3.8V-28V Vin, 3A Synchronous Step-down DCDC Converter with EMI Reduction

FEATURES

(0, 5HGXFWLRQ ZLWK 6ZLWFKLQJ)UHTXHQF\
– N+]6ZLWFKLQJ)UHTXHQF\
Spread 6SHFWUXP

REVISION HISTORY

127(3DJH QXPEHUV IRU SUHYLRXV UHYLVLRQV PD\ GLIIHU IURP SDJH QXP

5HYLVLR3QURGXFWLRQ

5HYLVLR8QSGDWH GHVFULSWLRQ

5HYLVLRQ SD8SGDJWHH

5HYLVLR8QSGD'WH YLFH 2UGHU ,QIRUPDWLRQ

DEVICE ORDER INFORMATION

ORDERABLE DEVICE	PACKAGING TYPE	STANDARD PACK QTY	PACKAGE MARKING	PINS	PACKAGE DESCRIPTION
6&7 &79%5	7DSH 5H		&		7627 /

ABSOLUTE MAXIMUM RATINGS

Over operating free-air temperature unless otherwise noted(1)

PIN CONFIGURATION

SW	5	Switching node of the buck converter.
BST	6	Power supply for the high-side power MOSFET gate driver. Must connect a 0.1uF or greater ceramic capacitor between BST pin and SW node.

RECOMMENDED OPERATING CONDITIONS

2YHU RSHUDWLQJ WHPSHUDWXUH UDQJH XQOHVV RWKHUZLVH QRWHG

PARAMETER	DEFINITION	MIN	MAX	UNIT
9, 1	, QSXW YROWDJH UDQJH			9
7-	2SHUDWLQJWHPSHUDWXUH			

TYPICAL CHARACTERISTICS

)LJXUH(IILFLHQF\ YV /RDG &9XUUHQ

)LJXUH(IILFLHQF\ YV /RDG &9XUUH

OPERATION

Overview

7KH6&7 &GHYLFH LV9 LQSXW $ RXWSXW &RQWUROOHU LQWHJUDWHG V\QFKURQRXV E
GHYLFH HPSOR\V IL[HG IUHTXHQF\ SHDN FXUUHQW PRGH FRQWURO $Q LQW

RSHUDWLRQ LV GLVDEOHG ZKHQ (1 YROWDJH IDOOV EHORZ LWV ORZHU WK

$Q LQWHUQDO SXOO XS FXUUHQW VRXUFH LQWHUQDO (1 SLQ

Bootstrap Voltage Regulator

$Q H[WHUQDO ERRWVWUDS FDSDFLWRU EHWZHHQ 6: DQG %6 SLQ SRZHUV WKH KLJK VLGH 026)(7 JDWH G
7KH ERRWVWUDS FDSDFLWRU YROWDJH LV FKDUJHG IURP DQ LQWHUQDO UHJXODWRU ZKHQ WKH ORZ VLGH 026)(7 LV
RII DQG WKH ORZ VLGH SRZHU 026)(7 LV RQ

7KH IORDWLQJ VXSSO\ %67 8/92 WKUHVKROG LV 9 ULVLQJ DQG K\VWHUHVLV FRQYHUWHU
RSHUDWHV ZLWK KLJK GXW\ F\FOH DSSOLFDWLRQV LQ FRQWLQXRXV FRQGXFWLRQ PRGH IRU FHUWDLQ WLPH DW KLJK
ERRWVWUDS FDSDFLWRU YROWDJH LV WRR ORZ WR NHHS WKH FDSDFLWRU VXIILFL
ERRWVWUDS FDSDFLWRU 6: 89/2 SUREOHP 7KH 9&/ GHWHFWV WR WXUQ RQ OR
SHULRGLFDOO\ WR UHIUHVK WKH YROWDJH RI ERRWVWUDS FDSDFLWRU

Low Drop-out Regulation

7R VXSSRUW WKH DSSOLFDWLRQ RI VPDOO YROWDJH EHWZHHQ 9RXW DQG 9LQ WKH /RZ 'U
LPSOHPHQWHG E\ &27 ZKHQ 6&97,1 LV FORVH WR RXWSXW YROWDJH WKH RQ WLPH
RQ WLPH ZLOO EH H[WHQGHG WR DYRLG RXWSXW YROWDJH GURSV VZLWFKL
PD[LPXP RQ WLPH 7\S LV WULJJHUHG DQG PD[GXW\ F\FOH RSHUDWLRQ 7KXV WKH
GXW\ F\FOH RI WKH VZLWFKLQJ UHJXODWRU '2 FDQ EH YHU\ KLJK DV

'XULQJ ORZ YROWDJH GLIIHUHQFH RI LQSXW DQG RXWSXW YROWDJHV L H
WKH RXWSXW FDQ WUDFN LQSXW LQ 2 RSHUDWLRQ PRGH

7KH PLQLPXP RSHUDWLQJ IUHTXHQF\ HIIHFWLYHO\ SUHYHQW DXGLR
E\ VZLWFKLQJ IUHTXHQF\ ZKHQ ZRUNLQJ ZLWK ODUJH GXW\ F\FOH

Thermal Shutdown

2QFH WKH MXQFWLRQ WHPSHUDWXUH H[FHHGV & WKH WKHUPDO VHQVLQJ FLUFXL
VZLWFKLQJ DQG UHVWDUWV ZLWK WKH MXQFWLRQ WHPSHUDWXUH GURSV EHORZ
RQ GHYLFH GXULQJ H[FHVVLYH KHDW DQG SRZHU GLVVLSDWLRQ FRQGLWL

APPLICATION INFORMATION

Typical Application

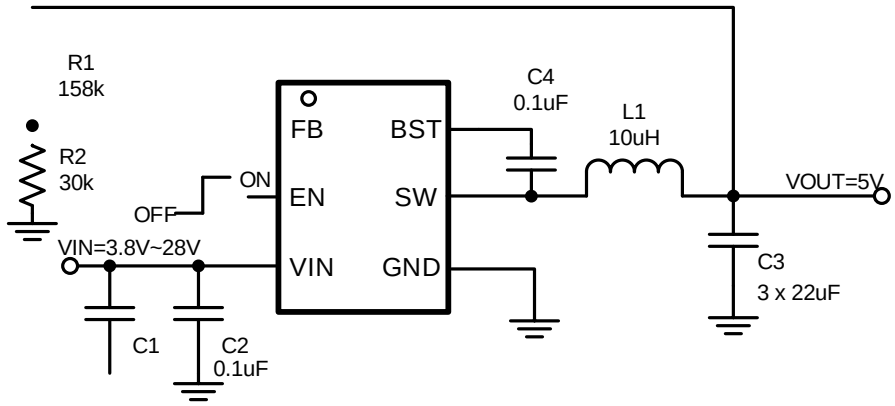


Figure 11. 24V Input, 5V/3A Output

Design Parameters

Design Parameters	Example Value
Input Voltage	24V
Output Voltage	5V
Output Current	3A
Output voltage ripple (peak to peak)	±8mV
Switching Frequency	400kHz

Output Feed-Forward Capacitor Selection

7KH6&7 &KDV WKH LQWHUQDO LQWHJUDWHG ORRS FRPSHQVDWLRQ DV V
FRPSHQVDWLRQ QHWZRUN RU KLJKHU ORRS EDQGZLGWK DQG EHWWHU WUDQVLHQW UHVSRQVH IHHG IRUZDUG FDSDFLWRU 8VXDOO\ WKH W\SH ,, F
KDV D SKDVH PDUJLQ EHWZHHQ DQG GHJUHH +RZHYHU 5 WKH FRXWS
UHVXOWV LQ ORZ SKDVH PDUJLQ 7R LQFUHDVH WKH FURVVRYHU IUHTXHQF\ VHOHFWHG WR SKDVH
SKDVH PDUJLQ DW WKH FURVVRYHU IUHTXHQF\ (TXDWLRQ LV XVHG WR FDOFXODWH WKH

$$= \frac{1}{2 \cdot \quad \times {}_1} \qquad (10)$$

Output Feedback Resistor Divider Selection

7KH6&7 &IHDWXUHV H[WHUQDO SURJUDPPDEOH RXWSXW YROWDJH E\ XVLQJ
VKRZQ LQ WKH W\SLFDO DSSOLFDWLRQ FLUFXLW)LJXUH 8VH WR FDOFXODWH WKH UHV

$${}_1 = \frac{(\quad - \quad) \times {}_2}{} \qquad (11)$$

Application Waveforms (Continued)

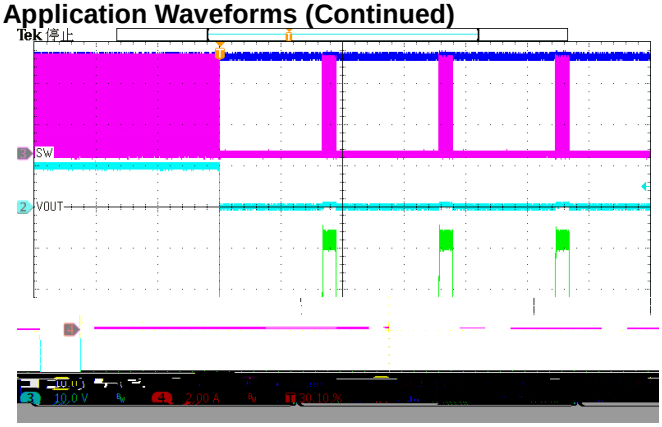


Figure 18. Over Current Protection(0A to hard short)

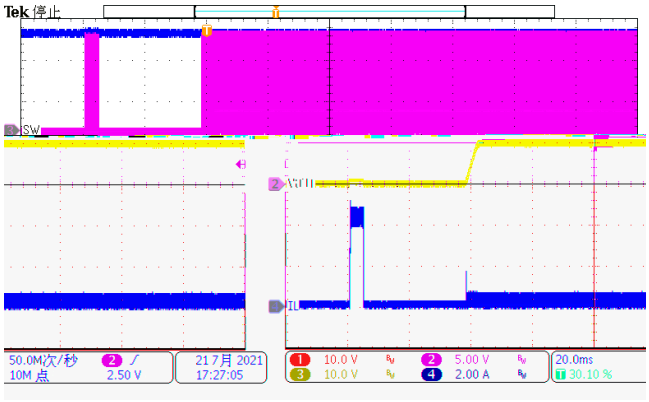


Figure 19. Over Current Release (hard short to 0A)

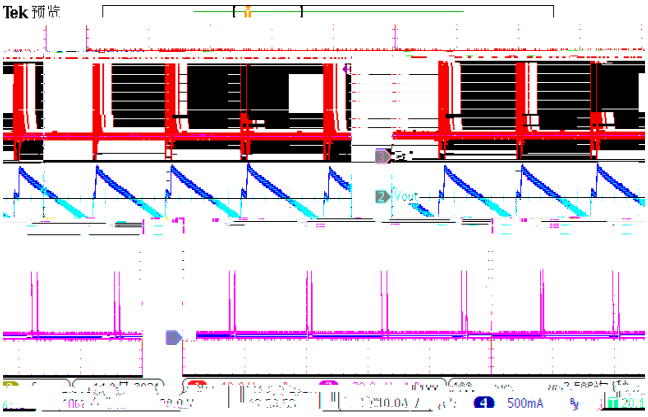


Figure 20. Output Ripple (Iload=10mA)

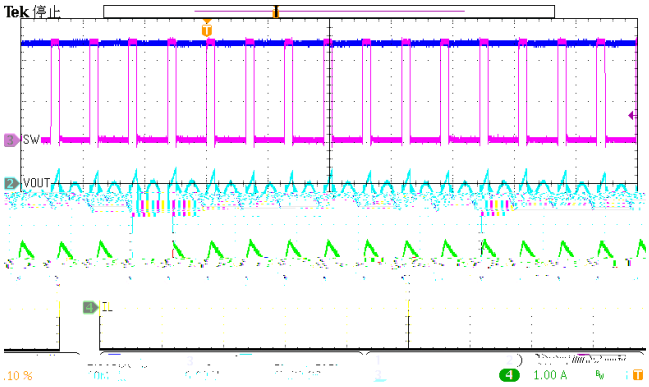


Figure 21. Output Ripple (Iload=1A)

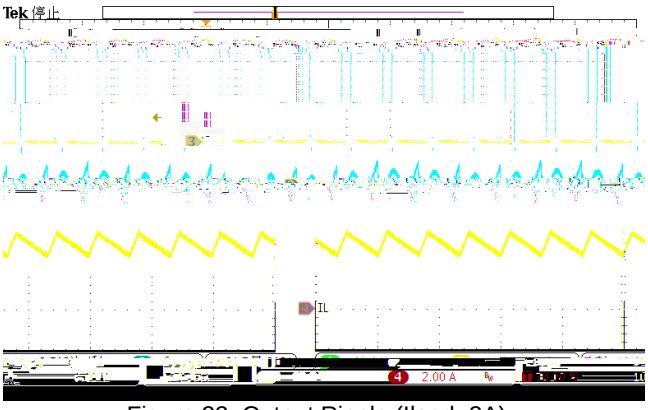


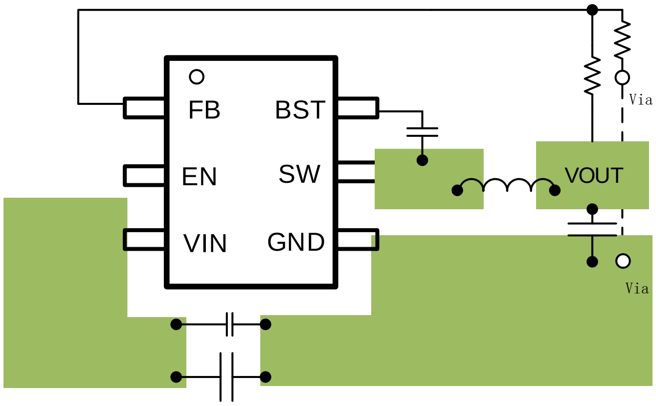
Figure 22. Output Ripple (Iload=3A)

Figure 23. Thermal, 24VIN, 5Vout, 3A

Layout Guideline

7KH UHJXODWRU FRXOG VXIIHU IURP LQVWDELOLW\ DQG QRLVH ... 3&% ... IUHTXHQF\ QRLVH LQGXFHV (0, VR IUHTXHQF\ ... DQG DUHD RI DOO WUDFHV FRQQHFWHG WR WKH 6: SLQ ... PLQLPL]H FRXSOLQJ 7KH LQSXW FDSDFLWRU QHHGV WR EH YHU\ FORVH WR ... ULSSOH 3ODFH WKH FDSDFLWRU DV FORVH WR 9,1 SLQ DV SRVVLEOH WR ... ZHOO UHIHU WR)LJXUH IRU WKH UHFRPPHQGHG 3&% OD\RXW RI 6&7 &

7KH OD\RXW QHHGV EH GRQH ZLWK ZHOO FRQVLGHUDWLRQ RI WKH WKHUPDO ... WKHUPDO YLDV LV XVHG WR LPSURYH WKH WKHUPDO GLVVLSDWLRQ ... WRS OD\HU JURXQG E\ YLDV

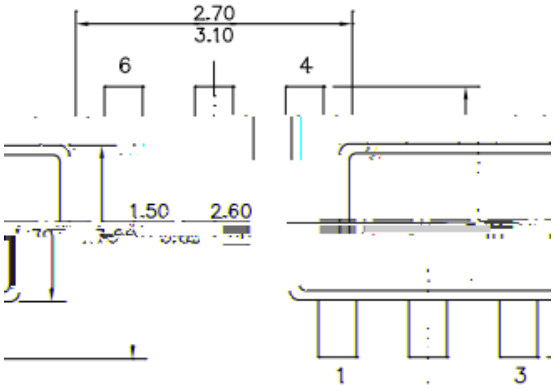


)LJXUH 3&% /D\RXW ([DPSOH

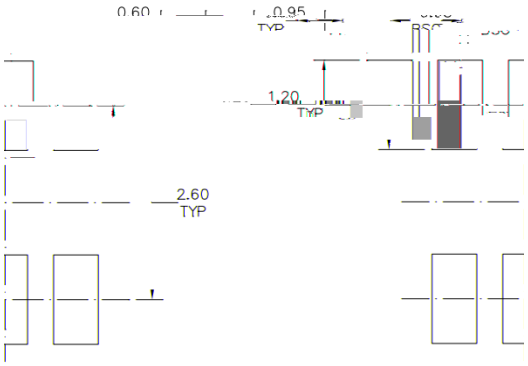
Thermal Considerations

7KH PD[LPXP ,& MXQFWLRQ WHPSHUDWXUH ... WKH PD[LPXP DOORZDEOH ... DQG VKRXOG EH ... DFWXDO SRZHU GLVVLSDWLRQ ...

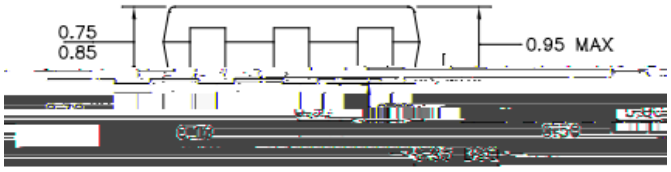
PACKAGE INFORMATION



723 9,(:



5(&200(1'(' /$1' 3$77(51



6,'(9,(:

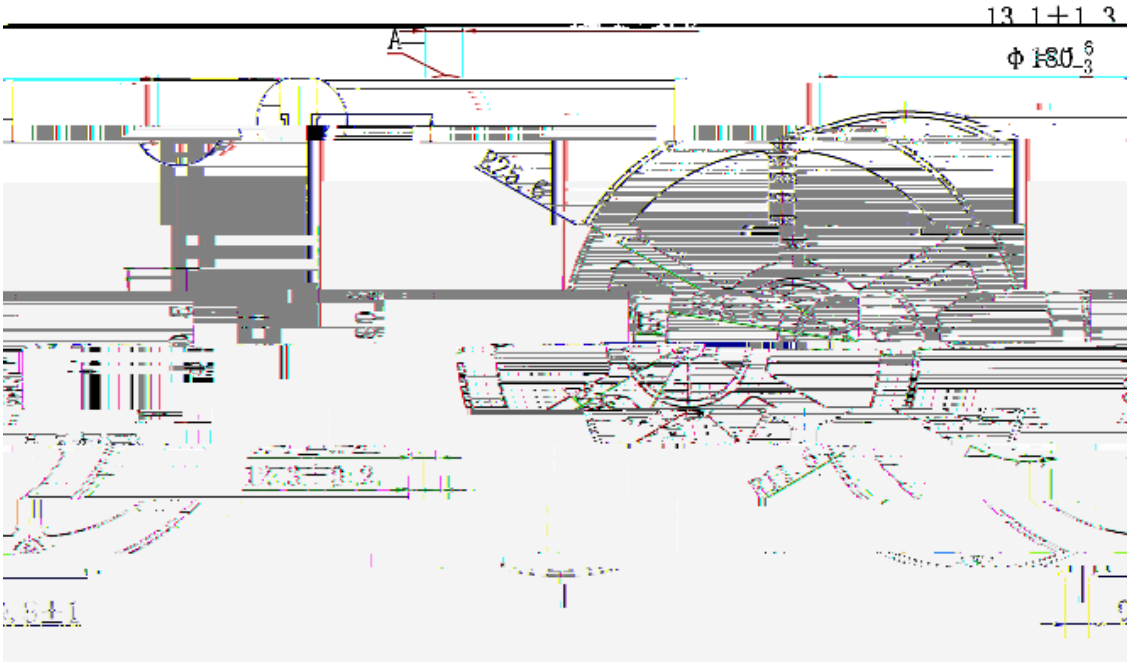
)5217 9,(:

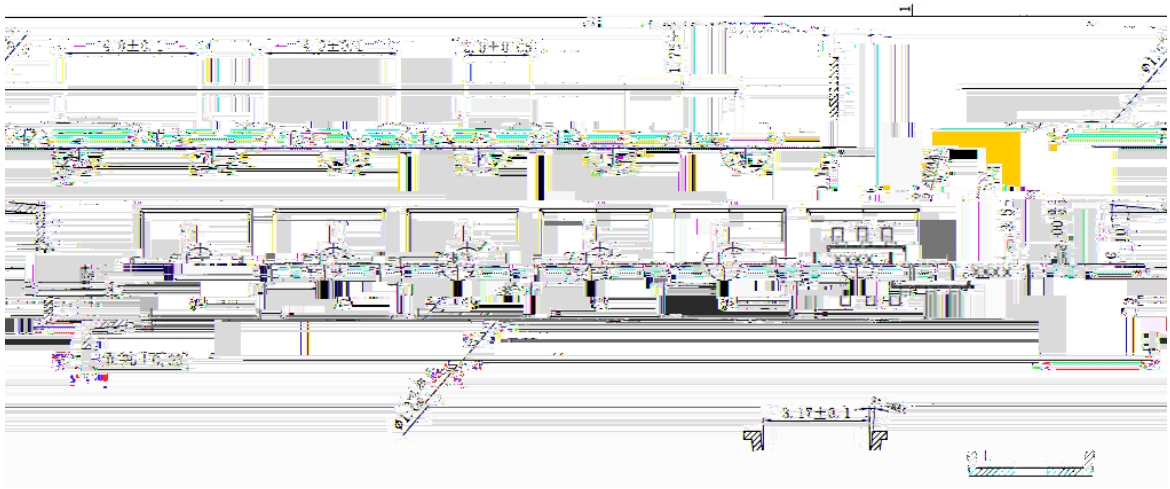
'(7$,/ $

NOTE:

1. $// ',0(16,216 $5(,1 0,//,0(7(56
2. 3$&.$*(/(1*7+ '2(6 127 ,1&/8'(02/')/$6+ 3527586,21 25 *$7(%855
3. 3$&.$*(:,'7+ '2(6 127 ,1&/8'(,17(5/($')/$6+ 25 3527586,21
4. /($' &23/$1$5,7< %27720 2) /($'6 $)7(5)250,1* 6+$// %(0,//,0(7(56 0$;
5. '5$:,1* &21)2506 72 -('(& 02 9$5,$7,21 $%
6. '5$:,1* ,6 127 72 6&$/(
7. 3,1 ,6 /2:(5 /()7 3,1 :+(1 5($',1* 723 0$5.)520 /()7 72 5,*+7 6(((;$03/(723 0$5.

TAPE AND REEL INFORMATION





Feeding Direction