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98@/</>/<  
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:63);- , " -/<3);- , 65=-9;-9

/+>?</=

E :63);- , 9-/<3);- , +65=-9;-9  
 E %7 ;6 ' +65;15<6<:  
 E 7-)2 -.1+1-5+@  
 E ' 15 !6>-9 , -5:1;@  
 E ' 1, -157<;9)5/- C & , +  
 E #).-;@ ?;9) 6> &63;)/- # & & 6415)3 <;7<;  
 E & , +1:63);165  
 E (&# 01/0 .9-8<-5+@ :>1;+015/  
 ■ 5)\*3-: 36> 796.13- 01/0 , -5:1;@ .13; -915/  
 E 7;141A-, .69)99)@ 67-9);165  
 ■ %7 ;6 <51;: C '  
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 ■ #0)915/ ;:9);-/@ 7-941;: , 1::1413)9 315- =63;)/-:  
 )+96::)5)99)@  
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 E & %& :069; +19+<1; )5 , ;0-94)3 796; -+;165  
 E ;096</0 063- 0!! 7)+2)/-  
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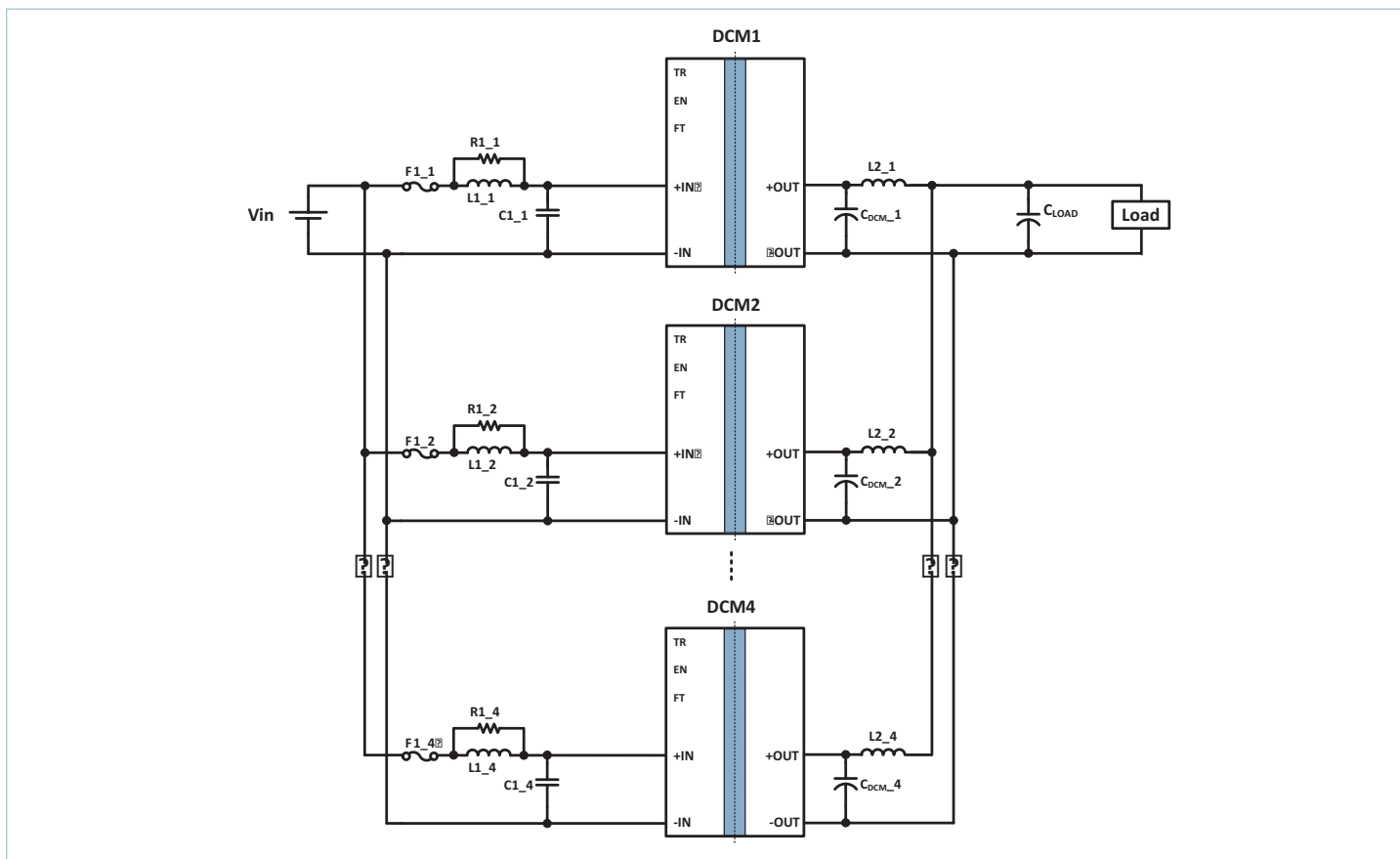
<9. ?-> ! +>381=		
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<9. ?-> /=-<3; >398

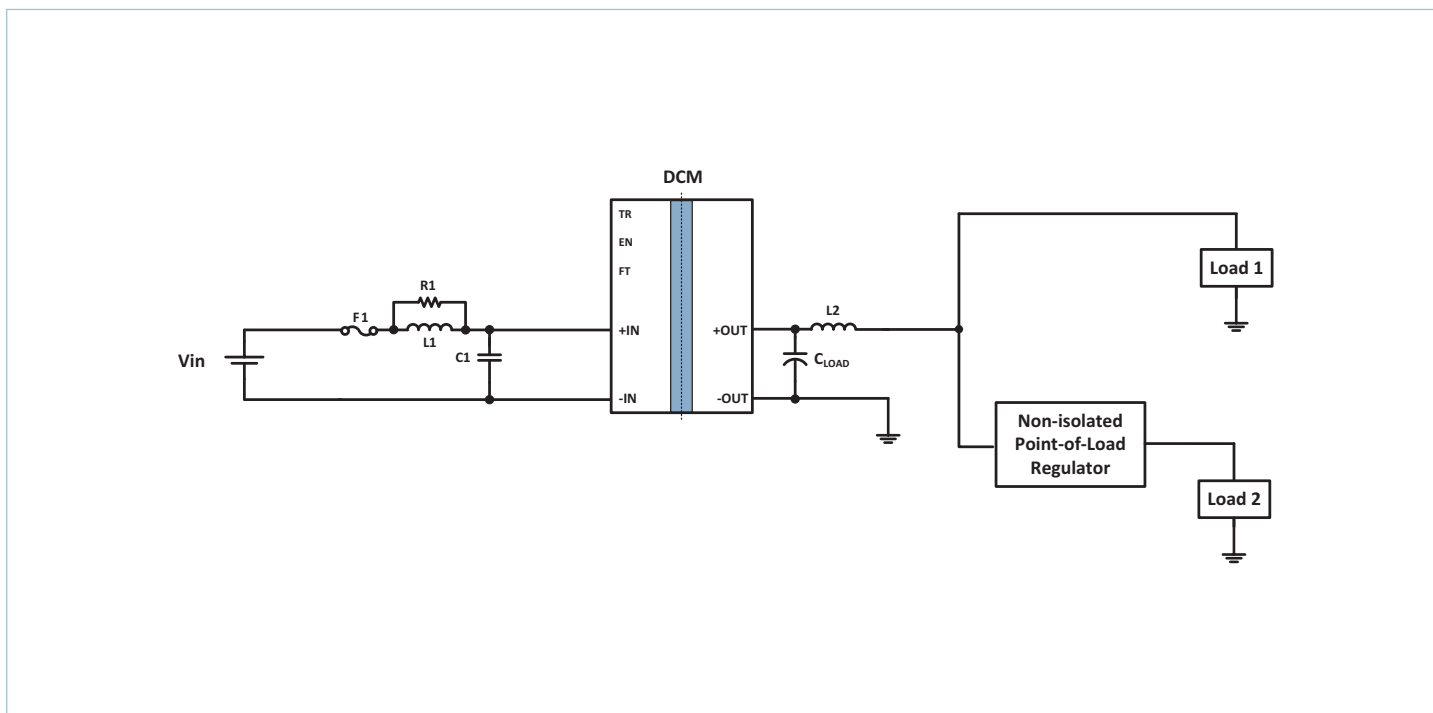
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 2>=E4AC4A >?4A0C8=6 5A>< 0= D=A46D;0C43 F834 A0=64 8=?DC C>  
 64=4A0C4 0= 8B>;0C43 +32 >DC?DC , 8C7 8CB 7867 5A4@D4=2H  
 I4A> E>;C064 BF8C278=6 .+( C>?>;>6H C74 # 2>=E4AC4A  
 2>=B8BC4=C;H 34;8E4AB 7867 4M284=2H 02A>BB C74 8=?DC ;8=4 A0=64  
 # >3D;0A # 2>=E4AC4AB 0=3 3>F=BCA40< ?A>3D2CB  
 BD??>AC 4M284=C ?>F 4A 38BCA81DC8>= ?A>E838=6 BD?4A8>A ?>F 4A  
 BHBC4 < ?4A5>A< 0=24 0=3 2>==42C8E8CH 5A>< 0 EOA84CH >5  
 D=A46D;0C43 ?>F 4A B>DA24B C> C74 ?>8=C >5 ;>03  
 "4E4A068=6 C74 C74A< 0; 0=3 34=B8CH 14=4JCB >5 +82>AIB 78&  
 ?02: 068=6 C427=>;>6H C74 # <>3D;4 >L4AB K4G81;4 C74A< 0;  
 < 0=064 < 4=C >?C8>=B F8C7 E4AH ;>F C>? 0=3 1>CC>< B834  
 C74A< 0; 8< ?430=24B )74A< 0;H 034?C 78& 10B43 ?>F 4A  
 2>< ?>=4=CB 4=01;4 2DBC>< 4AB C> 02784E4 2>BC 4L42C8E4 ?>F 4A  
 BHBC4 < B>;DC8>=B F8C7 ?A4E8>DB;H D=OCC08=01;4 BHBC4 < B81 4  
 F 4867C 0=3 4M284=2H OCCA81DC4B @D82; ;H 0=3 ?A4382C01;H

#C: 3-+6 : : 63-+>398=

E ") , )9 ")5/- 15, 15/  
 E <1, )5+- #@:; -4: 647<;15/  
 E 6;69 91=-  
 E 1:73)@ !# ") , 16



\$@71+)3 7731+);165 ! 15 )5 )99)@ 6. .6<9 <51;:



\$@71+)3 7731+);165 #15/3- ! ;6 ) 565 1:63);-, 9- /<3);69 )5, , 19-+; ;6 36),





6/->3-+6 " : /-3E-+>398=

-G<:@=@:8K@FEJ 8GGCP FM<I 8CC C@E< KI@D 8E; CF8; :FE;@K@FEJ, @EK<IE8C<K8E<@EK< 96. 0-JG<:@=@:8K@FEJ 8GGCP FM<I K?< K<DG<I8KLI< I8E>< F= R #(. R

>>3, ?>/	"C7, 96	98. 3>398= 9>/=	38	#C:	+B	\$83>
9A/< 8: ?> " : /-3E-+>398						
#EGLK MFCK8>< I8E><	0#(	FEK@ELFLJ FG<I8K@FE				0
#EILJ? :LII<EK G<8B	#(.*	1@K? D8O@DLD 2. =LCC I<J@JK@M< CF8;				
#EGLK :8G8:@K8E:< @EK<IE8C	#(#(.	==<:K@M< M8CL< 8K EFD@E8C @EGLK MFCK8>				S
#EGLK :8G8:@K8E:< @EK<IE8C	, #(#(.	K ""Q				DΩ
#EGLK @E;L:K8E:< <OK<IE8C	&#(	@==<I<EK@8C DF;< N@K? EF =LIK?<I C@E< 9P				S"
9 9+ " : /-3E-+>398						
#EGLK GFN<I U ;@J89C<;	* +	(FD@E8C C@E< J<< @> 1FIJK :8J< C@E< J<< @>				1 1
#EGLK GFN<I U <E89C<; N@K? E	*(&	(FD@E8C C@E< J<< @> 1FIJK :8J< C@E< J<< @>				1 1
9A/< ?> ?> " : /-3E-+>398						
)LKGLK MFCK8>< J<K GF@EK	0) (. )'	0#( 0 EFD@E8C KI@D 8K &F8; #(. R				0
,8K<; FLKGLK MFCK8>< KI@D I8E	0) )..#'#(!	.I@D I8E>< FM<I K<DG N@K? I8K<; CF8; -G<:@Z<J K?< &FN (FD@E8C 8E; ">?>.I@D :FE;C				0
)LKGLK MFCK8>< CF8; I<LC8K@	□0) )&	&@E<8I CF8; C@E< )LKGLK MFCK8>< @E:I<8J< : CF8; :LII<EK KF EF CF8; F<J EFK @E:CL;< C@>? I<LC8K@FE -<< @> 8E; -< :<J@>E !L@;<C@				0
)LKGLK MFCK8>< C@>?K CF8; I<	□0) )&&	KF CF8; 8;;@K@FE8C 0 I<C8K@M< KF :8C:I CF8; C@E< GF@EK J<< @> 8E; -< :<J@>E !L@				0
)LKGLK MFCK8>< K<DG<I8KLI< :F<=Z:@<EK	□0) ).."	(FD@E8C C@E<8I K<DG<I8KLI< :F<=Z:@<EK I<C .#(. T -<< @> 8E; <J@>E !L@;<C@E<J -<:K@				D0 R
0) ) 8::LI8:P	0 ) ) . /, 3	?< KFK8C FLKGLK MFCK8>< J<KGF@EK 8::LI8:P :8C:LC8K<; @;<8C 08J<; FE CF8; K<DG 8E; KI@D O:CL;<J 0) )&&				
,8K<; FLKGLK GFN<I	* ) )	FEK@ELFLJ ) 0 ≥ 0				1
,8K<; FLKGLK :LII<EK	# )	FEK@ELFLJ ) 0 ≤ 0				
)LKGLK :LII<EK C@D@K	# )&	)= I8K<; # ) D8O LCCP FG<I8K@FE8C :LII<EK C@ EFD@E8C KI@D 8E; 9<CFN				
LII<EK C@D@K ;<C8P	K ) )&#	?< DF;LC< N@CC GFN<I C@D@K @E 8 =8JK KI8				DJ
=Z:@<E:P	η	LCC CF8; EFD@E8C C@E< EFD@E8C KI@D LCC CF8; FM<I C@E< 8E; K<DG<I8KLI< EFD@E8 CF8; FM<I I8K<; C@E< K<DG<I8KLI< 8E; KI@D				
)LKGLK MFCK8>< I@GGC<	0) ).."	)M<I 8CC FG<I8K@E> JK<8;P JK8K< C@E< 8E; KI@D ""Q 1 D@E@DLD ) 2. 8E; 8K C<8JK I8K<; CF8;				D0
)LKGLK :8G8:@K8E:< @EK<IE8C	) )#(.	==<:K@M< M8CL< 8K EFD@E8C FLKGLK MFCK8>				S
)LKGLK :8G8:@K8E:< @EK<IE8C	, ) )#(.	K ""Q				DΩ
)LKGLK :8G8:@K8E:< <OK<IE8C	) ) 2.	""Q 98E;N@;K? K EFD@E8C KI@D D@E@DLD8E; 8K C<8JK I8K<; CF8;				S
)LKGLK :8G8:@K8E:< <OK<IE8C	) ) 2..(-	O:CL;<J :FDGFE<EK K<DG<I8KLI< :F<=Z:@<EK FI CF KI8EJ@<EKJ ;FNE KF I8K<; CF8; N@K? JK8K@: KI@				S
)LKGLK :8G8:@K8E:< <OK<IE8C	) ) 2. ..(-.#	O:CL;<J :FDGFE<EK K<DG<I8KLI< :F<=Z:@<EK FI CF KI8EJ@<EKJ ;FNE KF I8K<; CF8; N@K? ;PE8D@: KI@DD				S



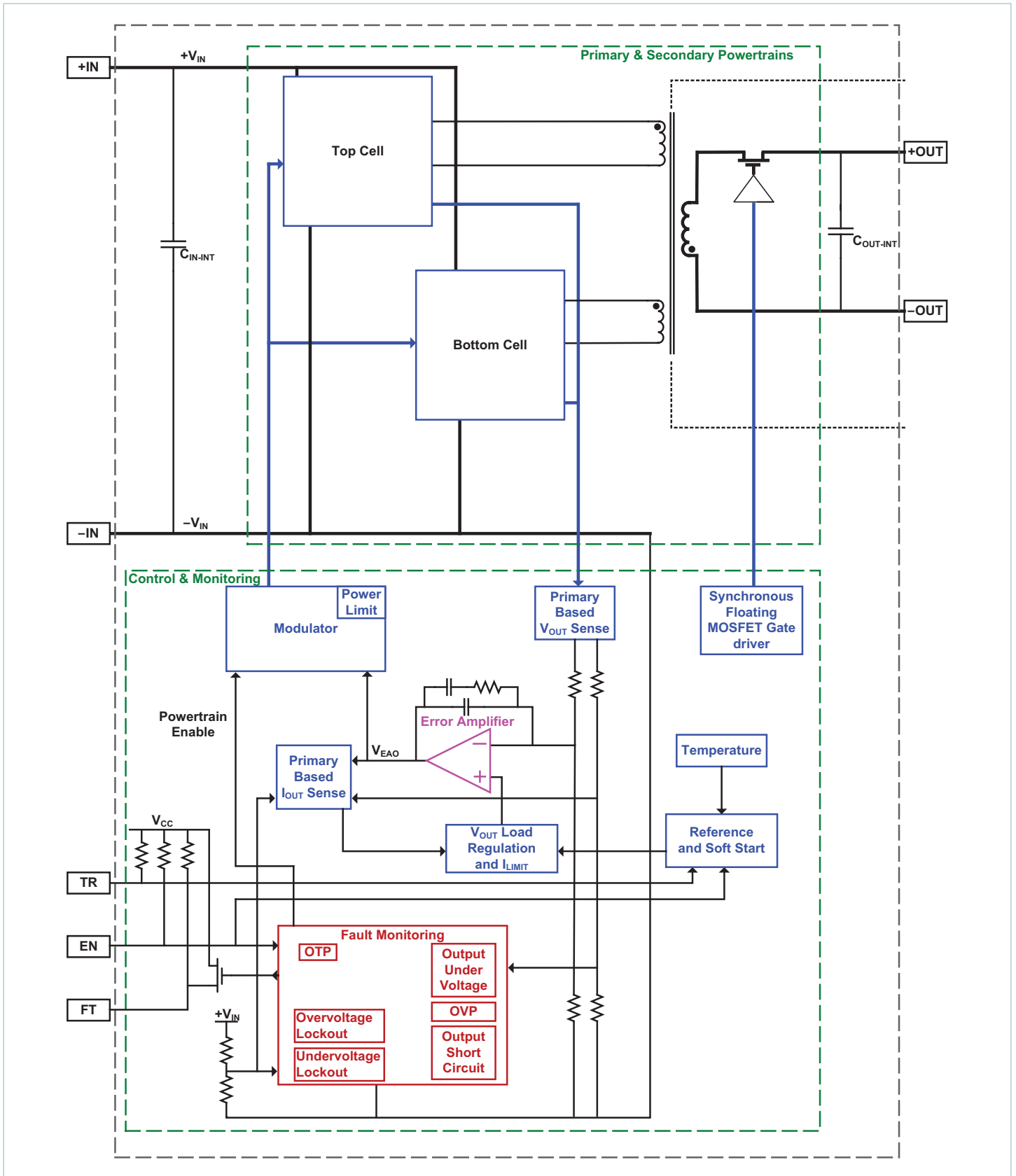
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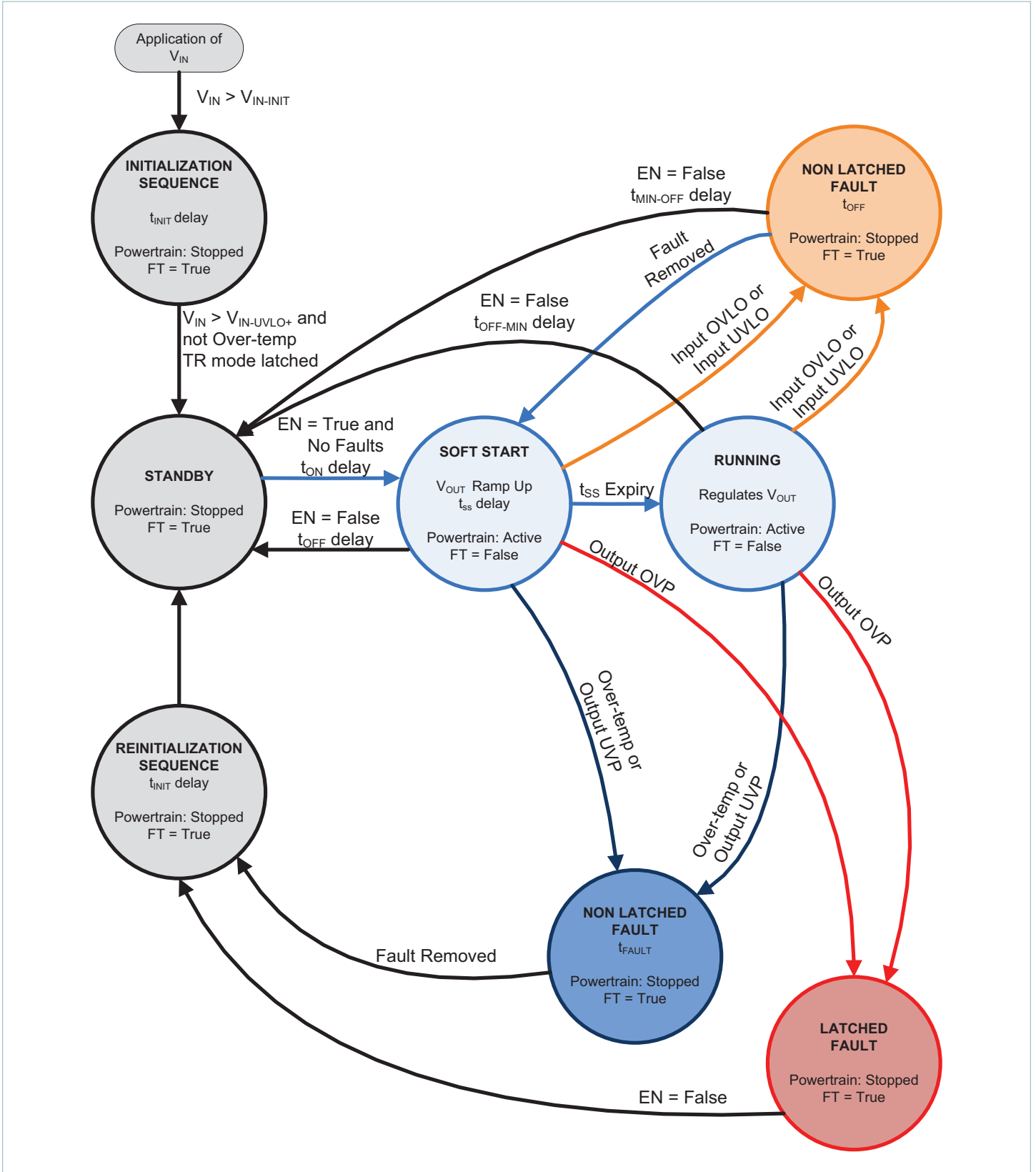
8+, 6/							
Y. ?< ( G@E <E89C<J 8E; ;@J89C<J K?< ' :FEM<IK<I N?<E ?<C; CFN K?< LE@K N@CC 9<; @J89C<; Y. ?< ( G@E ?8J 8E @EK<IE8C GLCC LG KF 0 8E; @J I<=<I<E<; KF K?< # ( G@E F= K?< :FEM<IK<I							
" #'	"# #	##! \$#	"'	# " # "			& \$ #
# \$#	5@	(<E89C< K?I<J?FC;	0 ( & (				0
		0 ( & #-				0	
		#EK<IE8CCP ><E<I8K<;	0				0
		( @EK<IE8C GLCC LG I<J@JK8E:< KF 0	, ( & #(.				BΩ

#37 #!							
Y. ?< ., G@E <E89C<J 8E; ;@J89C<J KI@D =LE:K@FEJ 8GGCP 8GGC@<; KF K?< ' :FEM<IK<I 1?<E 0@E ZIJK :IFJJ<K?< MFCK8>< FE ., ;<K<ID@E<J N?<K?<I FI EFK KI@D @J 8:K@M< Y # = ., @J EFK [F8K@E> 8K GFN<I LG 8E; ?8J 8 MFCK8>< C<JJ K?8E ., KI@D <E89C< K?I<J?FC; KI@D @J 8:K@M< Y # = KI@D @J 8:K@M< K?< ., G@E GIFM@;<J ;PE8D@: KI@D :FEKIFC N@K? 8K C<8JK "Q F= ; :FEKIFC 98E;N@;K? FM<I K?< FLKGLK MFCK8>< F= K?< Y. ?< ., G@E ?8J 8E @EK<IE8C GLCC LG KF 0 I<=<I<E<; KF K?< # ( G@E F= K?< :FEM<IK<I							
" #'	"# #	##! \$#	"'	# " # "			& \$ #
# \$#	#,);<7	., KI@D ;@J89C< K?I<J?	0, # #-	.I@D ;@J89C<; N?<E ., 89FM< K?@J K?I<, 8K GFN<I LG			0
		., KI@D <E89C< K?I<J?F	0, # (	.I@D <E89C<; N?<E ., 9<CFN K?@J K?I<J' 8K GFN<I LG			0
# \$#	7-9);165)3 >1;0 \$914 -5)*3-,	#EK<IE8CCP ><E<I8K<;	0				0
		., G@E =LE:K@FE8C I8E	0, #, (!				0
		0), I<=<I<; ., G@E I<JFCLK@FE	0), .-	1@K? 0 0			D0
		., @EK<IE8C GLCC LG I<J@JK8E:< KF 0	, .## #(.				BΩ

+?6> #								
Y. ?< . G@E @J 8 8LCK [8> G@E Y 1?<E K?< DF;LC< @J <E89C<; 8E; EF =8LCK @J GI<J<EK K?< . G@E ;F<J EFK ?8M< :LII<EK ;I@M< :8G89@C@KP Y 1?<E<M<I K?< GFN<IKI8@E JKFGJ ;L< KF 8 =8LCK GIFK<:K@FE FI ;@J89C@E> K?< DF;LC< 9P GLCC@E> ( CFN K?< . G@E FLKGLK 0:: 8E; GIFM@;< 8E <OK<IE8C :@IL@K Y 1?<E DF;LC< JK8IKJ LG K?< . G@E @J GLCC<; ?@<K@FD@:IF:FEKIFCC<I @E@K@8C@Q8K@FE 8E; N@CC I<D8@E ?@>? LEK@C JF=K JK8IK GIF<:								
" #'	"# #	##! \$#	"'	# " # "			& \$ #	
# \$# \$#	5@	. @EK<IE8C GLCC LG I<J@JK8E:< KF 0	, /& #(.				BΩ	
		. MFCK8><	0 /& .#0	K I8K<; :LII<EK ;I@M< :8G89@C@KP			0	
	\$ +;1=-	. :LII<EK ;I@M< :8G89@	#/& .#0	)M<I CF8; 9<PFE; K?< -)&/ . ' 2#/' I8K@E>J D8P :8LJ< DF;LC<; 8D8><				D
		. I<JGFEJ< K@D<	K .#0	<C8P =IFD :<J8K@FE F= JN@K?>@E> K . *@E :K@M<				SJ

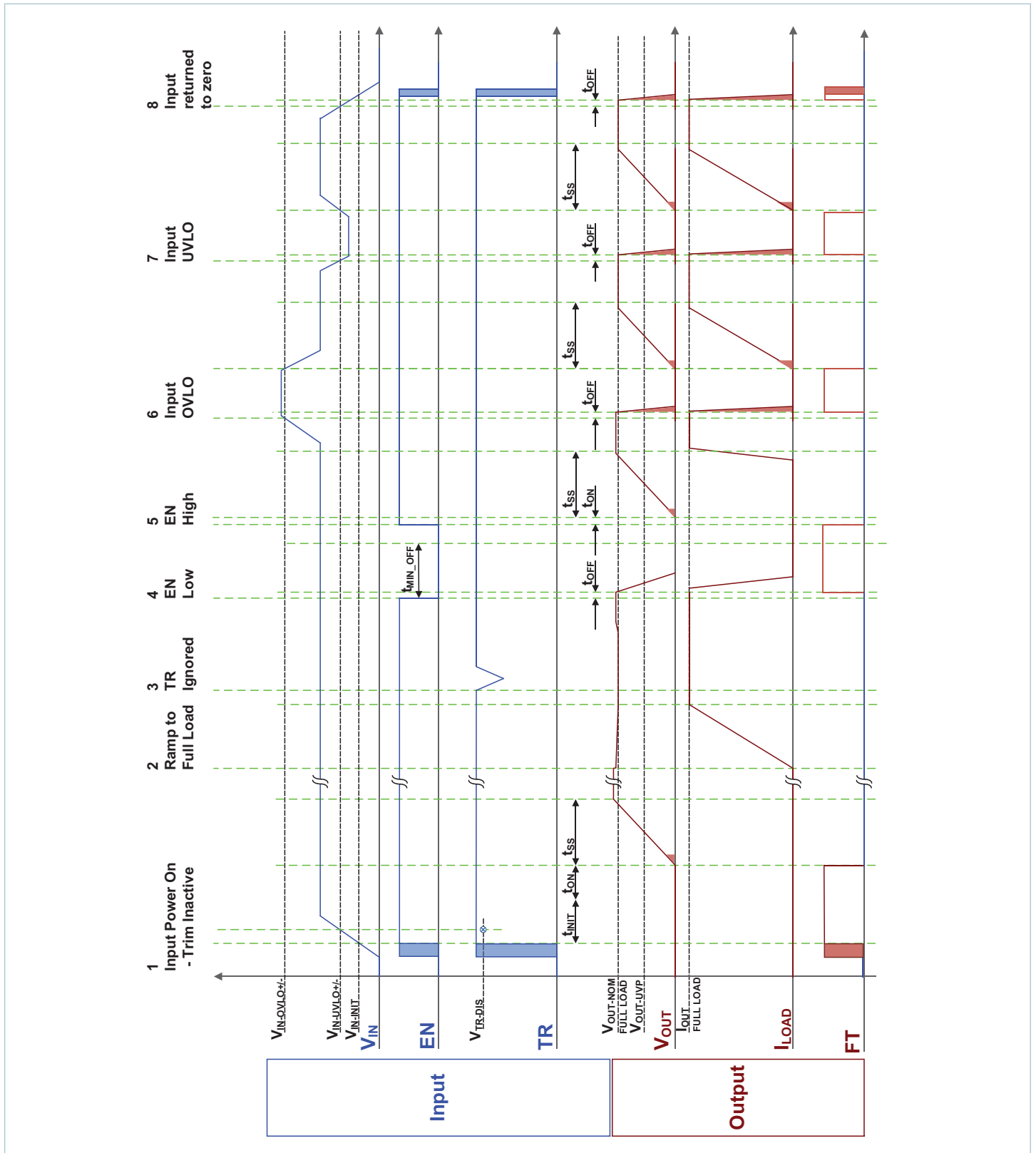


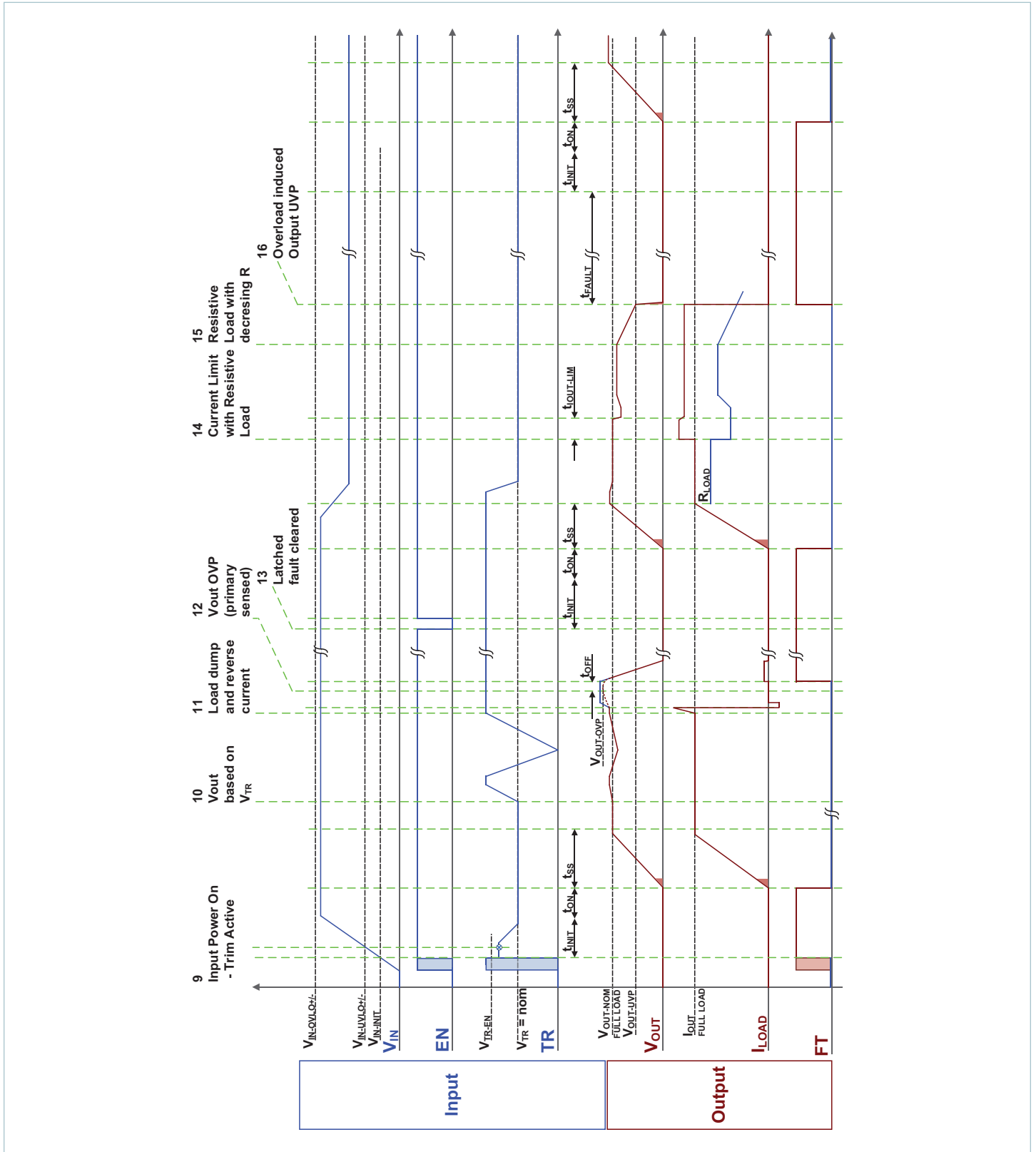




#37381 3+1<+7=

6, <3- 57<; )9- :06>5 15 \*3<- 6, <3- <;7<; )9- :06>5 15 \*96>5





#C: 3-+6 /<09<7+8- / 2+<+->/<3=>3-=-

\$0- .6336>15/ .1/<9-: 79-: -5; ;@71+)37-9.694)5+- ); \$ B <53-: : 6;0-9>1:- 56;- , #-- )::6+1);- , .1/<9-: .69 /-5-9)3;9-5, , );)

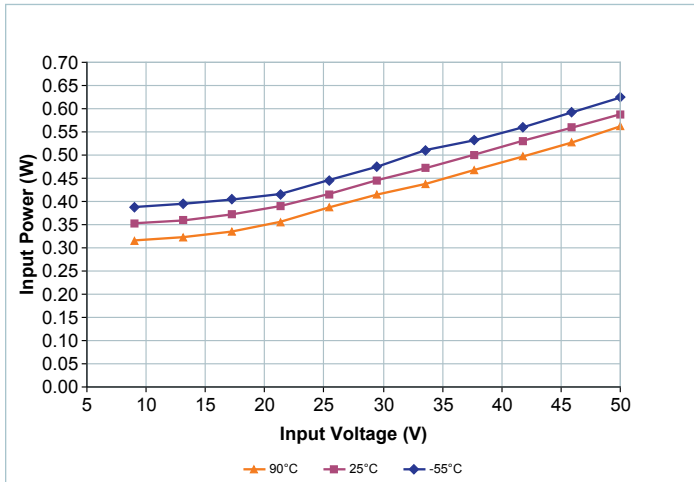


Figure 3 — Disabled power dissipation vs.  $V_{IN}$

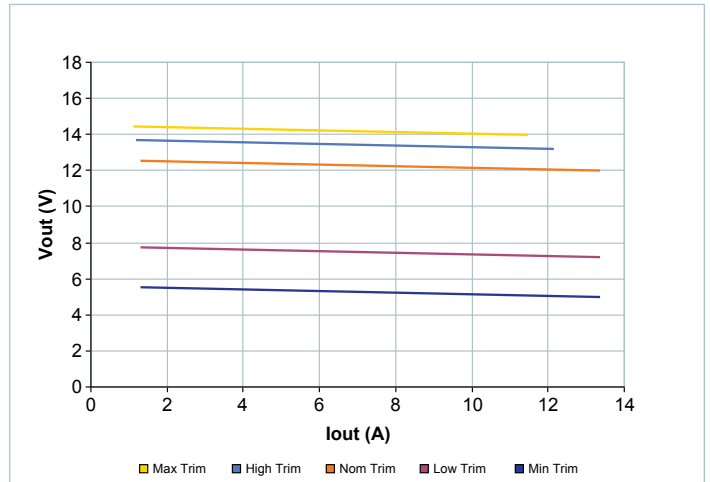


Figure 6 — Ideal  $V_{OUT}$  vs. load current, at 25°C case

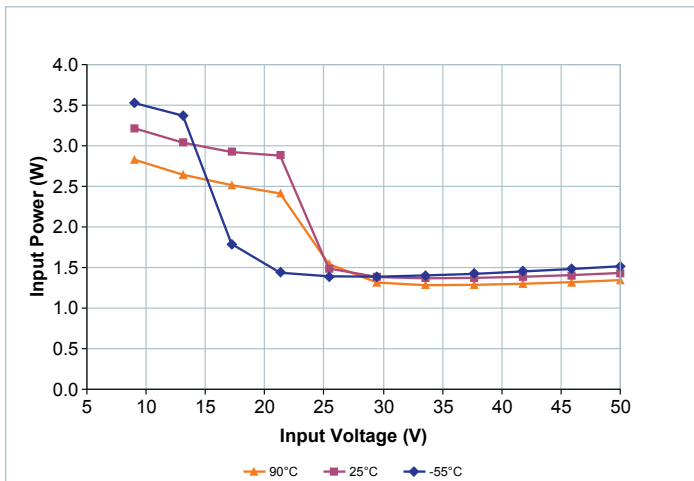


Figure 4 — No load power dissipation vs.  $V_{IN}$  at nominal trim

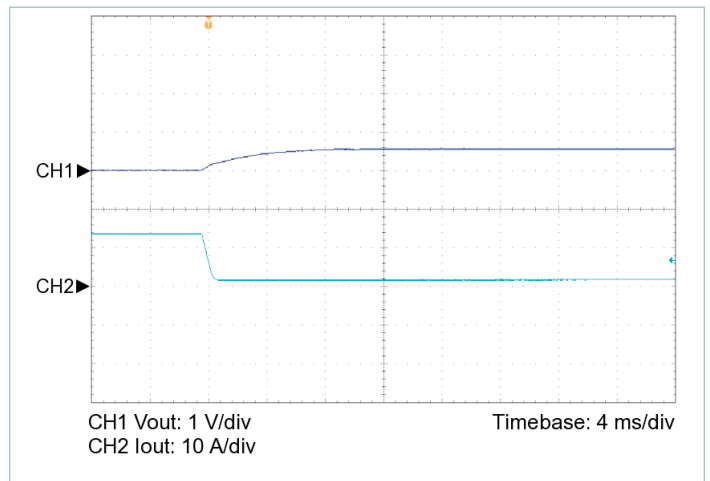


Figure 7 — 100% to 10% load transient response,  $V_{IN} = 30\text{ V}$ , nominal trim,  $C_{OUT\_EXT} = 1000\ \mu\text{F}$

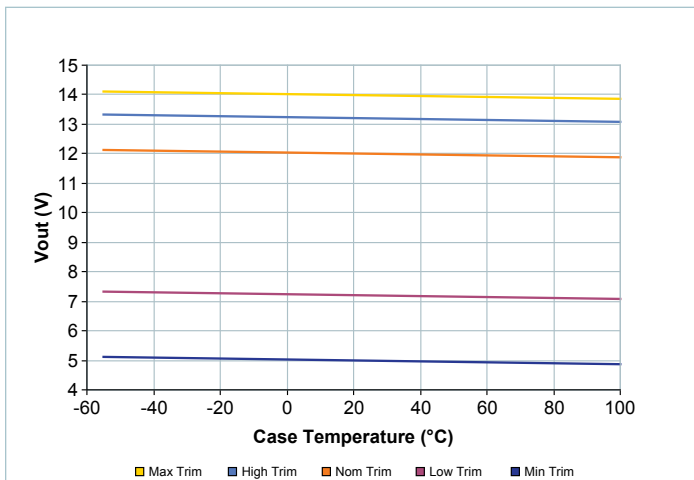


Figure 5 — Ideal  $V_{OUT}$  vs. case temperature, at full load

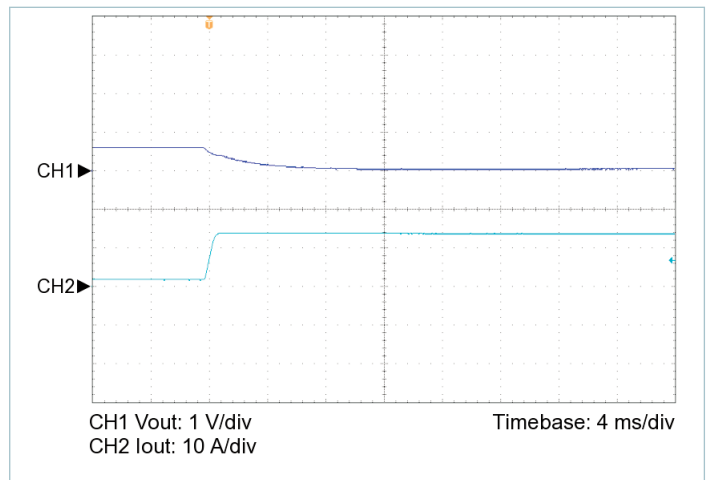


Figure 8 — 10% to 100% load transient response,  $V_{IN} = 30\text{ V}$ , nominal trim,  $C_{OUT\_EXT} = 1000\ \mu\text{F}$

#C: 3-+6 / <09<7+8- / 2+<+->/<3=>3=- -98>

\$0- .636>15/ .1/<9-: 79-:-5; ;@71+)37-9.694)5+- ); \$

B <53-:: 6;0-9>1:- 56;- , #-- )::6+1);-, .1/<9-: .69 /-5-9)3;9-5, , );)

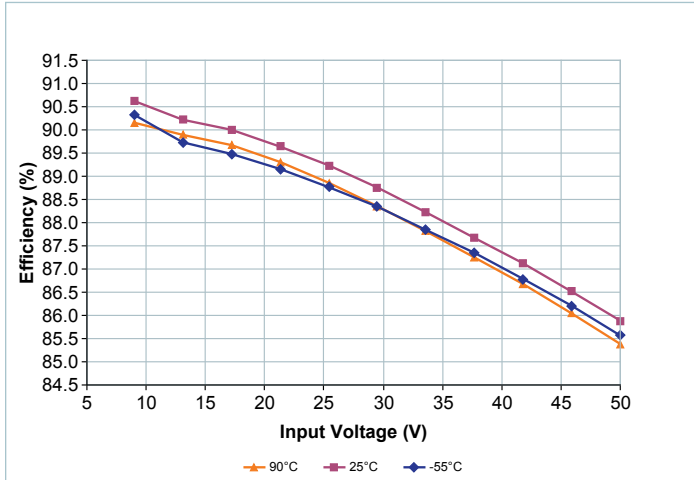


Figure 9 — Full Load Efficiency vs.  $V_{IN}$  at low trim

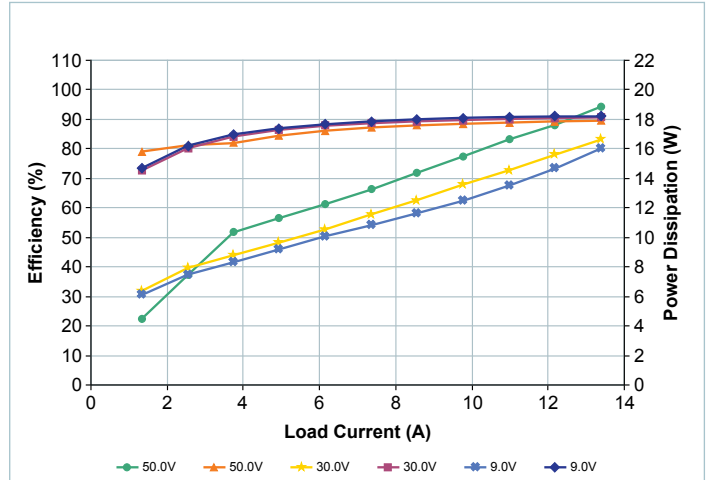


Figure 12 — Efficiency and power dissipation vs. load at  $T_{CASE} = -55^{\circ}C$ , nominal trim

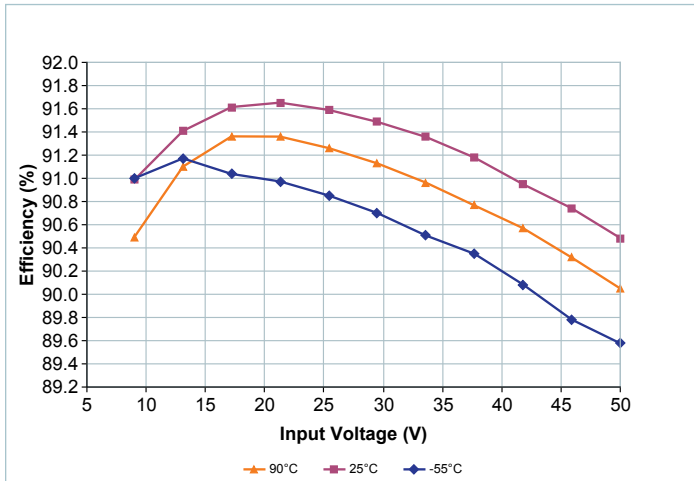


Figure 10 — Full Load Efficiency vs.  $V_{IN}$  at nominal trim

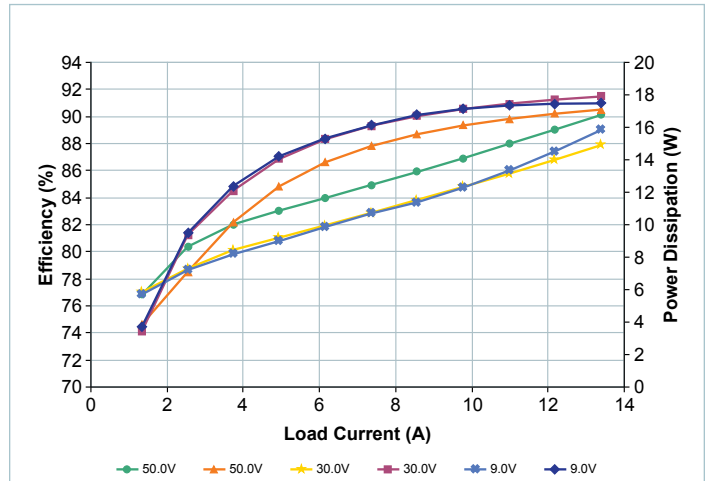


Figure 13 — Efficiency and power dissipation vs. load at  $T_{CASE} = 25^{\circ}C$ , nominal trim

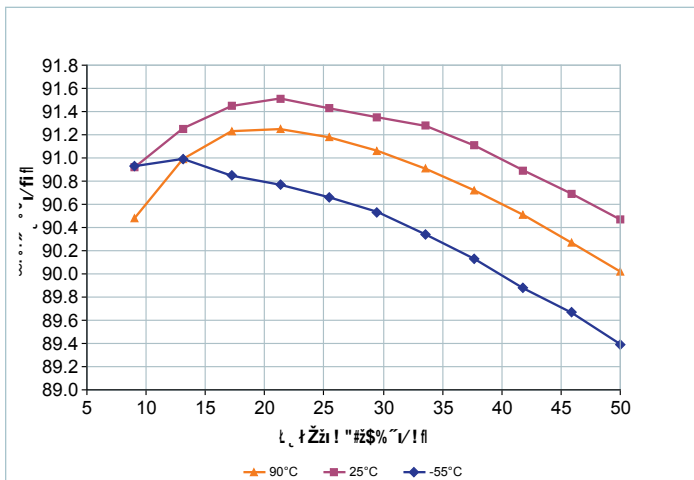


Figure 11 — Full Load Efficiency vs.  $V_{IN}$  at high trim

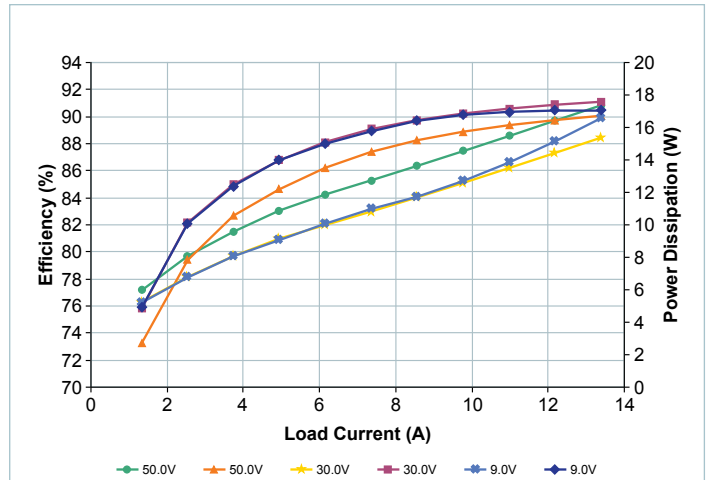


Figure 14 — Efficiency and power dissipation vs. load at  $T_{CASE} = 90^{\circ}C$ , nominal trim

#C: 3-+6 /<09<7+8-/ 2+<+->/<3=>3=- -98>

\$0- .6336>15/ .1/<9-: 79-:-5; ;@71+)3 7-9.694.)5+- ); \$ B <53-:: 6;0-9>1:- 56;- , #-- )::6+1);-, .1/<9-: .69 /-5-9)3;9-5, , );)

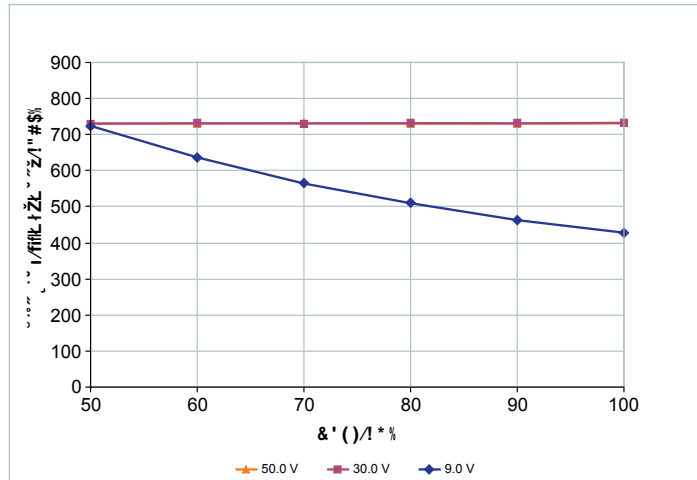


Figure 15 — Nominal powertrain switching frequency vs. load, at nominal trim

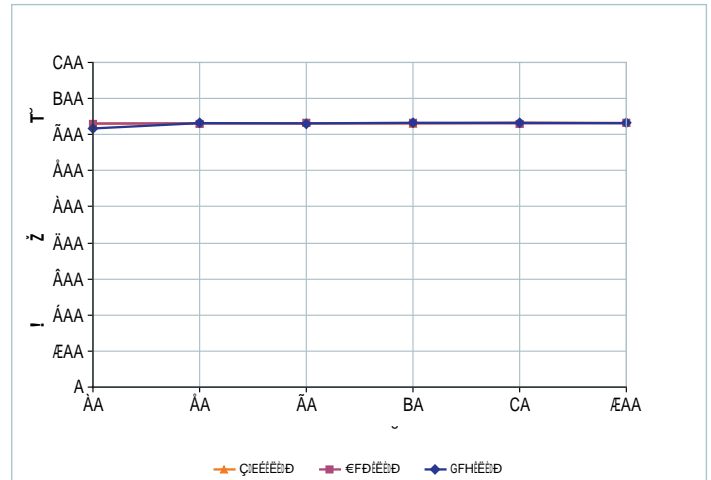


Figure 18 — Nominal powertrain switching frequency vs. load, at nominal  $V_{IN}$

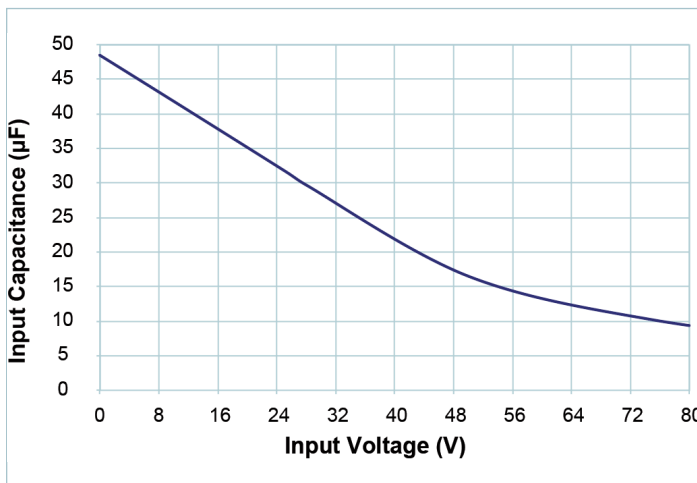


Figure 16 — Effective internal input capacitance vs. applied voltage

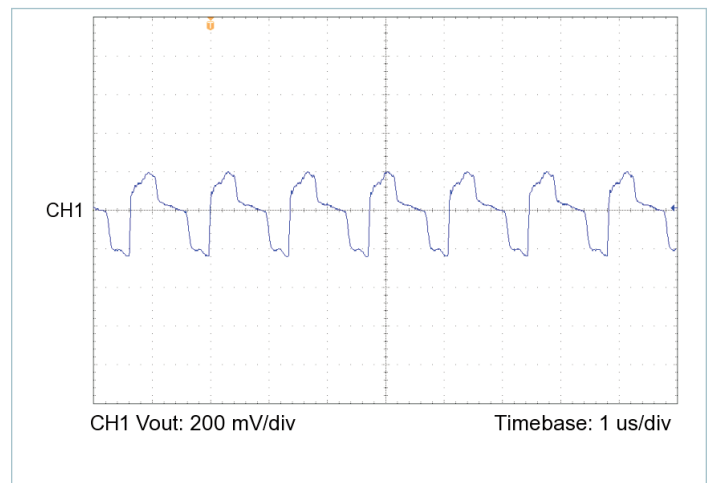


Figure 19 — Output voltage ripple,  $V_{IN} = 30 V$ ,  $V_{OUT} = 12.0 V$ ,  $C_{OUT\_EXT} = 1000 \mu F$ ,  $R_{LOAD} = 0.896 \Omega$

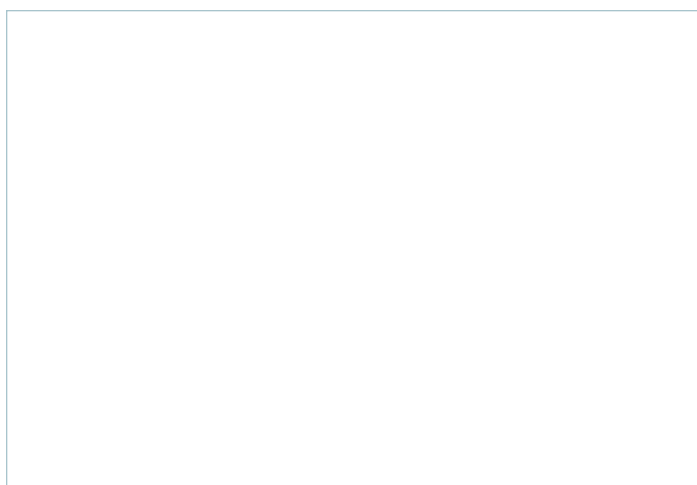


Figure 17 — Startup from EN,  $V_{IN} = 30 V$ ,  $C_{OUT\_EXT} = 10000 \mu F$ ,  $R_{LOAD} = 0.896 \Omega$

/8/<+6 2+<+>/<3=>3-=-

-G<:@=@:8K@FEJ 8GGCP FM<I 8CC C@E< KI@D 8E; CF8; :FE;@K@FEJ @EK<IE8C K<DG<I8KLI< @EK<IE8C K<DG<I8KLI< EFK<; 96. 0JG<:@=@:8K@FEJ 8GGCP FM<I K?< K<DG<I8KLI< I8E>< F= R #(. R

>>3, ?>/	"C7, 96	98. 3>398= 9>/=	38	#C:	+B	\$83>
/-2+83-+6						
&<E>K?	&		5 6	5 6	5 6	DD 5@E6
1@;K?	1		5 6	5 6	5 6	DD 5@E6
"<@>?K	"		5 6	5 6	5 6	DD 5@E6
0FCLD<	0FC	(F ?<8K J@EB		5 6		:D 5@E6
1<@>?K	1			5 6		> 5FQ6
&<8; ZE@J?		(@:B<C				SD
		*8CC8;@LD				
		!FC;				
#2/<7+6						
)G<I8K@E> @EK<IE8C K<DG<I8K	. #(.	' !I8;<				R
.?<ID8C I<J@JK8E:< KFG J@;<	Φ#(. .)'	JK@D8K<; K?<ID8C I<J@JK8E:< KF D8C				R 1
.?<ID8C I<J@JK8E:< C<8;J	Φ#(. & .	K<DG<I8KLI< @EK<IE8C :FDGFE<EK =II				R 1
.?<ID8C I<J@JK8E:< 9FKKFD J@;	Φ#(. .)'	@JFK?<ID8C KFG				R 1
.?<ID8C :8G8:@KP		JK@D8K<; K?<ID8C I<J@JK8E:< KF D8O@DL D K<DG<I8KLI< @EK<IE8C :FDGFE<EK =IFD @JFK?<ID8C C<8;J				1J R
==/7, 6C						
-KF18>< K<DG<I8KLI<	. .	' !I8;<				R
- I8K@E>	" "	'<K?F; G<I "LD8E F;P 'F;<C .<JK	& --			0
	'	- \$ \$ -	& --			
"96. /<381 ( )						
*<8B K<DG<I8KLI< KFG :8J<		FI =LIK?<I @E=FID8K@FE GC<8J< :FE				R
		=8:KFIP 8GGC@:8K@FEJ				

( ) \*IF;L:K @J EFK @EK<E;<; =FI I<[FN JFC;<I 8KK8:?

/8/<+6 2+<+>/<3=>3-= 98>

-G<:@=@:8K@FEJ 8GGCP FM<I 8CC C@E< KI@D 8E; CF8; :FE;@K@FEJ @EK<LEK>KLEK>48K@J< EFK<; 96. 0+JG<:@=@:8K@FEJ 8GGCP FM<I K?< K<DG<I8KLI< I8E>< F= R #(. R

>>3, ?>/	"C7, 96	98. 3>398= 9>/=	38	#C:	+B	\$83>
"+0/>C						
@<C<:KI@: 1@K?JK8E; <JK	0*#).	#( KF )/. #( KF - )/. KF -				0:: 0:: 0::
! /63+, 363>C						
'.		'#& " % ( *8IKJ FLEK R !IFLE; <E@>E -K8K@FE8IP #E;FFIJ FDGLK<I <C:FI;@8 #JJL< 'K?F; # 8J< R ! !				"IJ "IJ
1/8-C :: <9@+t=						
><E:P 8GGIFM8CJ JK8E;8I;J						



38 ?8->398=

=?DC ?>F4A ?8=B \$ 8B C74 A454A4=24 5>A O;; 2>=CA>; ?8=B O=3  
 C74A45>A4 O ! 4;E8= 2>==42C8>= 5>A C74 2>=CA>; B86=O;B 8B  
 A42><< 4=343 OB 2;>B4 OB ?>BB81;4 C> C74 ?8= => C74 ?02: O64 C>  
 A43D24 45542CB >5 E>;C064 3A>? 3D4 C> \$ 2DAA4=C

\$# \$#  
 %DC?DC ?>F4A ?8=B

8+, 6/  
 )78B ?8= 4=01;4B O=3 38B01;4B C74 # 2>=E4AC4A F74= 74;3 ;>F C74  
 D=8C F8;; 14 38B01;43 C 8B A454A4=243 C> C74 \$ ?8= >5 C74 2>=E4AC4A  
 )74 \$ ?8= 70B O= 8=C4A=0; ?D;; D? C> + C7A>D67 O  
 : Ω A4B8BC>A

- %DC?DC 4=01;4 , 74= \$ 8B O;;>F43 C> ?D;; D? O1>E4 C74 4=01;4  
 C7A4B7>;3 C74 <>3D;4 F8;; 14 4=01;43 5;40E8=6 \$ 5;>OC8=6 8C 8B  
 ?D;;43 D? C> + O=3 C74 <>3D;4 F8;; 14 4=01;43
- %DC?DC 38B01;4 \$ <OH 14 ?D;;43 3>F= 4GC4A=0;;H 8= >A34A  
 C> 38B01;4 C74 <>3D;4
- \$ 8B O= 8=?DC >;=;H 8C 3>4B =>C ?D;; ;>F 8= C74 4E4=C >5 O 50D;C
- )74 \$ ?8=B >5 <D;C8?;4 D=8CB B7>D;3 14 3A8E4= 7867 2>=2DAA4=C;H  
 C> ?4A< 8C C74 OAAOH C> BCOAC 8= C> <OG8< D< AOC43 ;>O3 >F4E4A  
 C74 38A42C 8=C4A2>==42C8>= >5 <D;C8?;4 \$ ?8=B A4@D8A4B O338C8>=0;  
 2>=B834AOC8>=B OB 38B2DBB43 8= C74 B42C8>= >= AAOH %?4AOC8>=

#! #37  
 )74 )' ?8= 8B DB43 C> B4;42C C74 CA8< <<>34 O=3 C> CA8< C74 >DC?DC  
 E>;C064 >5 C74 # 2>=E4AC4A )74 )' ?8= 70B O= 8=C4A=0; ?D;; D? C>  
 + C7A>D67 O : Ω A4B8BC>A

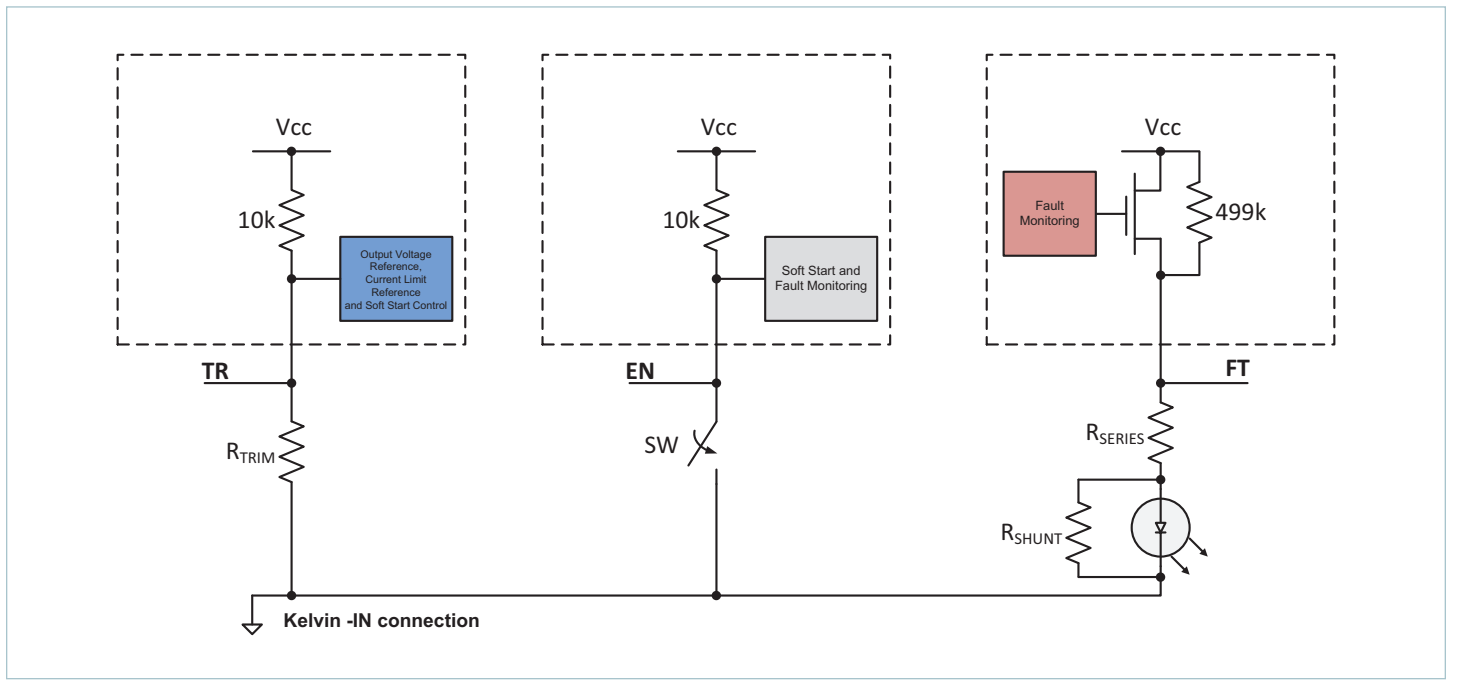
)74 # F8;; ;OC27 CA8< 1470E8>A OC O??;82OC8>= >5 + \$ >=24 + \$  
 4G2443B + \$ \*+ "% O=3 ?4AB8BC 8= C7OC BO< 4 1470E8>A D=C8; ;>BB >5  
 8=?DC E>;C064  
 ■ C O??;82OC8>= >5 + \$ 85 )' 8B BO< ?;43 OC O1>E4 +; # ( C74  
 <>3D;4 F8;; ;OC27 8= O =>= CA8< <>34 O=3 F8;; 86=>A4 C74 )'  
 8=?DC 5>A OB ;>=6 OB + \$ 8B ?A4B4=C

■ C O??;82OC8>= >5 + \$ 85 )' 8B BO< ?;43 OC 14;>F +; # \$ C74 )'  
 F8;; B4AE4 OB O= 8=?DC C> 2>=CA>; C74 A4O; C8< 4 >DC?DC E>;C064  
 A4;OC8E4 C> 5D;; ;>O3 X C F8;; ?4AB8BC 8= C78B 1470E8>A D=C8; + \$ 8B  
 => ;>=64A ?A4B4=C

5 CA8< 8B O2C8E4 F74= C74 # 8B >?4AOC8=6 C74 )' ?8= ?A>E834B  
 3H=O< 82 CA8< 2>=CA>; OC O CH?82O; 1 >5 3 10=3F83C7 >E4A C74  
 >DC?DC E>;C064 )' O;B> 342A4OB4B C74 2DAA4=C ;8< 8C C7A4B7>;3 F74=  
 CA8< <8=6 O1>E4 +%+) \$%#  
 # +?6>  
 )74 ) ?8= ?A>E834B O OD;C B86=0;  
 =HC8< 4 C74 <>3D;4 8B 4=01;43 O=3 70B =>C A42>6=8I43 O 50D;C C74  
 ) ?8= 8B 8=O2C8E4 ) 70B O= 8=C4A=0; : Ω ?D;; D? C> +22 C74A45>A4  
 O B7D=C A4B8BC>A ' ( \*\$ ) >5 O??A>G8< OC4;H : Ω 20= 14 DB43 C>  
 4=BDA4 C74 " 8B 2>< ?;4C;H >55 F74= C74A4 8B => 50D;C ?4A C74  
 3806AO< 14;>F

, 74=4E4A C74 ?>F4ACA08= BC>?B 3D4 C> O 50D;C ?A>C42C8>=>A  
 38B01;8=6 C74 <>3D;4 1H ?D;;8=6 \$ ;>F C74 ) ?8= 142>< 4B O2C8E4  
 O=3 ?A>E834B 2DAA4=C C> 3A8E4 O= 4GC4A=0; 28A2D8C  
 , 74= O2C8E4 ) ?8= 3A8E4B C> + F8C7 D? C> < >5 4GC4A=0;  
 ;>O38=6 # >3D;4 <OH 14 3O< O643 5A>< O= >E4A 2DAA4=C ) 3A8E4  
 C7DB O A4B8BC>A 8= B4A84B 5>A 2DAA4=C ;8< 8C8=6 8B A42><< < 4=343  
 )74 ) ?8= 142>< 4B O2C8E4 <<> < 4=COA8;H F74= C74 <>3D;4 BCOACB D?

#C: 3-+6 B>/<8+6 3<-?3>= 09< "318+6 38= #! #



/=318 ?3. /638/=

?36. 381 69-5= +8. "C=>/7 /=318

)74 # R 2>=E4AC4A 8=?DC 0224?CB C74 5D;; C> + AO=64 O=3 8C 64=4AOC4B O= 8B>;OC43 CA8 << O1;4 +32 >DC?DC # D;C8?;4 # B < OH 14 ?OAO;4;43 5>A 78674A ?>F 4A 20?O28CH E8O F 8A4;4BB ;>O3 B7OA8=6 4E4= F 74= C74H OA4 >?4AOC8=6 >55 >5 38554A4=C 8=?DC E>;CO64 BD??;84B

)74 # 2>=E4AC4A ?A>E834B O A46D;OC43 >DC?DC E>;CO64 OA>D=3 3458=43 =><8=0; ;>O3 ;8=4 O=3 C4 < ?4AOCDA4 2>4558284=C B )74 ;>O3 ;8=4 O=3 C4 < ?4AOCDA4 2>4558284=C B 4=O1;4 2>=586DAOC8>= >5 O= OAAOH >5 # 2>=E4AC4AB F 7827 <O=O64 C74 >DC?DC ;>O3 F 8C? => B7OA4 1DB O<>=6 <>3D;4B >F=BCA4O< A46D;OC>AB < OH 14 DB43 C> ?A>E834 C867C4A E>;CO64 A46D;OC8>= 85 A4@D8A43

)74 # # & # # < OH 14 DB43 8= BCO=30;>=4 O??;82OC8>=B F 74A4 C74 >DC?DC ?>F 4A A4@D8A4 < 4=CB OA4 D? C> , >F 4E4A 8C 8B 40B8;H 34?;>H43 OB OAAOHB >5 <>3D;4B C> 8=2A4OB4 ?>F 4A 70=3;8=6 20?O28CH AAOHB >5 D? C> 4867C D=8CB 70E4 144= @DO;85843 5>A , 20?O28CH ??;82OC8>= >5 # 2>=E4AC4AB 8= O= OAAOH A4@D8A4B => 34AOC8=6 >5 C74 < OG8 < D < OE08;O1;4 ?>F 4A E4ABDB F 70C 8B B?4285843 5>A O B8=6;4 <>3D;4

"90" ">+<> , 74= C74 # BCOACB 8C F8;; 6> C7A>D67 O B>5C BCOAC A>DC8=4 AO< ?B C74 >DC?DC E>;CO64 1H <>3D;OC8=6 C74 8=C4A=O; 4AA>A O< ?;8584A A454A4=24 )78B 20DB4B C74 >DC?DC E>;CO64 C> O??A>G8< OC4 O ?8424F 8B4 ;8=4OA AO< ? )74 >DC?DC AO< ? 58=8B 74B F 74= C74 E>;CO64 A4O274B 48C74A C74 =><8=0; >DC?DC E>;CO64 >A C74 CA8 << 43 >DC?DC E>;CO64 8= 20B4B F 74A4 CA8 << >34 8B O2C8E4

DA8=6 B>5C BCOAC C74 < OG8 < D < ;>O3 2DAA4=C 20?O18;8CH 8B A43D243 \* =C8; +>DC O2784E4B OC ;4OBC +%\*) " ) ( C74 >DC?DC 2DAA4=C < DBC 14 ;4BB C70= %\*) O , 8= >A34A C> 6DOAO=C44 BCOACD? \$>C4 C7OC C78B 8B 2DAA4=C OE08;O1;4 C> C74 ;>O3 O1>E4 C7OC F 7827 8B A4@D8A43 C> 27OA64 C74 >DC?DC 20?O28CH>A

9738+6 ?>; ?> %96>+1/ 9+. 38/ )7A>D67>DC C78B 3>2D < 4=C C74 ?A>6AO << 43 >DC?DC E>;CO64 48C74A C74 B?4285843 =><8=0; >DC?DC E>;CO64 85 CA8 < 8B 8=O2C8E4 >A C74 CA8 << 43 >DC?DC E>;CO64 85 CA8 < 8B O2C8E4 8B B?4285843 OC 5D;; ;>O3 O=3 OC A>>< C4 < ?4AOCDA4 )74 O2CDO; >DC?DC E>;CO64 >5 C74 # 8B 68E4= 1H C74 ?A>6AO << 43 CA8 << 43 >DC?DC E>;CO64 F 8C? <>38582OC8>= 1OB43 >; ;>O3 O=3 C4 < ?4AOCDA4 )74 =><8=0; >DC?DC E>;CO64 8B + O=3 C74 O2CDO; >DC?DC E>;CO64 F 8;; << OC27 C78B OC 5D;; ;>O3 O=3 A>>< C4 < ?4AOCDA4 F 8C7 CA8 < 8=O2C8E4

)74 ;OA64BC <>38582OC8>= C> C74 O2CDO; >DC?DC E>;CO64 2>< ?OA43 C> C74 ?A>6AO << 43 >DC?DC 8B 3D4 C> C74 +%\*) \$%# ;>O3 ;8=4 F 7827 5>A C78B <>34; 2>AA4B?>=3B C> □+%\*) "% >5 + B C74 ;>O3 8B A43D243 C74 8=C4A=O; 4AA>A O< ?;8584A A454A4=24 O=3 1H 4GC4=B8>= C74 >DC?DC E>;CO64 A8B4B 8= A4B?>=B4 )78B ;>O3 ;8=4 8B C74 ?A8< OAH 4=O1;4A >5 C74 F 8A4;4BB 2DAA4=C B7OA8=6 O<>=6BC O= OAAOH >5 #B

)74 ;>O3 ;8=4 8< ?O2C >= C74 >DC?DC E>;CO64 8B O1B>;DC4 O=3 3>4B =>C B2O;4 F 8C7 ?A>6AO << 43 CA8 < E>;CO64

>A O 68E4= ?A>6AO << 43 >DC?DC E>;CO64 C74 O2CDO; >DC?DC E>;CO64 E4ABDB ;>O3 2DAA4=C OC 5>A =><8=0; CA8 < O=3 A>>< C4 < ?4AOCDA4 8B 68E4= 1H C74 5>;>F 8=6 4@DOC8>=

" ! \$ % !

9738+6 ?>; ?> %96>+1/ #/7: /<+>?</ 9/003-3/8> B42>=3 O338C8E4 C4A< C> C74 ?A>6AO << 43 >DC?DC E>;CO64 8B 1OB43 >= C74 C4 < ?4AOCDA4 >5 C74 <>3D;4 )78B C4A< ?4A< 8CB 8< ?A>E43 C74A< O; 10;O=28=6 O<>=6 <>3D;4B 8= O= OAAOH 4B?428O;H F 74= C74 5O2C>AH =><8=0; CA8 < ?>8=C 8B DC8;8143 CA8 << >34 8=O2C8E4 )78B C4A< 8B < D27 B< O; ;4A C70= C74 ;>O3 ;8=4 34B2A8143 O1>E4 A4?A4B4=C8=6 >;>H O < + X 270=64 ' 46D;OC8>= 2>4558284=C 8B A4;OC8E4 C> X >A =><8=0; CA8 < O=3 5D;; ;>O3 C74 >DC?DC E>;CO64 A4;OC4B C> C74 C4 < ?4AOCDA4 O22>A38=6 C> C74 5>;>F 8=6 4@DOC8>=

" ! % %

F 74A4 ) \$) 8B 8= X

)74 8< ?O2C >5 C4 < ?4AOCDA4 2>4558284=C >= C74 >DC?DC E>;CO64 8B O1B>;DC4 O=3 3>4B =>C B2O;4 F 8C7 CA8 < >A ;>O3

#37 9. / +8. ?>; ?> #37 98<96 , 74= C74 8=?DC E>;CO64 8B 8=8C8O;H O??;843 C> O # O=3 O5C4A C \$ ) 4;O?B4B C74 CA8 < ?8= E>;CO64 +) 8B BO< ?;43 )74 )' ?8= 7OB O= 8=C4A=O; ?D;; D? A488BC>A C> + B> D=;4BB 4GC4A=O; 28A2D8CAH ?D;; B C74 ?8= E>;CO64 ;>F 4A 8C F 8;; ?D;; D? C> + 5 C74 8=8C8O;H BO< ?;43 CA8 < ?8= E>;CO64 8B 78674A C70= +) ; # ( C74= C74 # F 8;; 38B01;4 CA8 << 8=6 OB ;>=6 OB C74 + \$ A4< O8=B O??;843 = C78B 2OB4 5>A O;; BD1B4@D4=C >?4AOC8>= C74 >DC?DC E>;CO64 F 8;; 14 ?A>6AO << 43 C> C74 =><8=0; )78B <8=8< 814B C74 BD??>AC 2>< ?>=4=CB A4@D8A43 5>A O??;82OC8>=B C7OC >;>H A4@D8A4 C74 =><8=0; AOC43 +>DC O=3 O;B> ?A>E834B C74 14BC >DC?DC B4C?>8=C O22DAO2H OB C74A4 OA4 => O338C8>=O; 4AA>AB 5A>< 4GC4A=O; CA8 < 2>< ?>=4=CB

5 OC 8=8C8O; O??;82OC8>= >5 + \$ C74 )' ?8= E>;CO64 8B ?A4E4=C43 5A>< 4G24438=6 +) ; # \$ C74= C74 # F 8;; O2C8E0C4 CA8 << >34 O=3 8C F 8;; A4< O8= O2C8E4 5>A OB ;>=6 OB + \$ 8B O??;843

+%\*) B4C ?>8=C D=34A 5D;; ;>O3 O=3 A>>< C4 < ?4AOCDA4 2O= 14 2O;2D;OC43 DB8=6 C74 4@DOC8>= 14;>F

" ! \$ % " "

\$>C4 C7OC C74 CA8 << >34 8B =>C 270=643 F 74= O # A42>E4AB 5A>< O=H 5OD;C 2>=38C8>= >A 148=6 38B01;43

#>3D;4 ?4A5A< O=24 8B 6DOAO=C443 C7A>D67 >DC?DC E>;CO64 CA8 < AO=64 +%\*)' # # \$ 5 +%\*) 8B CA8 << 43 O1>E4 C78B AO=64 C74= 24AOC8= 2>< 18=OC8>=B >5 ;8=4 O=3 ;>O3 CAO=B84=C 2>=38C8>=B < OH CA8664A C74 >DC?DC %+&

@/<+66 ?>; ?> %96>+1/ #<+8=0/< ?8->398 )O: 8=6 ;>O3 ;8=4 4@DOC8>= C4 < ?4AOCDA4 2>4558284=C 4@DOC8>= O=3 CA8 < 4@DOC8>= 8=C O22>D=C C74 64=4AO; 4@DOC8>= A4;OC8=6 C74 +%\*) C> ?A>6AO << 43 CA8 < F 74= O2C8E4 ;>O3 O=3 C4 < ?4AOCDA4 8B 68E4= 1H

" ! % " " % ! % ! Δ " !

8=0;H =>C4 C7OC F 74= C74 ;>O3 2DAA4=C 8B 14;>F >5 C74 AOC43 20?O28CH C74A4 8B O= O338C8>=O; U+ F 7827 < OH O33 C> C74 >DC?DC E>;CO64 34?4=38=6 >= C74 ;8=4 E>;CO64 F 7827 8B A4;OC43 C> DABC #>34 &;4OB4 B44 C74 B42C8>= => DABC #>34 14;>F 5>A 34C08;B \*B4 +5>A U+%\*) "" F 74= ;>O3 8B O1>E4 >5 AOC43 ;>O3 (44 B42C8>= => DABC #>34 >?4AOC8>= 5>A ;867C ;>O3 45542CB => >DC?DC E>;CO64



C4 < ?4AOCDA4 50D;C 8B A468BC4A43 C74 ?>F 4ACA08= 8< < 4380C4;H BC>?B  
 BF8C278=6 C74 >DC?DC E>;C064 >5 C74 2>=E4AC4A 50;;B O=3 C74 2>=E4AC4A  
 A4 < O8=8 38B01;43 >5A OC ;40BC C8 < 4 C \* ) 74= C74 2>=E4AC4A F08CB 5>A  
 C74 8=C4A=0; C4 < ?4AOCDA4 C> A4CDA= C> 14;>F ) %& 145>A4  
 A42>E4A8=6 &A>E8343 C74 2>=E4AC4A 8B BC8;; 4=01;43 C74 # F8;;  
 A4BCOAC O5C4A C % ) O=3 C%\$

?>; ?> @/<@96>+1/ +?> <9>/->398 %  
 ) 74 2>=E4AC4A <>=8C>AB C74 >DC?DC E>;C064 3DA8=6 4027 BF8C278=6  
 2H2;4 1H O 2>AA4B?>=38=6 E>;C064 A45;42C43 C> C74 ?A8<OAH B834 2>=CA>;  
 28A2D8CAH 5 C74 ?A8<OAH B4=B43 >DC?DC E>;C064 4G2443B +%\*) %& C74  
 %& 50D;C ?A>C42C8>= 8B CA8664A43 ) 74 2>=CA>; ;>682 38B01;4B C74  
 ?>F 4ACA08= O=3 C74 >DC?DC E>;C064 >5 C74 2>=E4AC4A 50;;B  
 ) 78B CH?4 >5 50D;C 8B ;OC2743 O=3 C74 2>=E4AC4A F8;; =>C BCOAC O608=  
 D=C8; C74 ;OC27 8B 2;40A43 ;40A8=6 C74 50D;C ;OC27 8B O2784E43 1H 48C74A  
 38B01;8=6 C74 2>=E4AC4A E8O C74 \$ ?8= >A 4;B4 1H A4 <>E8=6 C74 8=?DC  
 ?>F 4A BD27 C7OC C74 8=?DC E>;C064 50;;B 14;>F + \$ % )

B>/<8+6 ?>; ?> +; +3>+8-/  
 ) 74 # 2>=E4AC4A 8=C4A=0; 2>< ?4=B0C8>= A4@D8A4B O <8=8< D<  
 4GC4A=0; >DC?DC 20?O28C>A = 4GC4A=0; 20?O28C>A 8= C74 AO=64 >5  
 C> W F8C7 (' >5 <V 8B A4@D8A43 ?4A # 5>A 2>=CA>; ;>?>  
 2>< ?4=B0C8>=?DA?>B4B

>F 4E4A B><4 # <>34;B A4@D8A4 O=8=2A40B4 C> C74 <8=8< D<  
 4GC4A=0; >DC?DC 20?O28C>A EO;D4 8= 24AC08= ;>O38=6 O=3 CA8<  
 2>=38C8>= = O??;82OC8>=B F 74A4 C74 ;>O3 20= 6> 14;>F >5 AOC43  
 ;>O3 1DC C74 >DC?DC CA8 < 8B 74;3 2>=BCO=C C74 AO=64 >5 >DC?DC  
 20?O28C>A A4@D8A43 8B 68E4= 1H %\*) -) )' \$ ( 8= C74 ;42CA820;  
 (?428582OC8>=B C01;4 5 C74 ;>O3 20= 6> 14;>F >5 AOC43 ;>O3 O=3  
 C74 # >DC?DC CA8 < 8B O;B> 3H=O <820;;H EOA843 C74 AO=64 >5 >DC?DC  
 20?O28C>A A4@D8A43 8B 68E4= 1H %\*) -) )' \$ ( ' # 8= C74 ;42CA820;  
 (?428582OC8>=B C01;4

?<=> 9. /  
 \* =34A ;867C ;>O3 2>=38C8>=B C74 # 2>=E4AC4A <OH >?4AOC4 8= 1DABC  
 <>34 34?4=38=6 >= C74 ;8=4 E>;C064 DABC <>34 >22DAB F 74=4E4A  
 C74 8=C4A=0; ?>F 4A 2>=BD <?C8>= >5 C74 2>=E4AC4A 2>< 18=43 F 8C7 C74  
 4GC4A=0; >DC?DC ;>O3 8B ;4BB C70= C74 <8=8< D< ?>F 4A CAO=B54A ?4A  
 BF8C278=6 2H2;4 = >A34A C> < O8=C08= A46D;OC8>= C74 4AA>A O<?;8584A  
 F8;; BF8C27 C74 ?>F 4ACA08= >55 O=3 >= A4?4OC43;H C> 45542C8E4;H ;>F 4A  
 C74 OE4A064 BF8C278=6 5A4@D4=2H O=3 ?4A <8C >?4AOC8>= F 8C7 =>  
 4GC4A=0; ;>O3 DA8=6 C74 C8 < 4 F 74= C74 ?>F 4A CAO8= 8B >55 C74  
 <>3D;4 8=C4A=0; 2>=BD <?C8>= 8B B86=85820=C;H A43D243 O=3 B> C74A4  
 8B O =>C01;4 A43D2C8>= 8= => ;>O3 8=?DC ?>F 4A 8= 1DABC <>34 , 74=  
 C74 ;>O3 8B ;4BB C70= >5 AOC43 >DC C74 >DC?DC E>;C064 <OH A8B4 1H  
 O <OG8< D< >5 + O1>E4 C74 >DC?DC E>;C064 20;2D;OC43 5A>< CA8<  
 C4 < ?4AOCDA4 O=3 ;>O3 ;8=4 2>=38C8>=B

#2/<7+6 />=318  
 OB43 >= C74 B054 C74A <O; >?4AOC8=6 OA4O B7>F 8= ?O64 C74 5D;;  
 AOC43 ?>F 4A >5 C74 # # & # 20= 14 ?A>24BB43  
 ?A>E8343 C7OC C74 C>? 1>CC>< O=3 ;403B OA4 O;; 74; 3 14;>F X  
 ) 74B4 2DAE4B 7867;867C C74 14=458CB >5 3DO; B8343 C74A <O;  
 <O=O64 < 4=C 1DC O;B> 34 <>=BCAOC4 C74 5;4G818;8CH >5 C74 +82>A 78&  
 ?;OC5>A < 5>A 2DBC> < 4AB F 7> OA4 ;8 <8C43 C> 2>>;8=6 =>;H C74 C>? >A C74  
 1>CC>< BDA5024  
 ) 74 %) & B4=B>A 8B ;>2OC43 >= C74 C>? B834 >5 C74 8=C4A=0; &  
 BCAD2CDA4 ) 74A45>A4 8= >A34A C> 4=BDA4 45542C8E4 >E4A C4 < ?4AOCDA4  
 50D;C ?A>C42C8>= C74 2OB4 1>CC>< C4 < ?4AOCDA4 < DBC 14 2>=BCAO8=43  
 1H C74 C74A <O; B>;DC8>= BD27 C7OC 8C 3>4B =>C 4G2443 C74 C4 < ?4AOCDA4  
 >5 C74 2OB4 C>?

) 74 78& ?O2: O64 ?A>E834B O 7867 346A44 >5 5;4G818;8CH 8= C7OC 8C  
 ?A4B4=CB C7A44 ?OC7FOHB C> A4 <>E4 74OC 5A>< 8=C4A=0; ?>F 4A  
 38BB8?OC8=6 2>< ?>=4=CB 4OC < OH 14 A4 <>E43 5A>< C74 C>? BDA5024  
 C74 1>CC>< BDA5024 O=3 C74 ;403B ) 74 4GC4=C C> F 7827 C74B4 C7A44  
 BDA5024 OA4 2>>;43 8B O : 4H 2>< ?>=4=C 5>A 34C4A <8=8=6 C74  
 < OG8< D< ?>F 4A C7OC 8B OE08;O1;4 5A>< O 78& OB 20= 14 B44= 5A><  
 86DA4

(8=24 C74 78& 7OB O <OG8< D< 8=C4A=0; C4 < ?4AOCDA4 AOC8=6 8C 8B  
 =424BBOAH C> 4BC8 < OC4 C78B 8=C4A=0; C4 < ?4AOCDA4 1OB43 >= O A4O;  
 C74A <O; B>;DC8>= 8E4= C7OC C74A4 OA4 C7A44 ?OC7FOHB C> A4 <>E4 74OC  
 5A>< C74 78& 8C 8B 74;?5D; C> B8 <?;85H C74 C74A <O; B>;DC8>= 8=C> O  
 A>D67;H 4@D8EO;4=C 28A2D8C F 74A4 ?>F 4A 38BB8?OC8>= 8B <>34;43 OB O  
 2DA44=C B>DA24 8B>C74A <O; BDA5024 C4 < ?4AOCDA4B OA4 A4?A4B4=C43 OB  
 E>;C064 B>DA24B O=3 C74 C74A <O; A4B8BCO=24B OA4 A4?A4B4=C43 OB  
 A4B8BC>AB 86DA4 B7>F B C74 C74A <O; 28A2D8C 5>A O 78& #  
 8= O= O??;82OC8>= F 74A4 1>C7 2OB4 C>? O=3 2OB4 1>CC>< O=3 ;403B OA4  
 2>>;43 = C78B 2OB4 C74 # ?>F 4A 38BB8?OC8>= 8B & %) \* O=3 C74  
 C7A44 BDA5024 C4 < ?4AOCDA4B OA4 A4?A4B4=C43 OB ) ( / )%& ) ( / )%& )%#  
 O=3 ) ( ) 78B C74A <O; BHBC4 < 20= =>F 14 E4AH 4OB8;H O=O;H 43  
 F8C7 B8 <?;4 A4B8BC>AB E>;C064 B>DA24B O=3 O 2DA44=C B>DA24

) 78B O=O;HB8B ?A>E834B O= 4BC8 < OC4 >5 74OC 5;>F C7A>D67 C74 EOA8>DB  
 ?OC7FOHB OB F 4;; OB 8=C4A=0; C4 < ?4AOCDA4

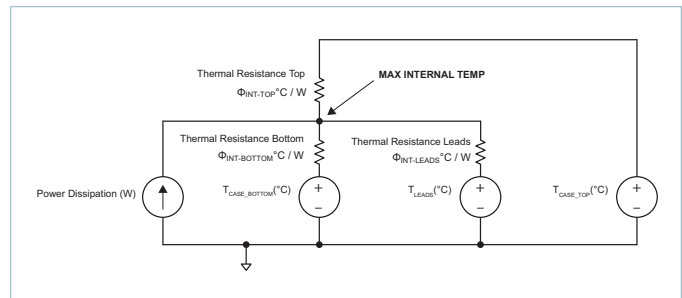


Figure 20 — Double side cooling and leads thermal model

;C4A=OC8E4;H 4@DOC8>=B 20= 14 FA8CC4= OA>D=3 C78B 28A2D8C O=3  
 O=0;H 43 O;641A0820;;H

& % Φ #  
 & % Φ #  
 & % Φ

, 74A4 ) % A4?A4B4=CB C74 8=C4A=0; C4 < ?4AOCDA4 O=3 & & O=3  
 & A4?A4B4=C C74 74OC 5;>F C7A>D67 C74 C>? B834 1>CC>< B834 O=3  
 ;403B A4B?42C8E4;H

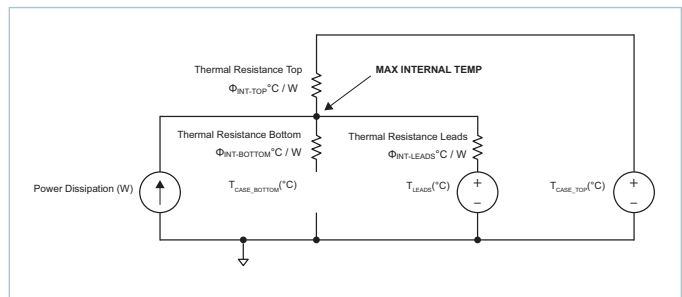


Figure 21 — One side cooling and leads thermal model

86DA4 B7>FB O B24=OA8> F 74A4 C74A4 8B => 1>CC>< B834 2>>;8=6  
 = C78B 2OB4 C74 74OC 5;>F ?OC7 C> C74 1>CC>< 8B ;45C >?4= O=3 C74  
 4@DOC8>=B =>F B8 <?;85H C>

& % Φ #  
 & % Φ

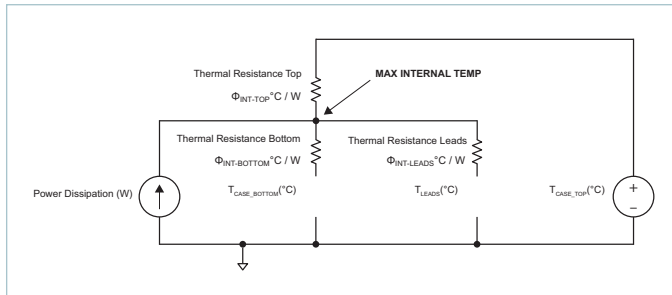


Figure 22 — One side cooling thermal model

86DA4 B7>FB O B24=OA8> F 74A4 C74A4 8B => 1>CC>< B834 O=3 ;403B  
 2>>;8=6 = C78B 2OB4 C74 74OC 5;>F ?OC7 C> C74 1>CC>< 8B ;45C >?4= O=3  
 C74 4@DOC8>=B =>F B8 <?;85H C>

& % Φ #

+82>A ?A>E834B O BD8C4 >5 >;8=4 C>>;B 8=2;D38=6 O B8 <D;OC>A O=3  
 C74A <O; 4BC8 <OC>A F 7827 6A4OC;H B8 <?;85H C74 COB: >5 34C4A <8=8=6  
 F 74C74A >A =>C O # C74A <O; 2>=586DAOCC>= 8B BD58284=C 5>A O 68E4=  
 2>=38C8>= ) 74B4 C>>;B 20= 14 5>D=3 OC  
[FFF E82>A?>F4A 2>< ?>F4A14=27](#)

<<+C : /<+>398

**A decoupling network is needed to facilitate paralleling:**

■ =>DC?DC 8=3D2C>A B7>D;3 14 03343 C> 4027 # 145>A4 C74  
 >DC?DCB OA4 1DBB43 C>64C74A C> ?A>E834 342>D?;8=6  
 ■ O27 # =443B O B4?OAO4 8=?DC 58;C4A 4E4= 85 C74 <D;C8?;4 # B  
 B7OA4 C74 BO <4 8=?DC E>;CO64 B>DA24 ) 74B4 58;C4AB ;8 <8C C74 A8??;4  
 2DA4A=C A45;42C43 5A>< 4027 # O=3 O;B> 74;? BD??A4BB  
 64=4AOC8>= >5 14OC 5A4@D4=2H 2DA4A=CB C7OC 2O= A4BD;C F 74=  
 <D;C8?;4 ?>F 4ACA08=B 8=?DC BCO64B OA4 ?4A <8CC43 C>  
 38A42;CH 8=C4A02C  
 5 B86=0; ?8=B ) \$ ) OA4 =>C DB43 C74H 20= 14 ;45C 5;>OC8=6 O=3  
 # F8; ;F>A: 8= C74 =><8=0; >DC?DC 2>=38C8>=  
 , 74= 2>><<=> <>34 =>8B4 8= C74 8=?DC B834 8B =>C O 2>=24A= )' O=3  
 \$ 20= 14 3A8E4= O=3 ) A4248E43 DB8=6 O B8=6;4 ! 4;E8= 2>==42C8>= C>  
 C74 B7OA43 \$ OB O A454A4=24

= 4G0 <?;4 >5 # ?OAO;;4;8=6 28A2D8C 8B B7>F= 8= 86DA4

' 42><< 4=343 E0;D4B C> BCOAC F8C7

\*B D <8=8 <8143 '  
 ! \*B Ω  
 \*B 4A0 <82 2O?O28C>AB 8= ?OAO;;4; W  
 \*B " T D  
 \*B 4;42CA>;HC82 >A CO=CO;D < 2O?O28C>A D S S D  
 O338C8>=0; 24A0 <82 4;42CA>;HC82 2O?O28C>AB 85 =44343 5>A

>DC?DC A8??;4 58;C4A8=6  
 =>A34A C> 74;? B4=B8C8E4 B86=0; 28A2D8CB A4942C ?>C4=C8O; =>8B4  
 O338C8>=0; 2><?>=4=CB OA4 A42><< 4=343  
 ! \*B %7 < 5028;8CO4 =>8B4 OCC4=DOC8>= 5>A )' ?8=  
 \*B \*B 8B O 54A8C4 1403 F8C7 O= 8 < ?43O=24 >5 OC ;40BC Ω  
 OC # I \*B 20= 14 O 24A0 <82 2O?O28C>A >5 D O28;8CO4 =>8B4  
 OCC4=DOC8>= 5>A \$ ?8=

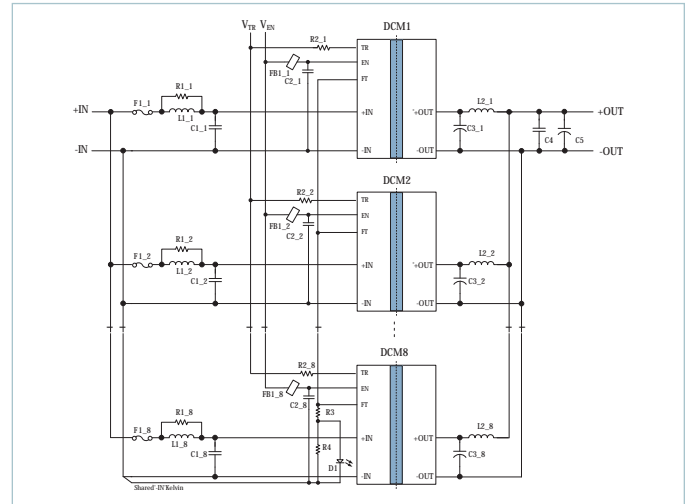


Figure 23 — DCM paralleling configuration circuit 1

, 74= 2><<=> <>34 =>8B4 A4942C8>= 8= C74 8=?DC B834 8B =44343  
 2><<=> <>34B 27>: 4 20= 14 03343 8= C74 8=?DC B834 >5 4027 #  
 = 4G0 <?;4 >5 # ?OAO;;4;8=6 28A2D8C 8B B7>F= 14;>F

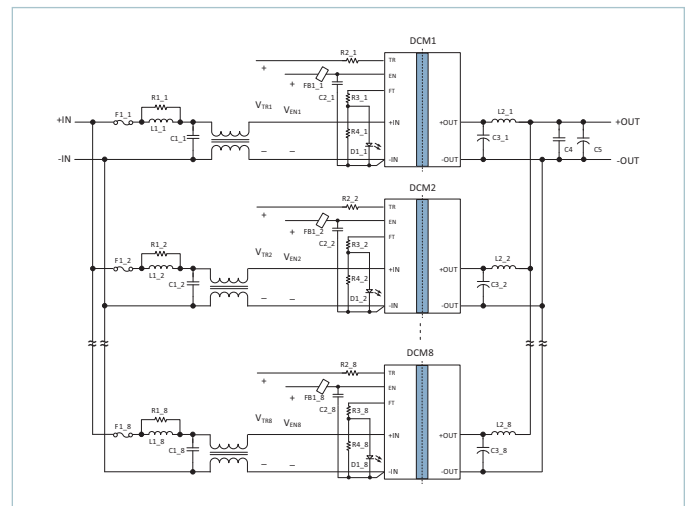
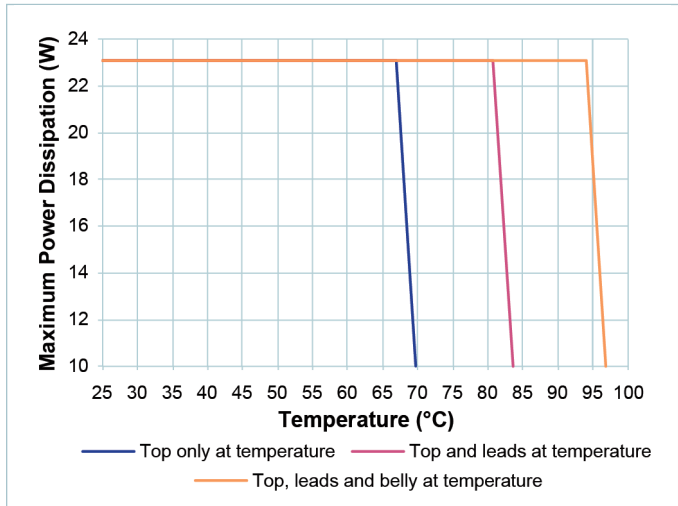


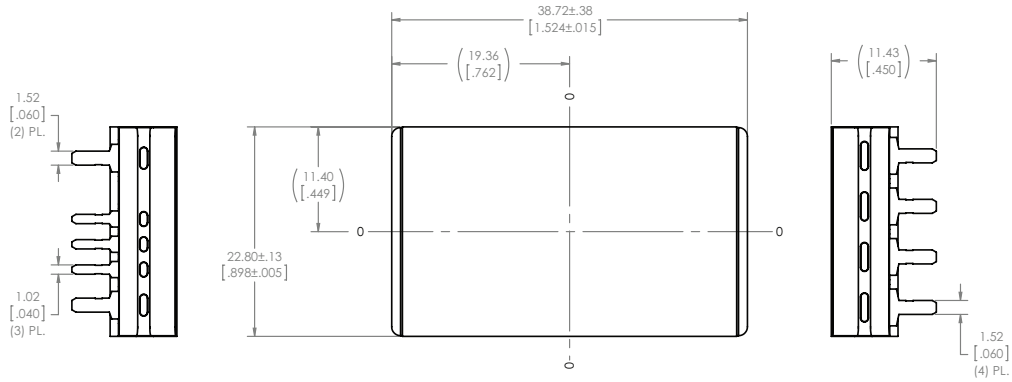
Figure 24 — DCM paralleling configuration circuit 2

\$>C824 C7OC 4027 6A>D? >5 2>=CA>; ?8=B=443 C> 14 8=38E83DO;;H 3A8E4=  
 O=3 8B>;OC43 5A>< C74 >C74A 6A>D?B 2>=CA>; ?8=B ) 78B 8B 1420DB4 \$  
 >5 4027 # 20= 14 OC O 38554A4=C E>;CO64 3D4 C> C74 2><<=> <>34  
 27>: 4B CC4 < ?C8=6 C> B7OA4 2>=CA>; ?8= 28A2D8CAH 2>D;3 ;403 C>  
 8=2>AA42C 1470E8>A >5 C74 # B

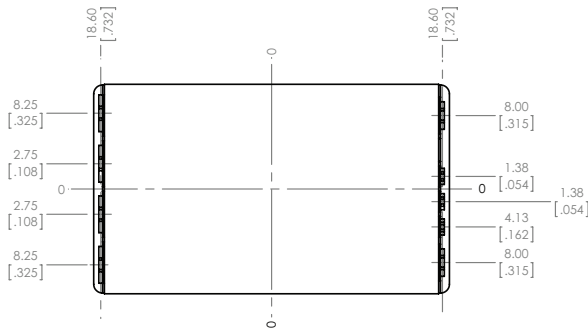
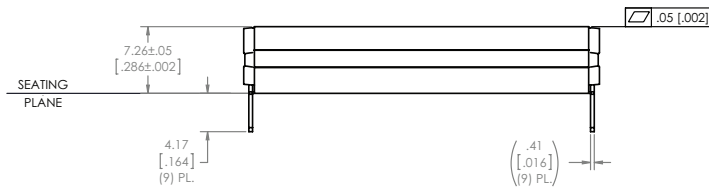
= OAAOH >5 # B DB43 OC C74 5D;; OAAOH AOC43 ?>F 4A <OH 64=4AO;;H  
 7OE4 >=4 >A <>A4 # B >?4AOC8=6 OC 2DAA4=C ;8< 8C 3D4 C> B7OA8=6  
 4AA>AB " >O3 B7OA8=6 8B 5D=2C8>=0;;H <O=O643 1H C74 ;>O3 ;8=4  
 ) 74A<O; 1O;O=28=6 8B 8<?A>E43 1H C74 =>< 8=O; 45542C8E4 C4 <?4AOCDA4  
 2>4558284=C >5 C74 >DC?DC E>;C064 B4C?>8=C  
 # B 8= 2DAA4=C ;8< 8C F8;; >?4AOC4 F8C7 78674A >DC?DC 2DAA4=C >A  
 ?>F 4A C7O= C74 AOC43 ;4E4;B ) 74A45>A4 C74 5>;>F8=6 ) 74A<O; (O54  
 %?4AOC8=6 A4O ?;>C B7>D;3 14 DB43 5>A OAAOH DB4 >A ;>O3B C7OC 3A8E4  
 C74 # 8= C> 2DAA4=C ;8< 8C 5>A BDBC08=43 >?4AOC8>=



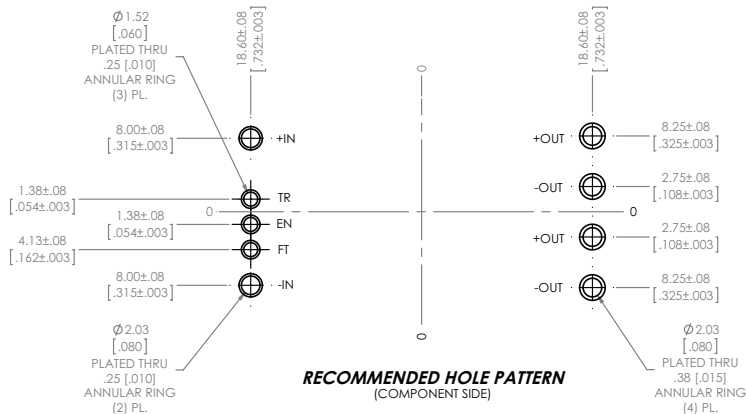
**Figure 25** — Thermal Specified Operating Area: Max Power Dissipation vs. Case Temp for arrays or current limited operation



TOP VIEW (COMPONENT SIDE)



BOTTOM VIEW



RECOMMENDED HOLE PATTERN (COMPONENT SIDE)

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Revision	Date	Description	Page Number(s)
1.0	03/23/16	Intital release	n/a



**Victor's comprehensive line of power solutions includes high density AC-DC and DC-DC modules and accessory components, fully configurable AC-DC and DC-DC power supplies, and complete custom power systems.**

#E=FID8K@FE=LIE@J?<; 9P 0@:FI @J 9<C@<M<; KF 9< 8::LI8K< 8E; I<C@89C< "FN<M<I EF I<JGFEJ@9@C@KP @J 8JJLD<; 9P 0@:FI =FI @K. I<G<I<EK8K@FEJ FI N8I18EK@<J N@K? I<JG<:K KF K?< 8::LI8:P FI :FDGC<K<E<JJ F= K?< :FEK<EKJ F= K?@J GL9C@:8K@FE 0@:FI I<J<IM<J K :?8E><J KF 8EP GIF;L:KJ JG<:@=:8K@FEJ 8E; GIF;L:K ;<J:I@GK@FEJ 8K 8EP K@D< N@K?FLK EFK@:< #E=FID8K@FE GL9C@J?<; 9P 0@:FI @J 9<C@<M<; KF 9< 8::LI8K< 8K K?< K@D< @K N8J GI@EK<; ?FN<M<I 0@:FI 8JJLD<J EF I<JGFEJ@9@C@KP =FI @E8::LI8:@<J <JK@E> 8E; LJ<; KF K?< <OK<EK 0@:FI ;<<DJ E<:<JJ8IP KF JLGGFIK 0@:FIVJ GIF;L:K N8I18EKP O:<GK N?<I< D8E;8K<; 9P >FM<IED<EK I<HL@I<D<EKJ K<JL G8I8D<K<IJ F= <8:? GIF;L:K @J EFK E<:<JJ8I@CP G<I=FID<;  
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**Product Warranty**

#E 0@:FIVJ JK8E;8I; K<IDJ 8E; :FE;@K@FEJ F= J8C< 0@:FI N8I18EKJ K?8K @KJ GIF;L:KJ 8I< =I<< =IFD EFE :FE=FID@KP KF @KJ -K8E;8I; -G<:@= W OGI<JJ &@D@K<; 18I18EKPX .?@J N8I18EKP @J <OK<E<; FECP KF K?< FI@>@E8C LP<I =FI K?< G<I@F; <OG@I@E> KNF P<8IJ 8=K<I K?< 8E; @J EFK I18EJ=<I89C<

/( & -- ) . " , 1# - 2\* , --&3 - . # ( 1 , # . ( - & - ! , ' ( . - # ! ( 3 / & 3 / . ) , # 4 0 # ) , - # ! ( . ) , 3 0 # ) , # - & # ' - & & , \* , - ( . # ) ( - & # # # # - ( 1 , , ( # - ) ( 3 % # ( 1 " . , , # - # ! 3 # \* & # # . # ) ( ) , 3 ) \* , . # ) ( ) & 1 1 # . " , - \* . . ) . " \* , ) / . - # ( & / # ! 1 # . ) / . & # # . # ) ( ( 3 1 , , ( # - ) , , \* , - ( . # ) ( - - . ) ' , " ( . # & # . 3 # . ( - - ) , \* , # / & , \* , / ) - # ( , # ! ' ( . ) ( 3 \* . ( . ) \* 3 , # ! . ) , ) , # ( . & & / & \* ) \* , , 3 , # ! . ) , ( 3 ) . " , ' . . ,

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0@:FI N@CC I<G8@I FI I<GC8<; <=<:K@M< GIF;L:KJ @E 8::FI;8E:< N@K? @KJ FNE 9<JK AL;>D<EK FI J<IM@:< LE;<I K?@J N8I18EKP K?< 9LP<I 0@:FI KF F9K8@E 8 ,<KLIE '8K<I@8C LK?FI@Q8K@FE ' ELD9<I 8E; J?@GG@E> @EJKIL:K@FEJ \*IF;L:KJ I<KLIE<; N@K?FLK GI@FI 8LK?FI@ I<KLIE<; KF K?< 9LP<I .?< 9LP<I N@CC G8P 8CC :?8I><J @E:LII<; @E I<KLIE@E> K?< GIF;L:K KF K?< =8:KFIP 0@:FI N@CC G8P 8CC I<J?@GD GIF;L:K N8J ;<=<:K@M< N@K?@E K?< K<IDJ F= K?@J N8I18EKP

**Life Support Policy**

0# ) , V - \* , ) / . - , ( ) . / . " , # 4 ) , / - - , # # & ) \* ) ( ( - # ( & # - / \* ) , . 0# - ) , - 3 - ' - 1 # . ) / . " . 2 \* , -- \* , # , 1 , # . ( \* , ) 0 & ) . " # 2 / . # 0 ) # , ( ! ( , & ) / ( - & ) 0 # ) , ) , \* , ) . # ( J LJ < ; ? < I < @ E C @ = < JLGGFIK ; < M @ : < J FI JPJK < DJ 8 I < ; < M @ : < J N ? @ : ? 8 8 I < @ EK < E < ; < = FI JLI > @ : 8 C @ DG C 8 EK @ EK F K ? < 9 F ; P FI 9 JLGGFIK FI JLJK 8 @ E C @ = < 8 E ; N ? F J < = N ? < E GIFG < ICP LJ < ; @ E 8 : : FI ; 8 E : < N @ K ? @ EJKIL : K @ FEJ = FI LJ < GIFM @ ; < ; @ E K ? < C 8 9 < C @ E > : 8 E 9 < I < 8 JFE89CP < OG < : K < ; KF I < JLCK @ E 8 J @ LJ < I : I @ K @ : 8 C : FDGFE < EK @ J 8 EP : FDGFE < EK @ E 8 C @ = < JLGGFIK ; < M @ : < FI JPJK < D N ? F J < = 8 @ CLI < KF G < I = FID : 8 E 9 < I < 8 JFE89CP < OG < : = 8 @ CLI < F = K ? < C @ = < JLGGFIK ; < M @ : < FI JPJK < D FI KF 8 = < : K @ KJ J 8 = < KP FI < = < : K @ M < E < JJ \* < I 0 @ : FI < IDJ 8 E ; FE ; @ K @ FEJ F = - 8 C < K ? < 8 E ; : FDGFE < EKJ @ E C @ = < JLGGFIK 8GGC @ : 8 K @ FEJ 8JJLD < J 8CC I @ JBJ F = JL : ? LJ < 8 E ; @ E ; < DE @ = @ < J 0 @ : FI 8 > 8 @ EJK 8CC C @ 89 @ C @ KP &

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