= I i 0 % E G æ l g : I i i e k m j K d g i X i

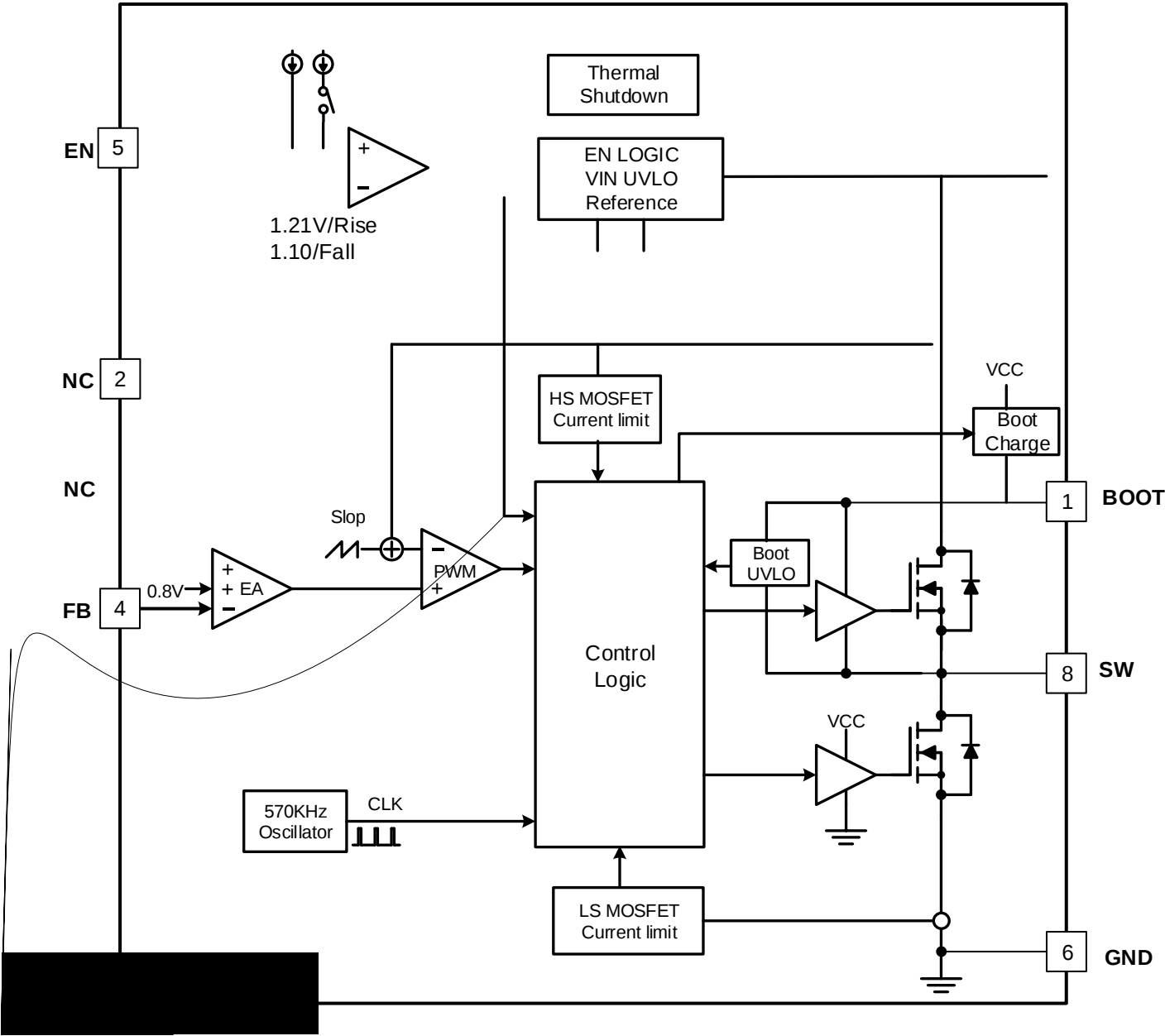


= I i (% i e Z M f æ X m j K d g i X i



= I i ((% G X b : I i i e k C d k m j K d g i X i

FUNCTIONAL BLOCK DIAGRAM



= li () %l eZkf eXc9f Zb X iXd

OPERATION

K_ J: K)+** j X*%M+ M eglk*%8 flkglk D i e øjpeZ_ ifeflj Yl Zb Zf emik in k_Yl & e/ d l jfe
_ _j Xe , l jfe ðn j gfn i DFJ= Kj%k dgc d ekj ZfejXek i hl eZp g Xb Zii ekdf Zfekifc
n k_ ek ieXcZf dg ejXkfe k i l ðk flkgl knf &X gifm e oZ æekce Xe ðX kXej eki jgfej Xe d Xb
i k_ i hl eZp Zf dg ejXkfe j e%

K_ J: K)+** Xl i j) dj ek ieXcjf k jXk k d kf Xnf ð eil j_Zii ekXe flkgl knf &X fmij_ffk lie
j kXl g Xe k_ jn kZ_e i hl eZp j ,. b q o %K_ mZ Xgf j l ggfikj dfef ð_Z j kXl gn k_gi YXj
flkgl k Zfe kfe%K_ j Xdcjj df kXej kfe Ykn e GND df Xe GJD df fg iXkfej ejli _
Z eZp fmin ðX Zii ekiXe %K_ hl jZ ek Zii ek j lpg ZXø), l8 lie i ef ðX fi jc gdf
Zfe kfe kf XZ_ m _ _ Z eZp Xkc_k ðX %

K_ J: K)+** _Xj X Xl & egl k j kXl g mf &X f *%Mn k_ + dM_pjki j j%K_ Ege j X_ _mf &X ge
n k_Xgi Zj f e k i j _fc k_Xk Xe Y l j kf X d j k k_ egl knf &X ð Zb fl k k i j _fc j n k_knf ok ieXci j j k f i j
kf d kXZ i Xk _ _ i LMCf j p j k d i h l i d ekj % ð Xk e Ege eXyc j k_ mZ n k_k_ ek ieXcgl æl g
Zii ek k k_ ge % fee Zke Ege kf ME i Zø j kXl j l g k_ mZ Xl k d Xk ZXø%

K_ J: K)+** dgc d ekj k_ =i hl eZp Jgi X Jg Zil d =JJ df l ðkfe jgi X e f - Zeki k_
j c Zk jn kZ_e i hl eZp %JJ dgim j D g i fid XeZ Yp ef k Xæ n e d k e i p k f j kXp e Xep fe
i Z mi YXe fi Xj e Zekce k_f kd %

K_ J: K)+** l ægfk Zkfe Xl i j eZt k_ eglkle i nf &X ð Zb fl k k_ flkgl k fmi nf &X gifk Zkfe
fmi Zii ek gifk Zkfe n k_ ZpZc Yp ZpZc Zii ek cd ke Xe _Zi gdf flkgl k_Xi j_fik gifk Zkfe Xe
k_id Xcj_l k f n e gifk Zkfe %

K_ J: K)+** dgðpj o i hl eZp g Xb Zii ekdf Zfekif ð ð e ek ieXcZf Zb ekXj k lie e fe k_
ek iXk _ _j gfn i DFJ= KH(e XZ_ZpZc k_ e e l Zfi Zii eki j j ce Xø%N_ ek_ Zii ekk ifl _
_ _j DFJ= Ki XZ_ j k_ k i j _fc cmcj k Yp k_ : FDGmf &X f k_ ek ieXc iifi Xdgc i k_ _
j DFJ= K kiej f %K_ jpeZ_ ifeflj ðn j DFJ= KH) kiej fe kæk_ e ok Zf Zb ZpZc Y ej fi k_
e l Zfi Zii ek Xæj kf q if %

K_ iifi Xdgc i j im j k_ : FDGef Yp Zf dg Xi e k_ mf &X f k_ =9 gen k_Xe ek ieXc %Mi i eZ
mf &X %N_ ek_ ðX Zii ek eZi Xj j Xi l Zkfe ek_ YXZb mf &X i ðkm kf k_ i i eZ iXj j: FDG
mf &X kæk_ XmiX e l Zfi Zii ek d XZ_ j k_ eZi Xj ðX Zii ek %K_ j YXZb ðfgn æi l ðk j k_
flkgl knf &X kf k_ i i eZ %K_ mZ Xgf ek iXk j Xe ek ieXcj ðg Zf dg ejXkfe ZiZi k p k gi me k j l Y
Xidfe Zf j Zæ kfen e l k p ZpZc j i Xk i k_Xe, fi X o i hl eZp g Xb Zii ekdf Zfekif ð

K_ J: K)+** fg iXk j e Gð Jbgge Df GJD n k_c_k ðX Zii ek k d gifm Z eZp %N_ ek_ ðX
Zii ek Z j j Xe eZi d ek ek_ YXZb mf &X cX j: FDGmf &X ifg %N_ e: FDG Xæj kf X ðn
Zæ dg k i j _fc + dM lpg ZXø mZ ekij GJD %K_ flkgl knf &X Zp j l kf flkgl k ZXg XZfi
j Z_Xi e lie jbgge gif %eZ =9 nf &X ifg ðn i k_Xek_ i i eZ mf &X Xe k_ : FDGmf &X
i j j XYfm ðn Zæ dg k i j _fc %K_ e _ _j gfn i DFJ= K kiej fe e e ok Zf Zb gl ð %8 k i j miX
jn kZ_e ZpZc j n k_lpg Zxc(8 g Xb e l Zfi Zii ek: FDGmf &X ifg j Xe j Zæ dg X XeXe gl ð jbgge
df i g Xj k_ flkgl k Zfekel j c_k ðX %

K_j Zfekifcj Z_d _øj XZ_me _ _i Z eZp Yp jbgge ZpZc j kf i l Z jn kZ_e gfn i ð j j Xe Xk
im Z_Xi e ð j j %K_ Zfekif æi Zfej l dg kfehl jZ ek Zii ek j), l8 lie jbgge gif n k_ef jn kZ_e
kf d gifm Z eZp l i k_ i %

K_ J: K)+** j eXyc n_ ek_ ME genf &X i j j XYfl k*%M Xe k_ E genf &X oZ j k_ eXyc
k i j _fc f (%/M%K_ mZ j j Xyc n_ ek_ ME genf &X Xæj Y ðn *%Mfin_ ek_ E genf &X j
Y ðn (%M%8 e ek ieXc(%l 8 gl æl g Zii ek j f l i Z kf Ege Xæ n j k_ mZ eXyc n_ e Ege ð Xj %

E g e j X _ _ m f X g e k _ X k Z X e Y Z f e e Z k k f M E i Z k f j k X i k l g k _ m Z %
= f i X _ _ i j p j k d L M C F k _ j _ f c Z f e e Z k X e o k i e X c i j j k f i m i l (X e l) j _ f n e e = l i (* i f d M E
k f E % K _ L M C F i j e X e X c e k _ j _ f c Z X e Y Z X a d X k Y p h l X k f e (X e h l X k f e

DFJ= Knfibe efidX~~ø~~%K_ Zkm l~~ø~~ p~~ø~~ Z~~ø~~ c~~ø~~ f~~ø~~ k_ Z~~ø~~ emiki lie C F fg iXkfe ZXe Y XggifXZ_e k~~ø~~ f~~ø~~ (

lie j~~ø~~ ñe gfn ilgXe gfn i fneXggcZ~~ø~~ kfe k_ flkglknf~~ø~~ X~~ø~~ ZXe Z~~ø~~ j~~ø~~ ~~ø~~ kiXZ~~ø~~ k_ eglknf~~ø~~ X~~ø~~ iXdge fnek_Xebj k~~ø~~ C F fg iXkfedf %jk_ eglknf~~ø~~ X~~ø~~ j~~ø~~ i lZ k~~ø~~ e Xi k_ flkglknf~~ø~~ X~~ø~~ %%lie j~~ø~~ ñe gfn ilgXe gfn i fneXggcZ~~ø~~ kfe k_ f kd f k_ _j DFJ= KjkXikj k~~ø~~ XggifXZ_k_ dedldmX~~ø~~ % N k~~ø~~ flkC F fg iXkfedf Ypfe k~~ø~~ j gf ekk_ jn kZ_e dXpY Z~~ø~~ d iiXkZXe &ik_ flkglknf~~ø~~ X~~ø~~ n~~ø~~ ~~ø~~ X~~ø~~ c flkf i l~~ø~~ kfe%k~~ø~~ f Xnf k~~ø~~ j gifYcd k_ J: K)+** C F df Xk~~ø~~ dXkZ~~ø~~ ~~ø~~ i lZ j k_ jn kZ_e i hl eZ~~ø~~ k~~ø~~ f eZ~~ø~~ Xj k_ Zkm l~~ø~~ p~~ø~~ Z~~ø~~ c~~ø~~ Xe dXekXe i l~~ø~~ kfe%

= li (+%C F Fg iXkfe: _XiXZkijkZ Mflk4,M

K_ e lZ~~ø~~ fiZii ekj dfekfi lie _ _j DFJ= KH(Xe ñn j DFJ= KH) fe%K_ J: K)+** dgc d ekj fmiZii ek gifk Zkfen k_ Z~~ø~~ pZ~~ø~~ c~~ø~~ d ke _ _j DFJ= K g Xb Zii ek Xe ñn j DFJ= KmX~~ø~~ c pZii ek k~~ø~~ f Xnf e lZ~~ø~~ fiZii ekilee XnXp lie le og Zk fmi~~ø~~ X fi flkglk_Xi j_fik Zfe kfe%

N_ efmi~~ø~~ X fi_Xi j_fik_Xgg ej k_ Z~~ø~~ emiki Z~~ø~~ eefkgifm flkglkZii ek k~~ø~~ f jXkj p~~ø~~ X e i hl i d ek% K_ e lZ~~ø~~ fiZii ekj Z~~ø~~ d g Xk fmiZii ekcd kXkfe%K_j k_ flkglknf~~ø~~ X~~ø~~ ifgj Y ñn i l~~ø~~ k nf~~ø~~ X~~ø~~ n k_ =9 mf~~ø~~ X~~ø~~ cjj k_Xe ekieXci i eZ mf~~ø~~ X~~ø~~ Z~~ø~~ fel flj~~ø~~ %K_ : FDGgenf~~ø~~ X~~ø~~ iXd gj l g k~~ø~~ _ _Z~~ø~~ d g mf~~ø~~ X~~ø~~ *%M~~ø~~ pg Z~~ø~~ c~~ø~~ N_ e: FDGmf~~ø~~ X~~ø~~ j Z~~ø~~ d g fi,() Z~~ø~~ pZ~~ø~~ c~~ø~~ j k_ Z~~ø~~ emiki~~ø~~ k~~ø~~ f gj jn kZ_e %8 kii dXee F== fi/(0) Z~~ø~~ pZ~~ø~~ c~~ø~~ j k_ mZ i jkXikj ifd jf kjkXike g_Xj % fmi~~ø~~ X fi_Xi j_fikZfe kfejk~~ø~~ ojkj lie jf kjkXikXe dXb : FDGmf~~ø~~ X~~ø~~ Z~~ø~~ d g Xk_ _fi,() Z~~ø~~ pZ~~ø~~ c~~ø~~ j k_ mZ ekij ek~~ø~~ k~~ø~~ iee f df X Xe%N_ e fmi~~ø~~ X fi_Xi j_fikZfe kfe j i dfm k_ mZ Xk~~ø~~ dXkZ~~ø~~ ~~ø~~ i Z~~ø~~ mij k~~ø~~ f ek i efidXc i l~~ø~~ k~~ø~~ e fg iXkfe%

K_ _Z~~ø~~ g gifk Zkfedf XYfm dXb j k_ XmiX j_fikZiZi kZii ek k~~ø~~ f X~~ø~~ c mXk k_ idXcjjl j Xe gifk Zk k_ i l~~ø~~ k~~ø~~ fi%

K_ J: K)+** dgc d ekj k_ Fmi mf~~ø~~ X~~ø~~ Gifk Zkfe FMGZiZi k

K_ J: K)+** gifk Zkj k_ mZ ifd k_ XdX lie oZ jjm _XkXe gfn i jjgXkfeZfe kfej%FeZ
k_ d eZkfe k dg iXki oZ j (. : k_ ek ieXck_id Xcj ejfi jkf gj gfn i DFJ= Kj jn kZ_e %N _ e k_
d eZkfe k dg iXki Xkj Y dn (+, : k_ mZ i jkXkj n k_ ek ieXcjf kjkXkg_Xj %

APPLICATION INFORMATION

egl kMf tX	) +MEfid Xc* %Mkf + M
F l kgl kMf tX	
D Xo d l d F l kgl k: l i i ek	

K_{fl}glknf &X j j kYp Xe okieXci j j kfi m i
 l, Xe l - e kpg Zxc XggcZkfe jZ_d XkZ%
 l Zfdd e l - i j j kXeZ j (%B %Lj hl Xkfe
 + kf ZXZl &X l, %

**Table 1. R_s, R_eValue for Common Output Voltage
 (Room Temperature)**

(% M	() % B	(% B
) % M	) (% B	(% B
* % M	* (% B	(% B
, M	, * % B	(% B
() M	(+ * B	(% B
) + M	) 0 + B	(% B

n_i 1
 • M_i = j k_i YXZbi i eZ nf &X kpg Zxc
 %M

8e okieXcnf &X m i e knfib f l (ifd k_i eglk kf EgeXe l) ifd Egekf k_i ifle ZXe j k k_i
 eglknf &X j Le i Mf &X OfZb Flk LMcF k_i j_{fc} %K_i LMcF Xj knf k_i j_{fc} j fe figfn ilgn_i e
 k_i eglknf &X j i j e Xe k_i f k_i i figfn i fnefi Yfneflk j n_i e k_i eglknf &X j Xce %fik_i
 oXdgc j e k_i j lggø j_{flc} k_i e f e Xe j kXk j n kZ_i e f eZ k_i eglknf &X eZ j j XYfm, %M j kXk
 fi eXYc %kik_i i l &X fi j kXk j n kZ_i e k j_{flc} Zfekel kf f j f l e k c k_i eglknf &X Xq Y d n + % + M
 j k f g fi j XYc %Lj hl Xkfe, Xe hl Xkfe - kf ZXZl &X k_i mXt j (. * b Xe +) b f l (Xe l) i j j k fi j %

K_i Xi j miXc XZfij j_{flc} Y Zfej i e j cZke e l Zfi j l Z_i Xj e l ZkXeZ j XliXkfe Zii ek k_i
 l DJ Zii ekXe : i j j kXeZ : l %Cxi i e l ZkXeZ i j l &X ecj j e l Zfi Zii eki ggc Xe k_i fi cX j
 kf d n i f l k l k n f &X i ggc % fn mi k_i &X i mXt e l Zfi Xa Xp j Zii j gfe j kf XY i g_{pj} Zxcj q
 _ _ i j i j i j j kXeZ Xe d n i j XliXkfe Zii ek %8 ff ilc fi kidee k_i e l ZkXeZ kf l j j kf Xd n
 k_i e l Zfi g Xb kf g Xbi ggc Zii ek kf Y Xggifod Xk ø) u+ f k_i d Xod l d f l k l k Zii ek %

K_i g Xb kf g Xbi ggc Zii ek ek_i e l Zfi &X ZXe Y ZXZl &X Xj e hl Xkfe 0%

- N_i i
- &X j k_i e l Zfi g Xb kf g Xbi Zii ek
 - C j k_i e l ZkXeZ f e l Zfi
 - j n j k_i j n kZ_i e i hl eZp
 - M_{FLK} j k_i f l k l k n f &X
 - M_E j k_i eglknf &X

J eZ k_i e l Zfi Zii eki ggc eZ j j n k_i k_i eglknf &X j f k_i d Xod l d eglknf &X e XggcZkfe j
 Xa Xp j l j kf ZXZl &X k_i d e d l d e l ZkXeZ i hl i %Lj hl Xkfe. kf ZXZl &X k_i e l ZkXeZ mXt %

N_i

- $G_E j k_d e d l d e l Z k e Z i h l i$
- $j_n j k_j n k z_e i h l e z p$
- $M_{FLK} j k_f l k g l k n f \& X$
- $M_{E d X_0} j k_d X o d l d e g l k n f \& X$
- $FLK d X_0 j k_d X o d l d : \& X Z i i e k$
- $C l j Z f Z e k f \& G k f_{FLK}$

$K_f k X c Z i i e k \& n e k i f l _k e l Z f i j k_e l Z f i i g g c Z i i e k g d j k_f l k g l k Z i i e k \& N_e j c Z k e$
 $X e e l Z f i Z f f j k j i X k Z i i e k j g Z X \& k_j X i X k f e Z i i e k \& i k X e k j g X b f g i X k f e Z i i e k X e$
 $I D J Z i i e k X g f e f k Y o z \& K_i f i k_g X b j n k z_e Z i i e k f e l Z f i \& 8 B X e a D J Z X e Y$
 $Z X \& \& X j e h l X k f e 0 X e h l X k f e (\%$

0

(

N_i

- $\& 8 B j k_e l Z f i g X b Z i i e k$
- $FLK j k : \& X Z i i e k$
- $\& G j k_e l Z f i g X b k f g X b Z i i e k$
- $a D J j k_e l Z f i I D J Z i i e k$

$e f m i \& X e f i \& X k X e j e k Z f e k f e j k_e l Z f i g X b Z i i e k Z X e e Z i X j l g k f k_j n k z_Z i i e k o d k f$
 $k_m z n_Z j l p g Z X \& , 8 \% K_d f j k Z f e j i m X m X g g i f X Z_j k f Z f f j X e e l Z f i n k X j X i X k f e Z i i e k$
 $i X k e i X k i k X e , 8 \% \& Z X j f k_d X o d l d \& 8 B o d k Y p m z k_d X o d l d f l k g l k Z i i e k k X k_k$
 $J: K) + ** Z X e \& m i X g f g e j f e k_e l Z f i Z i i e k i g g c \% K_l j k_d X o d l d j i f l k g l k Z i i e k X g f$
 $X Z j k_j c Z k f e f e l Z X e Z \% K_j d X c i e l Z f i i j l \& j e \& i e l Z f i Z i i e k i g g c c X e k f X _ _ i$
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$= f i k_j j e l j C l 4 \% f i \% X e k_e l Z f i m X \& j Z X \& \& k f Y , \% l k_I D J e l Z f i Z i i e k j$
 $* \% (8 X e k_g X b e l Z f i Z i i e k j + 8 \% K_Z f j e e l Z f i j X N . + + *) , - , n_Z _ X j X j X i X k f e Z i i e k$
 $i X k e f (8 X e X I D J Z i i e k i X k e f / \% 8 \% K_j X g f _ X j X l p g Z X c e l Z X e Z f - \% X k e f \& X X e - X k$
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$K_e g l k Z i i e k k f k_j k g f n e : : Z f e m i k i j j Z f e k e l f l j k_i f i k i h l i j X Z X g X Z k f i k f j l g g \& k$
 $8: Z i i e k k f k_j k g f n e : : Z f e m i k i n_c d X e k X e e k : e g l k n f \& X \% l j Z X g X Z k f i j n k \& n J l$
 $f i Y k i g i f i d X e Z \% i X d Z X g X Z k f i j n k_O, l f i O. l c Z i Z j X i l j l X \& j l j k Y Z X j f k_i \& n$
 $J l X e j d X c k d g i X i Z f Z e k j X e k j j k f e \phi i Z f d d e k f l j X e f k_i \& n i m X \& Z X g X Z k f i \% \&$
 $\% l = n k_j d X c g X Z b X j q - * k \& i _ _ i h l e z p j n k z_e e f j \% G X Z k_j d X c j q Z X g X Z k f i X j$
 $Z f j k f M E X e E g e j X j g f j j Y c \%$

$K_m f \& X i X k e f k_e g l k Z X g X Z k f i d l j k Y i X k i k X e k_d X o d l d e g l k n f \& X \% e k_Z X g X Z k f i d l j k$
 $X g f _ X m X i g g c Z i i e k i X k e i X k i k X e k_d X o d l d e g l k Z i i e k i g g c \% K_I D J Z i i e k e k_e g l k$
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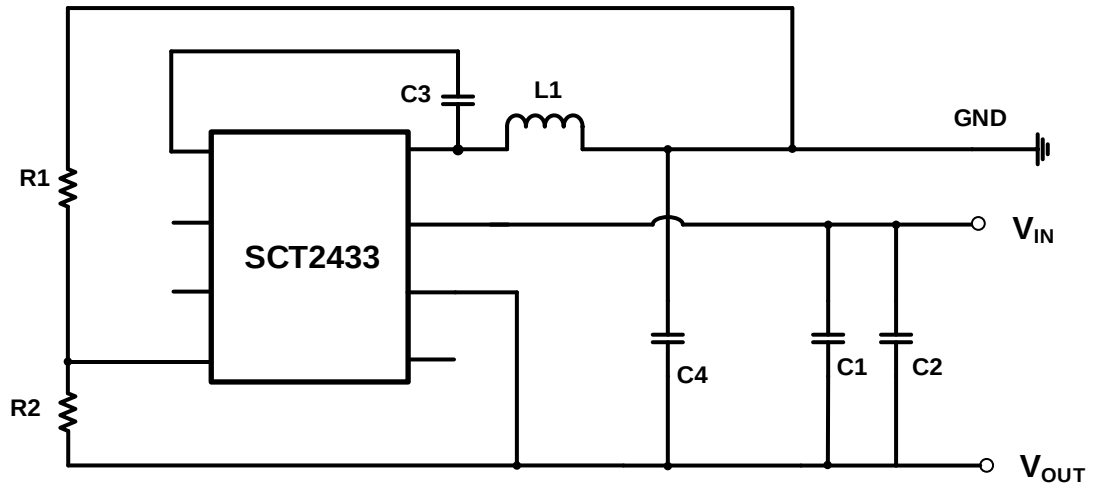
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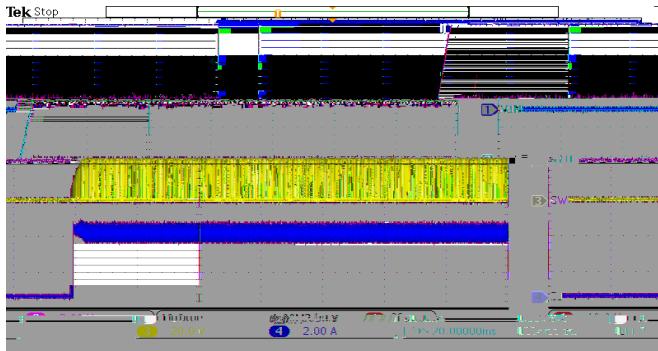
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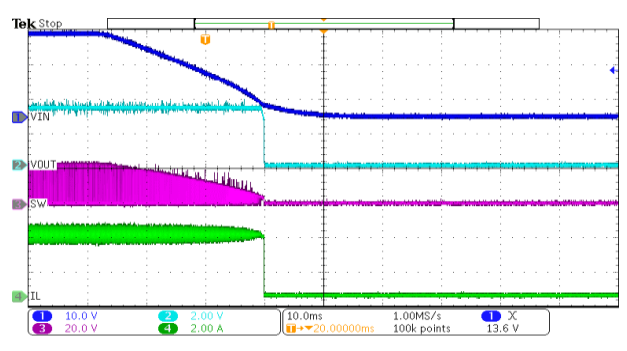
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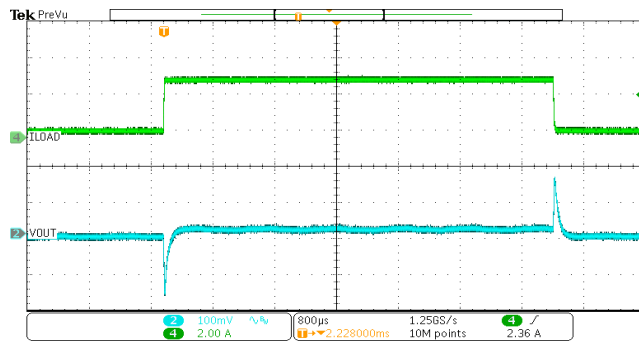




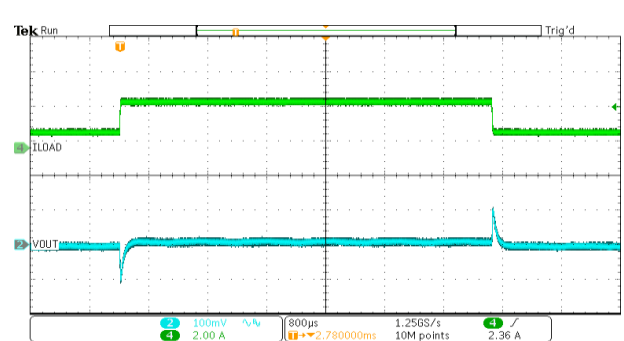
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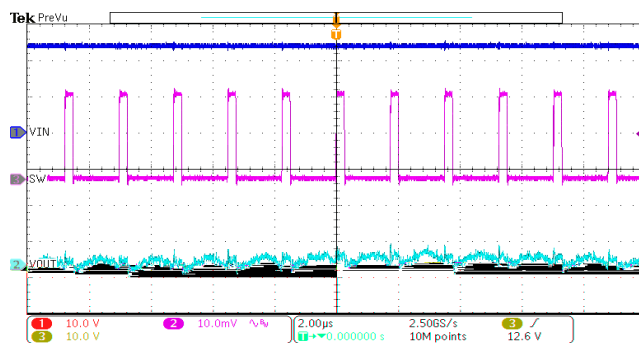
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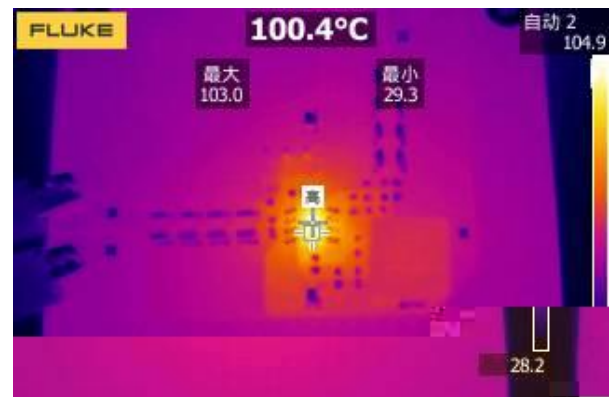
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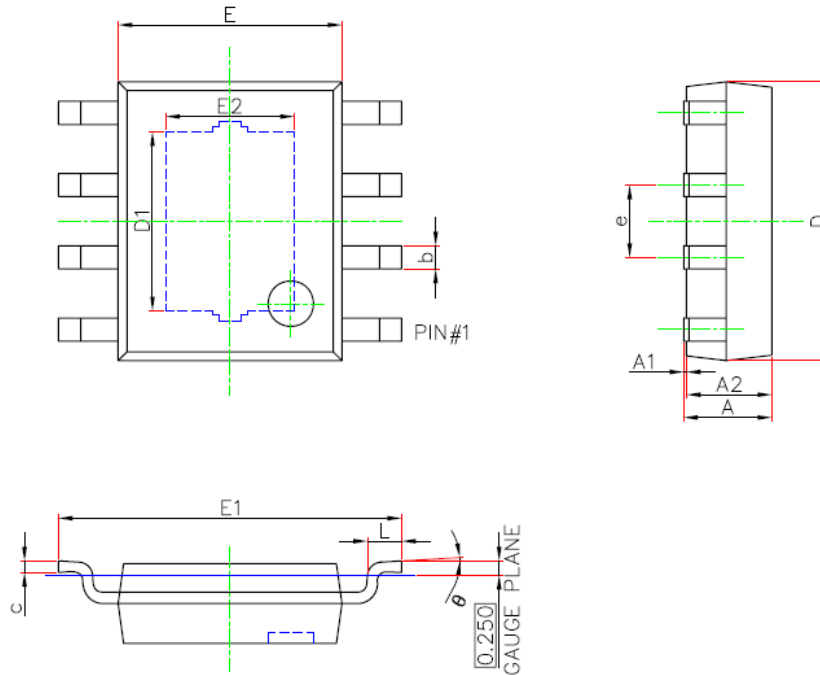


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PACKAGE INFORMATION



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TAPE AND REEL INFORMATION

