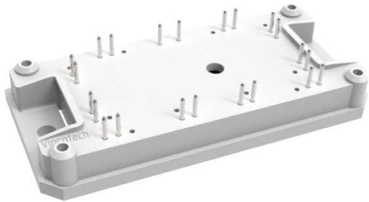
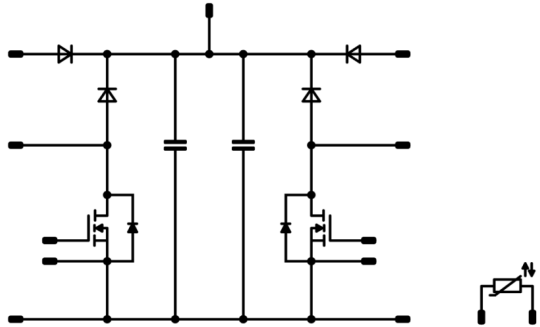




Vincotech

flow BOOST 1 dual SiC		1200 V / 40 mΩ
Features • High frequency SiC MOSFET • Compact and low inductive design		flow 1 12mm housing 
Target applications • Solar		Schematic 
Types • 10-FY12B2A040MR-L387L68		

Maximum Ratings

$T_j = 25\text{ °C}$, unless otherwise specified

Parameter	Symbol	Condition	Value	Unit
Boost Switch				
Drain-source voltage	V_{DS}		1200	V
Drain current	I_D	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	31	A
Peak drain current	I_{DM}	t_p limited by T_{jmax}	137	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	68	W
Gate-source voltage	V_{GS}		-4/22	V
Maximum Junction Temperature	T_{jmax}		175	°C



Vincotech

Maximum Ratings

$T_j = 25\text{ °C}$, unless otherwise specified

Parameter	Symbol	Condition	Value	Unit
-----------	--------	-----------	-------	------

Boost Diode

Peak repetitive reverse voltage	V_{RRM}		1200	V
Continuous (direct) forward current	I_F	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	40	A
Repetitive peak forward current	I_{FRM}		100	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	119	W
Maximum junction temperature	T_{jmax}		175	°C

Bypass Diode

Peak Repetitive Reverse Voltage	V_{RRM}		1600	V
Continuous (direct) forward current	I_F	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	46	A
Surge (non-repetitive) forward current	I_{FSM}	50 Hz Single Half Sine Wave $t_p = 10\text{ ms}$ $T_j = 150\text{ °C}$	270	A
Surge current capability	I_{pt}		370	A ² s
Total power dissipation	P_{tot}	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	56	W
Maximum Junction Temperature	T_{jmax}		150	°C

Capacitor (DC)

Maximum DC voltage	V_{MAX}		1000	V
Operation Temperature	T_{op}		-55...+125	°C

Module Properties

Thermal Properties

Storage temperature	T_{stg}		-40...+125	°C
Operation temperature under switching condition	T_{jop}		-40...(T _{jmax} - 25)	°C

Isolation Properties

Isolation voltage	V_{isol}	DC Test Voltage $t_p = 2\text{ s}$	4000	V
Creepage distance			min. 12,7	mm
Clearance			9,43	mm
Comparative Tracking Index	CTI		> 200	



Vincotech

Characteristic Values

Parameter	Symbol	Conditions					Value			Unit
			V_{GE} [V] V_{GS} [V]	V_{CE} [V] V_{DS} [V] V_F [V]	I_C [A] I_D [A] I_F [A]	T_j [°C]	Min	Typ	Max	

Boost Switch

Static

Drain-source on-state resistance	$r_{DS(on)}$		18		20	25 125 150		39 52 60	50	mΩ
Gate-source threshold voltage	$V_{GS(th)}$	$V_{GS} = V_{DS}$			0,01	25	2,7		5,6	V
Gate to Source Leakage Current	I_{GSS}		-4/22	0		25			±100	nA
Zero Gate Voltage Drain Current	I_{DSS}		0	1200		25			10	μA
Internal gate resistance	r_g							7		Ω
Gate charge	Q_g	18	600	20	25			107		nC
Gate to source charge	Q_{GS}							22		
Gate to drain charge	Q_{GD}							41		
Short-circuit input capacitance	C_{iss}	$f = 1$ MHz	0	800	25			1337		pF
Short-circuit output capacitance	C_{oss}							76		
Reverse transfer capacitance	C_{rss}							27		

Thermal

Thermal resistance junction to sink	$R_{th(j-s)}$	phase-change material $\lambda = 3,4$ W/mK						1,41		K/W
-------------------------------------	---------------	---	--	--	--	--	--	------	--	-----

MOSFET Switching

Turn-on delay time	$t_{d(on)}$	$R_{goff} = 4 \Omega$ $R_{gon} = 4 \Omega$	+16/0	700	32	25 125		16 15		ns
Rise time	t_r					25 125		7 7		
Turn-off delay time	$t_{d(off)}$					25 125		63 71		
Fall time	t_f					25 125		7 5		
Turn-on energy (per pulse)	E_{on}	$Q_{rFWD} = 0,2 \mu C$ $Q_{rFWD} = 0,2 \mu C$				25 125		0,397 0,369		mWs
Turn-off energy (per pulse)	E_{off}					25 125		0,325 0,364		



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Characteristic Values

Parameter	Symbol	Conditions					Value			Unit
			V_{GE} [V] V_{GS} [V]	V_{CE} [V] V_{DS} [V] V_F [V]	I_C [A] I_D [A] I_F [A]	T_j [°C]	Min	Typ	Max	

Boost Diode

Static

Forward voltage	V_F				20	25 125		1,43 1,69	1,6	V
Reverse leakage current	I_R			1200		25			400	μA

Thermal

Thermal resistance junction to sink	$R_{th(j-s)}$	phase-change material $\lambda = 3,4$ W/mK						0,80		K/W
-------------------------------------	---------------	---	--	--	--	--	--	------	--	-----

FWD Switching

Peak recovery current	I_{RRM}	$di/dt = 6371$ A/μs $di/dt = 5717$ A/μs	+16/0	700	32	25 125		27 27		A
Reverse recovery time	t_{rr}					25 125		9 9		ns
Recovered charge	Q_r					25 125		0,191 0,188		μC
Reverse recovered energy	E_{rec}					25 125		0,057 0,057		mWs
Peak rate of fall of recovery current	$(di_{rr}/dt)_{max}$					25 125		10013 9679		A/μs

Bypass Diode

Static

Forward voltage	V_F				35	25 125	0,8	1,17 1,13	1,6	V
Reverse leakage current	I_F			1600		25 145			50 1100	μA

Thermal

Thermal resistance junction to sink	$R_{th(j-s)}$	phase-change material $\lambda = 3,4$ W/mK						1,25		K/W
-------------------------------------	---------------	---	--	--	--	--	--	------	--	-----

Capacitor (DC)

Capacitance	C							47		nF
Tolerance							-10		+10	%



Vincotech

Characteristic Values

Parameter	Symbol	Conditions					Value			Unit
			V_{GE} [V] V_{GS} [V]	V_{CE} [V] V_{DS} [V] V_F [V]	I_C [A] I_D [A] I_F [A]	T_j [°C]	Min	Typ	Max	

Thermistor

Rated resistance	R					25		22		kΩ
Deviation of R_{100}	$\Delta_{R/R}$	$R_{100} = 1484 \Omega$				100	-5		5	%
Power dissipation	P					25		5		mW
Power dissipation constant						25		1,5		mW/K
B-value	$B_{(25/50)}$	Tol. ± 1 %				25		3962		K
B-value	$B_{(25/100)}$	Tol. ± 1 %				25		4000		K
Vincotech NTC Reference									I	



Vincotech

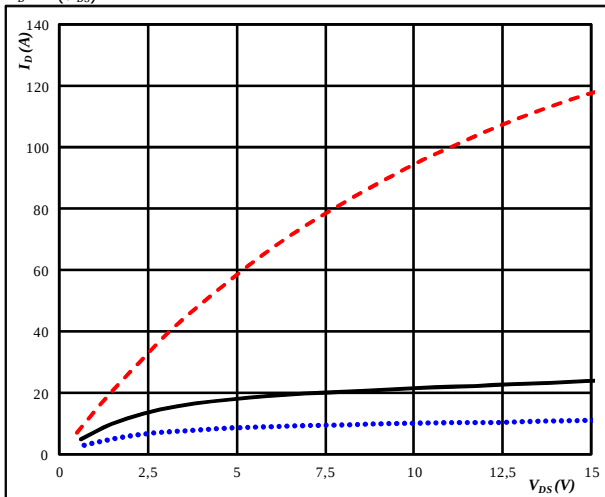
10-FY12B2A040MR-L387L68 datasheet

Boost Switch Characteristics

figure 1. MOSFET

Typical output characteristics

$$I_D = f(V_{DS})$$

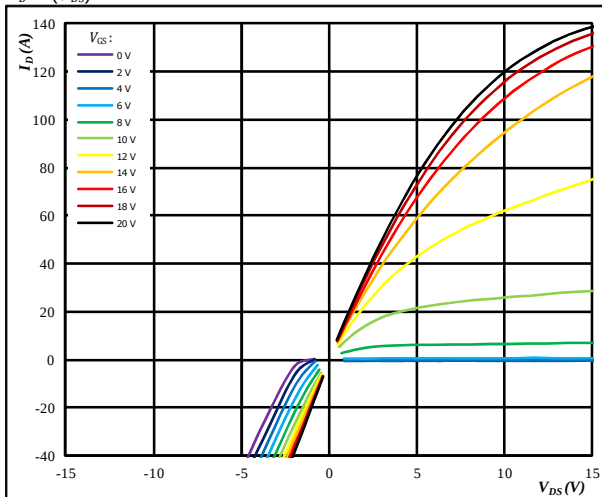


$t_p = 250 \mu s$
 $V_{GS} = 18 V$
 $T_j: 25 \text{ } ^\circ C$ (blue dotted)
 $125 \text{ } ^\circ C$ (black solid)
 $150 \text{ } ^\circ C$ (red dashed)

figure 2. MOSFET

Typical output characteristics

$$I_D = f(V_{DS})$$

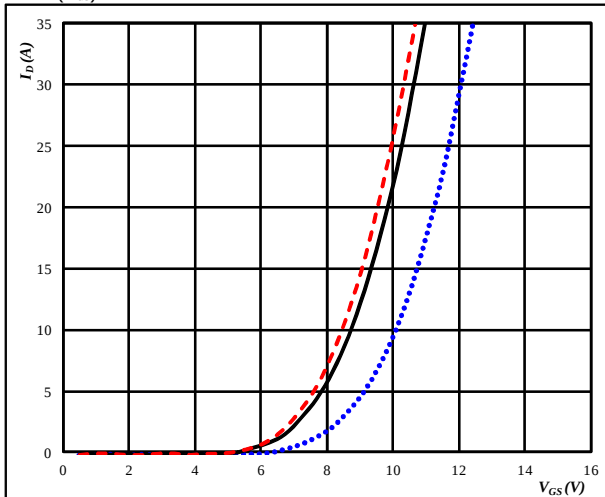


$t_p = 250 \mu s$
 $T_j = 150 \text{ } ^\circ C$
 V_{GS} from 0 V to 20 V in steps of 2 V

figure 3. MOSFET

Typical transfer characteristics

$$I_D = f(V_{GS})$$

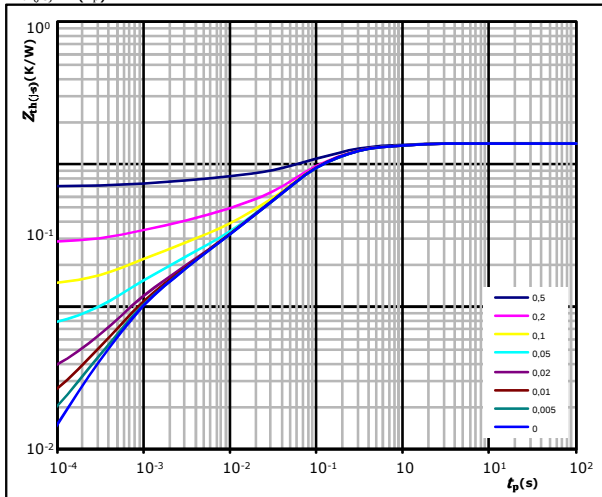


$t_p = 100 \mu s$
 $V_{DS} = 10 V$
 $T_j: 25 \text{ } ^\circ C$ (blue dotted)
 $125 \text{ } ^\circ C$ (black solid)
 $150 \text{ } ^\circ C$ (red dashed)

figure 4. MOSFET

Transient thermal impedance as a function of pulse width

$$Z_{th(j-s)} = f(t_p)$$



$D = t_p / T$
 $R_{th(j-s)} = 1,41 \text{ K/W}$
MOSFET thermal model values

$R \text{ (K/W)}$	$\tau \text{ (s)}$
1,24E-01	1,00E+00
3,91E-01	1,66E-01
6,76E-01	6,11E-02
1,21E-01	5,50E-03
9,55E-02	8,02E-04



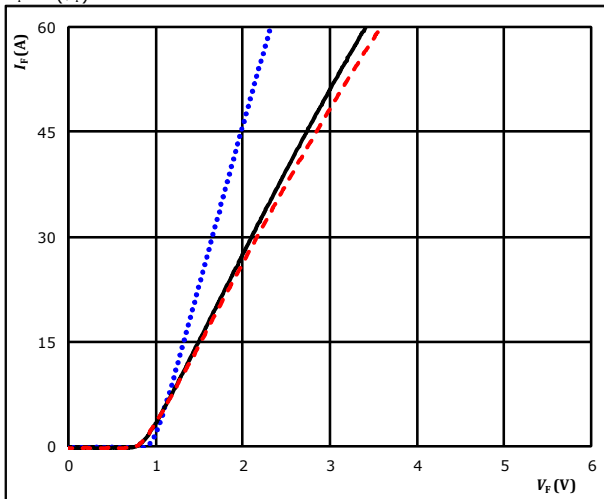
Vincotech

Boost Diode Characteristics

figure 1. FWD

Typical forward characteristics

$$I_F = f(V_F)$$

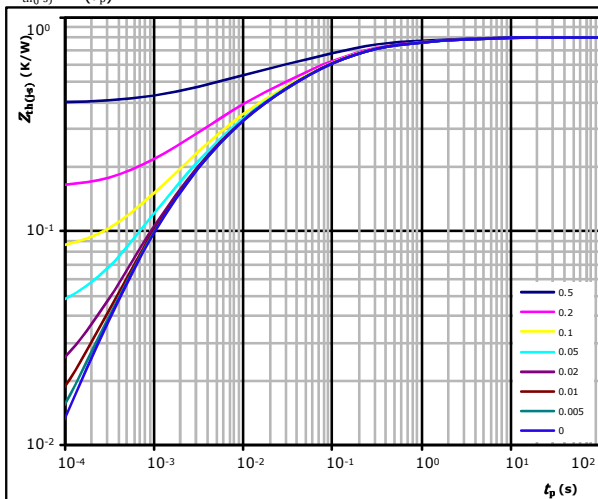


$t_p = 250 \mu s$
 T_j : 25 °C (blue dotted line), 125 °C (black solid line), 150 °C (red dashed line)

figure 2. FWD

Transient thermal impedance as a function of pulse width

$$Z_{th(j-s)} = f(t_p)$$



$D = t_p / T$
 $R_{th(j-s)} = 0,80 \text{ K/W}$

FWD thermal model values

$R \text{ (K/W)}$	$\tau \text{ (s)}$
3,98E-02	3,29E+00
9,04E-02	5,06E-01
2,65E-01	8,56E-02
1,68E-01	1,77E-02
1,66E-01	4,16E-03
7,14E-02	8,53E-04



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Bypass Diode Characteristics

figure 1. Rectifier Diode
Typical forward characteristics

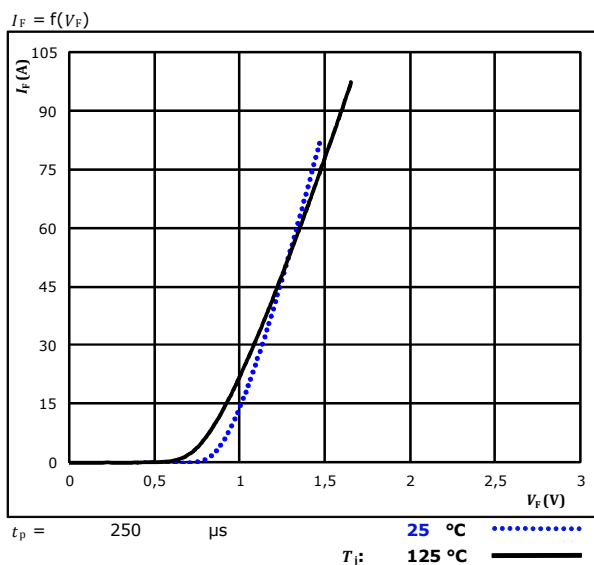
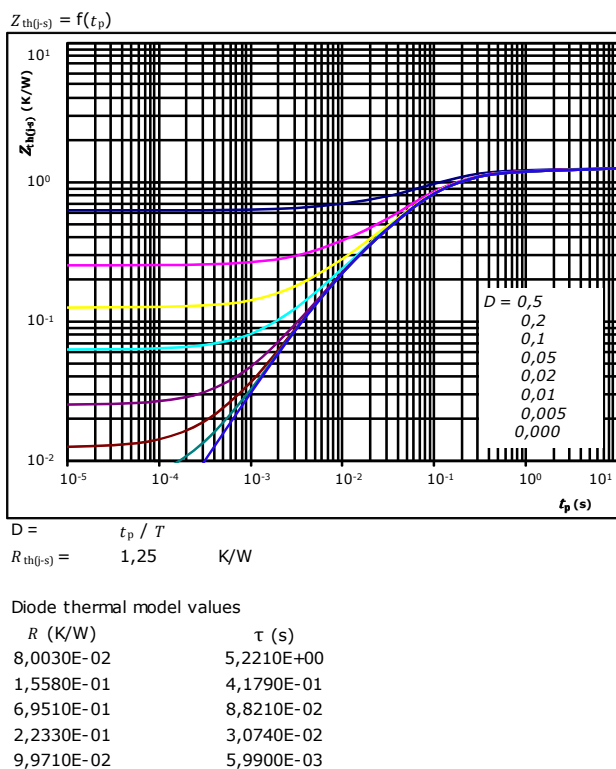
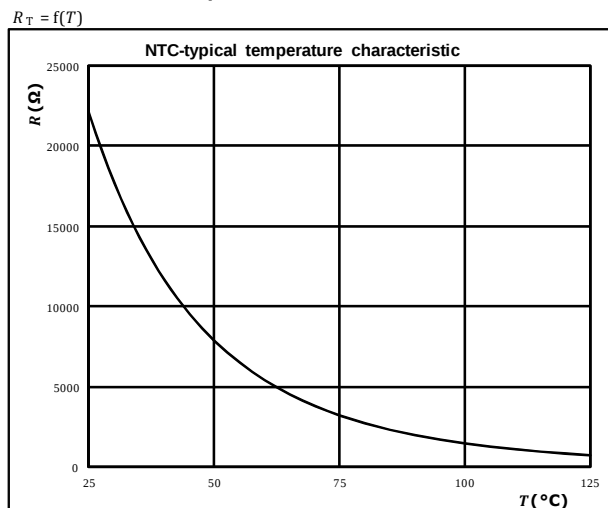


figure 2. Rectifier Diode
Transient thermal impedance as a function of pulse width



Thermistor Characteristics

Thermistor typical temperature characteristic
Typical NTC characteristic
as a function of temperature





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Boost Switching Characteristics

figure 1. MOSFET

Typical switching energy losses as a function of drain current

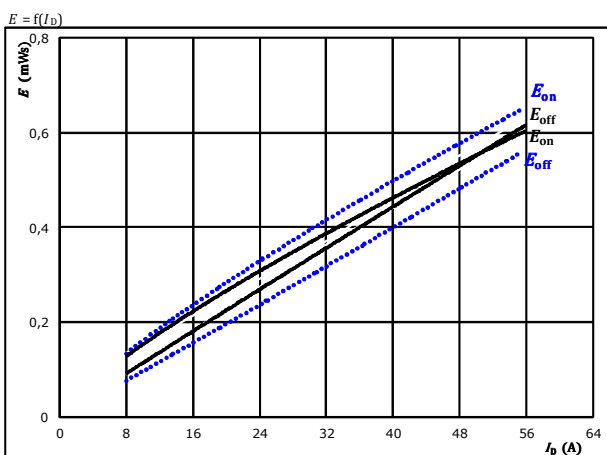


figure 2. MOSFET

Typical switching energy losses as a function of gate resistor

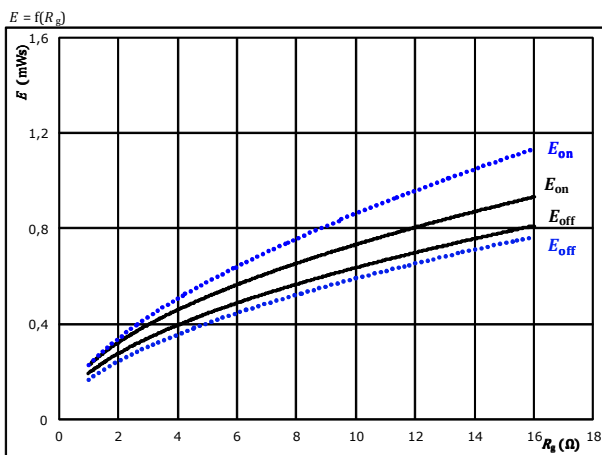


figure 3. FWD

Typical reverse recovered energy loss as a function of drain current

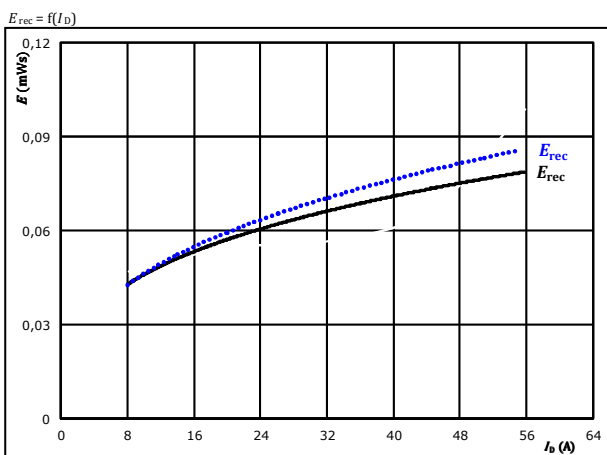
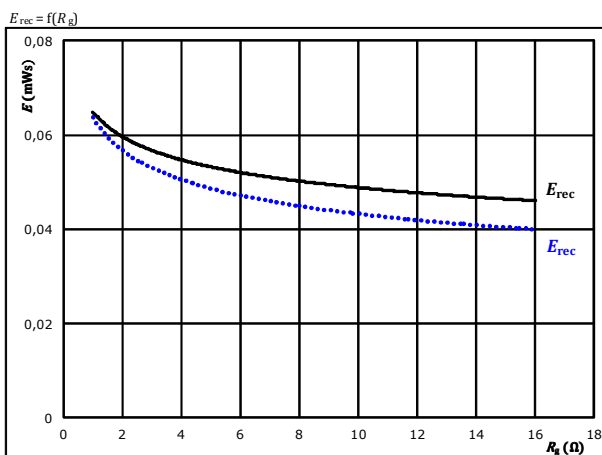


figure 4. FWD

Typical reverse recovered energy loss as a function of gate resistor





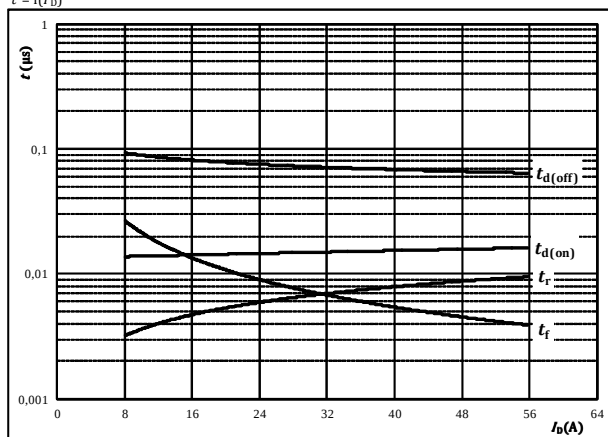
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Boost Switching Characteristics

figure 5. MOSFET

Typical switching times as a function of drain current

$$t = f(I_D)$$



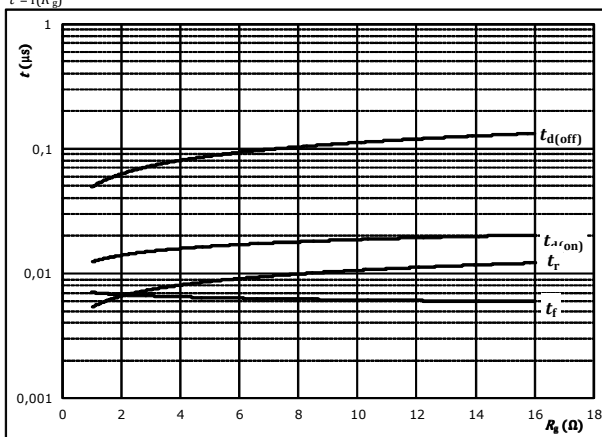
With an inductive load at

T_J	=	125	°C
V_{DS}	=	700	V
V_{GS}	=	+16/0	V
R_{gon}	=	4	Ω
R_{goff}	=	4	Ω

figure 6. MOSFET

Typical switching times as a function of gate resistor

$$t = f(R_g)$$



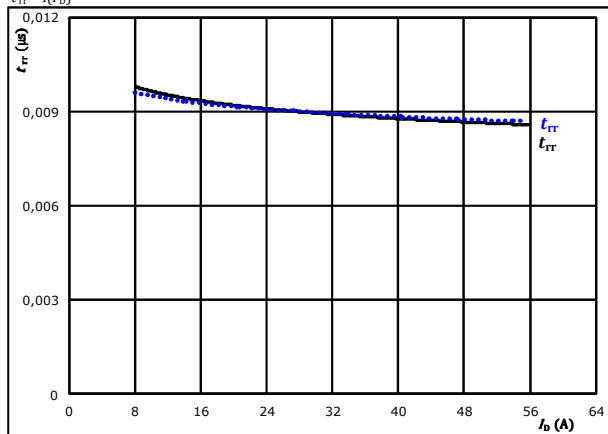
With an inductive load at

T_J	=	125	°C
V_{DS}	=	700	V
V_{GS}	=	+16/0	V
I_D	=	32	A

figure 7. FWD

Typical reverse recovery time as a function of drain current

$$t_{rr} = f(I_D)$$

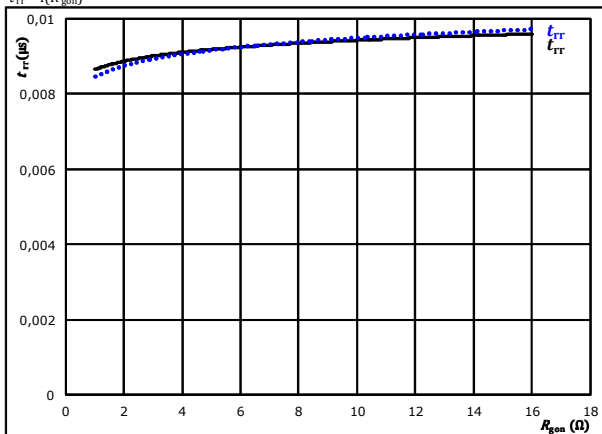


At	V_{DS}	=	700	V	T_J :	25 °C	
	V_{GS}	=	+16/0	V		125 °C	————
	R_{gon}	=	4	Ω			

figure 8. FWD

Typical reverse recovery time as a function of MOSFET turn on gate resistor

$$t_{rr} = f(R_{gon})$$



At	V_{DS}	=	700	V	T_J :	25 °C	
	V_{GS}	=	+16/0	V		125 °C	————
	I_D	=	32	A			



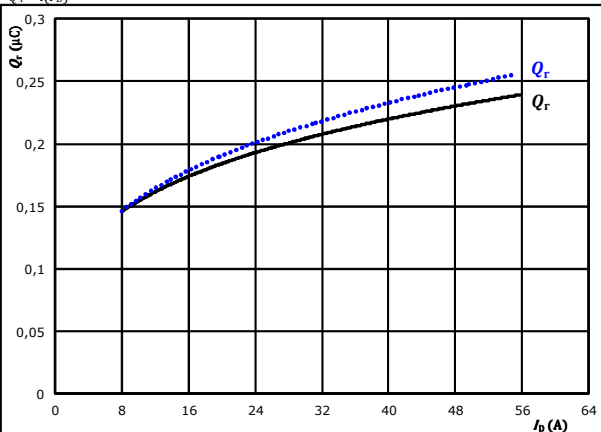
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Boost Switching Characteristics

figure 9. FWD

Typical recovered charge as a function of drain current

$$Q_r = f(I_D)$$

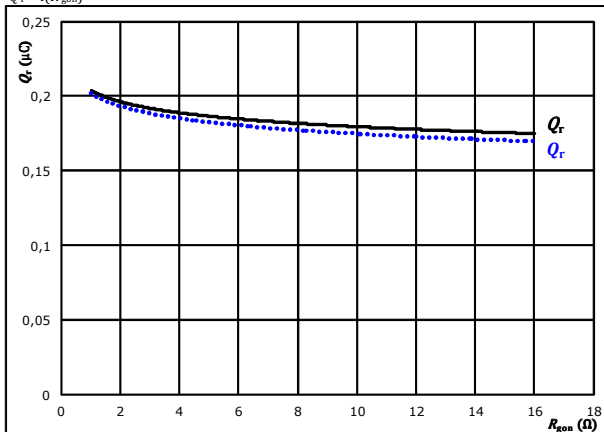


At $V_{DS} = 700$ V
 $V_{GS} = +16/0$ V
 $R_{gon} = 4$ Ω
 $T_j: 25$ °C (dotted blue line)
 125 °C (solid black line)

figure 10. FWD

Typical recovered charge as a function of MOSFET turn on gate resistor

$$Q_r = f(R_{gon})$$

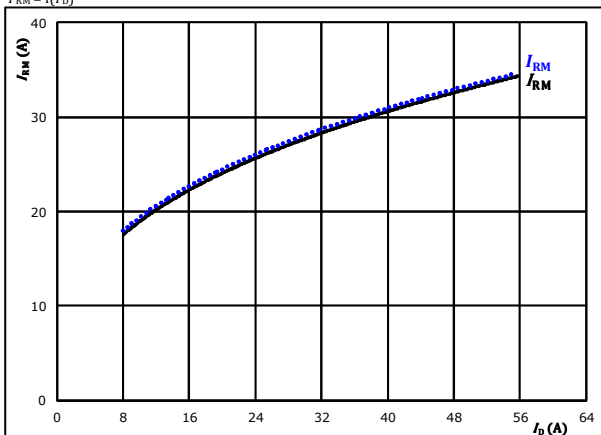


At $V_{DS} = 700$ V
 $V_{GS} = +16/0$ V
 $I_D = 32$ A
 $T_j: 25$ °C (dotted blue line)
 125 °C (solid black line)

figure 11. FWD

Typical peak reverse recovery current current as a function of drain current

$$I_{RM} = f(I_D)$$

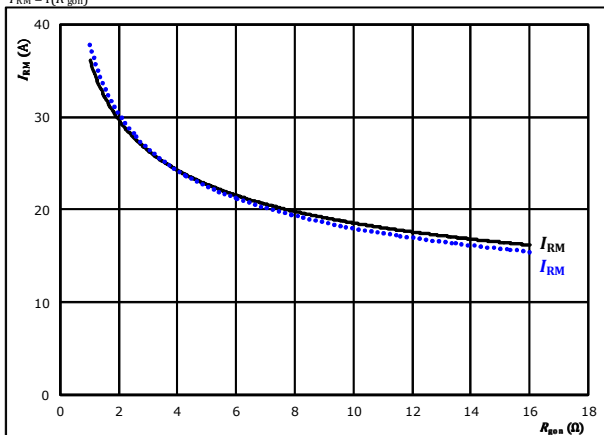


At $V_{DS} = 700$ V
 $V_{GS} = +16/0$ V
 $R_{gon} = 4$ Ω
 $T_j: 25$ °C (dotted blue line)
 125 °C (solid black line)

figure 12. FWD

Typical peak reverse recovery current as a function of MOSFET turn on gate resistor

$$I_{RM} = f(R_{gon})$$



At $V_{DS} = 700$ V
 $V_{GS} = +16/0$ V
 $I_D = 32$ A
 $T_j: 25$ °C (dotted blue line)
 125 °C (solid black line)



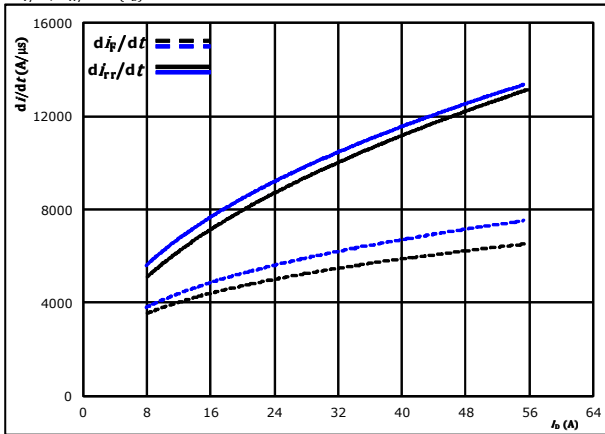
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Boost Switching Characteristics

figure 13. FWD

Typical rate of fall of forward and reverse recovery current as a function of drain current

$$di_F/dt, di_{rr}/dt = f(I_D)$$

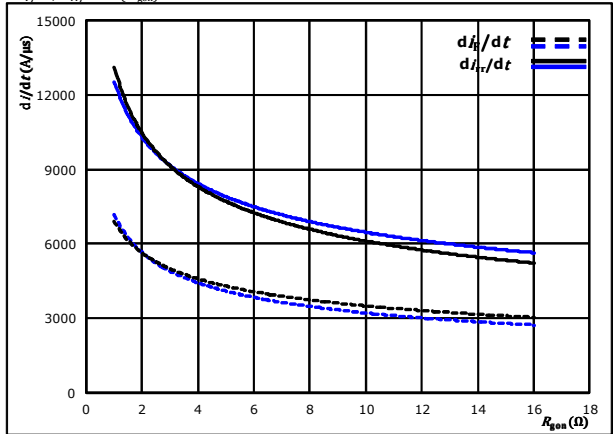


At $V_{DS} = 700$ V
 $V_{GS} = +16/0$ V
 $R_{gon} = 4$ Ω
 $T_j: 25$ °C (dotted line)
 125 °C (solid line)

figure 14. FWD

Typical rate of fall of forward and reverse recovery current as a function of MOSFET turn on gate resistor

$$di_F/dt, di_{rr}/dt = f(R_{gon})$$



At $V_{DS} = 700$ V
 $V_{GS} = +16/0$ V
 $I_D = 32$ A
 $T_j: 25$ °C (dotted line)
 125 °C (solid line)



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Boost Switching Definitions

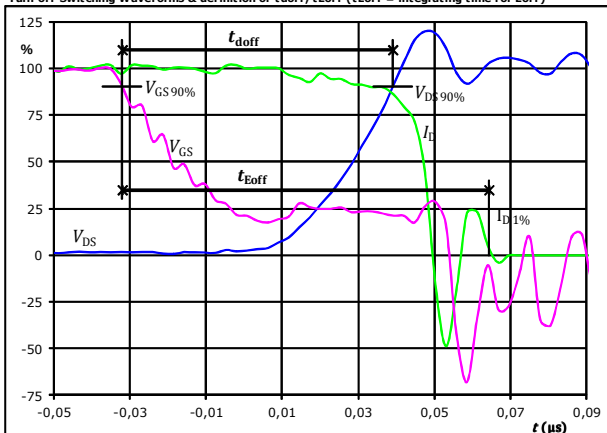
General conditions

T_j	=	125 °C
R_{gon}	=	4 Ω
R_{goff}	=	4 Ω

figure 1.

MOSFET

Turn-off Switching Waveforms & definition of t_{doff} , t_{Eoff} (t_{Eoff} = integrating time for E_{off})

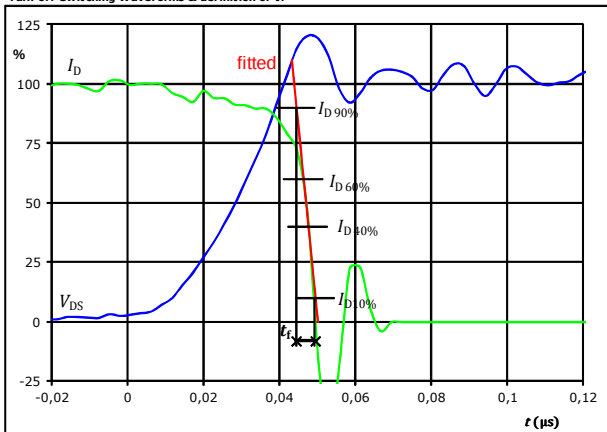


$V_{GS}(0\%) =$	0	V
$V_{GS}(100\%) =$	16	V
$V_{DS}(100\%) =$	700	V
$I_D(100\%) =$	32	A
$t_{doff} =$	0,071	μs
$t_{Eoff} =$	0,096	μs

figure 3.

MOSFET

Turn-off Switching Waveforms & definition of t_f

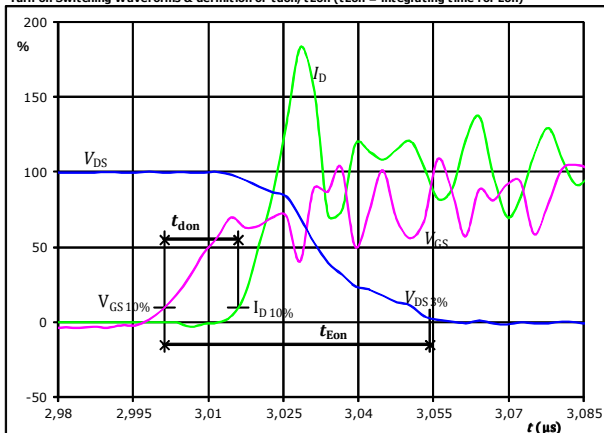


$V_{DS}(100\%) =$	700	V
$I_D(100\%) =$	32	A
$t_f =$	0,005	μs

figure 2.

MOSFET

Turn-on Switching Waveforms & definition of t_{don} , t_{Eon} (t_{Eon} = integrating time for E_{on})

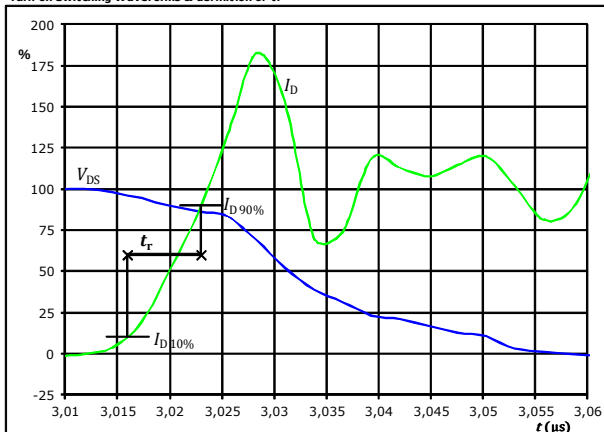


$V_{GS}(0\%) =$	0	V
$V_{GS}(100\%) =$	16	V
$V_{DS}(100\%) =$	700	V
$I_D(100\%) =$	32	A
$t_{don} =$	0,015	μs
$t_{Eon} =$	0,053	μs

figure 4.

MOSFET

Turn-on Switching Waveforms & definition of t_r



$V_{DS}(100\%) =$	700	V
$I_D(100\%) =$	32	A
$t_r =$	0,007	μs



Vincotech

Boost Switching Definitions

figure 5. MOSFET

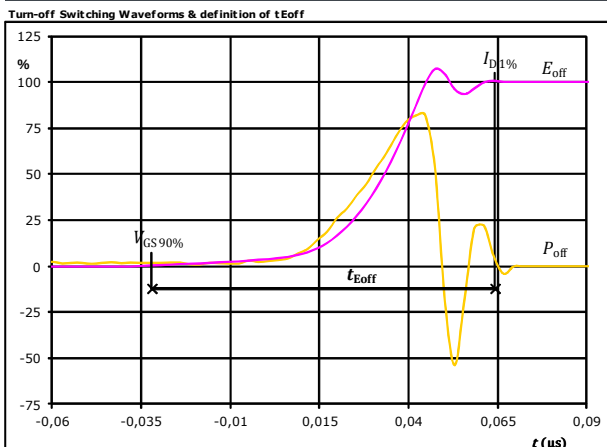


figure 6. MOSFET

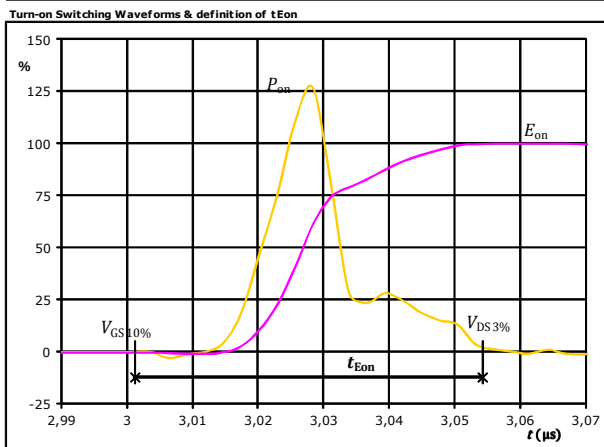
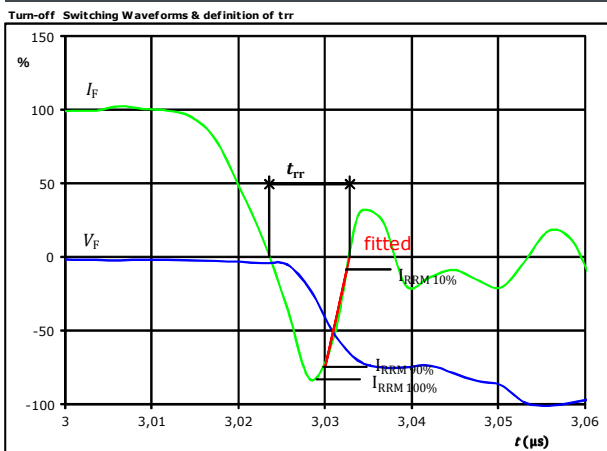


figure 7. FWD



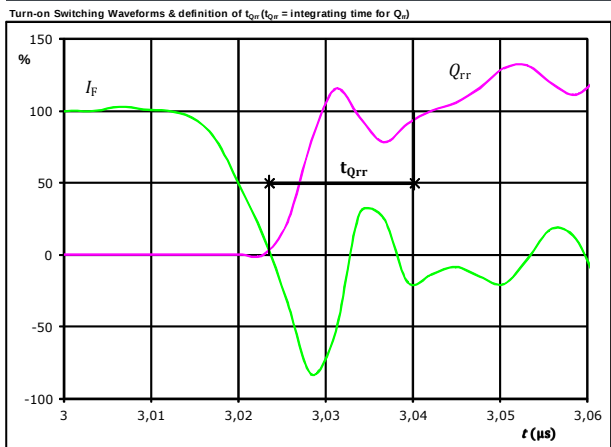


Vincotech

10-FY12B2A040MR-L387L68
datasheet

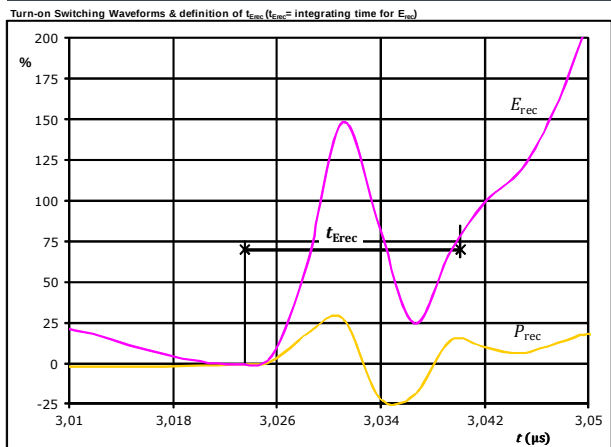
Boost Switching Definitions

figure 8. FWD



I_F (100%) = 32 A
 Q_{rr} (100%) = 0,19 μ C
 t_{Qrr} = 0,02 μ s

figure 9. FWD



P_{rec} (100%) = 22,38 kW
 E_{rec} (100%) = 0,06 mJ
 t_{Erec} = 0,02 μ s



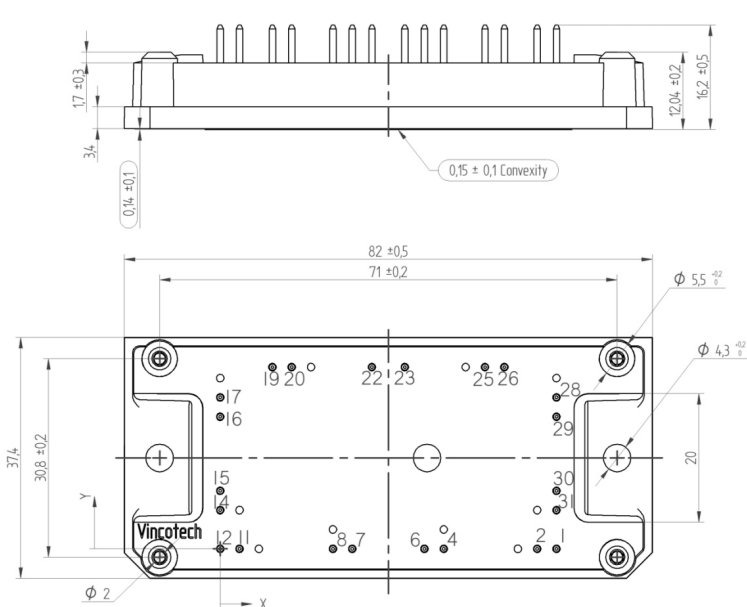
10-FY12B2A040MR-L387L68

datasheet

Vincotech

Ordering Code & Marking									
Version			Ordering Code						
without thermal paste 12mm housing with solder pins			10-FY12B2A040MR-L387L68						
with thermal paste 12mm housing with solder pins			10-FY12B2A040MR-L387L68-/3/						
NN-NNNNNNNNNNNNNN TTTTTUV WWYY UL VIN LLLL SSSS  			Text	Name	Date code	UL & VIN	Lot	Serial	
				NN-NNNNNNNNNNNNNN-TTTTTUV	WWYY	UL VIN	LLLL	SSSS	
			Datamatrix	Type&Ver	Lot number	Serial	Date code		
				TTTTTUV	LLLL	SSSS	WWYY		

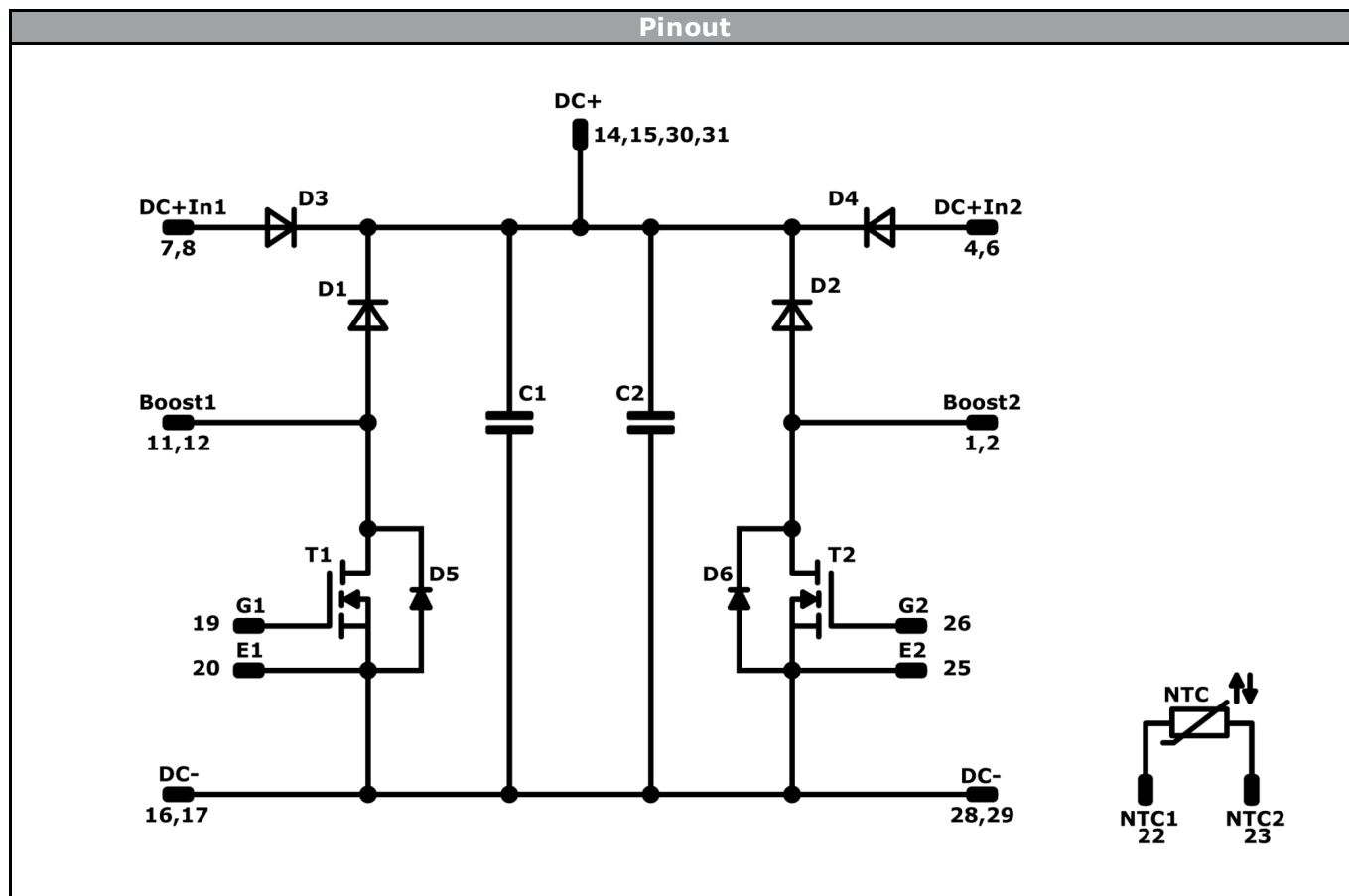
Outline							
Pin table [mm]				Pin table [mm]			
Pin	X	Y	Function	Pin	X	Y	Function
1	52,2	0	Boost2	30	52,2	9	DC+
2	49,2	0	Boost2	31	52,2	6	DC+
3	Not assembled			32	Not assembled		
4	34,7	0	DC+In2				
5	Not assembled						
6	31,7	0	DC+In2				
7	20,5	0	DC+In1				
8	17,5	0	DC+In1				
9	Not assembled						
10	Not assembled						
11	3	0	Boost1				
12	0	0	Boost1				
13	Not assembled						
14	0	6	DC+				
15	0	9	DC+				
16	0	20,5	DC-				
17	0	23,5	DC-				
18	Not assembled						
19	8,1	28,2	G1				
20	11,1	28,2	E1				
21	Not assembled						
22	23,55	28,2	NTC1				
23	28,65	28,2	NTC2				
24	Not assembled						
25	41,1	28,2	E2				
26	44,1	28,2	G2				
27	Not assembled						
28	52,2	23,5	DC-				
29	52,2	20,5	DC-				



The outline drawing shows the component from two perspectives. The top view is a rectangular layout with dimensions 82 ±0.5 mm by 71 ±0.2 mm. It features 32 pins arranged in two rows of 16. The left row of pins is numbered 1 to 16, and the right row is numbered 32 to 17. The pins are spaced at 2.5 mm intervals. The component has a central area with two NTC thermistors (NTC1 and NTC2) and two G pins (G1 and G2). The bottom view shows the component's profile with dimensions 17 ±0.3 mm, 3.4 mm, 12.0 ±0.2 mm, and 16.2 ±0.5 mm. The component has a central area with two NTC thermistors (NTC1 and NTC2) and two G pins (G1 and G2). The component has a central area with two NTC thermistors (NTC1 and NTC2) and two G pins (G1 and G2).



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Identification					
ID	Component	Voltage	Current	Function	Comment
T1,T2	MOSFET	1200 V	40 mΩ	Boost Switch	
D1,D2	FWD	1200 V	20 A	Boost Diode	
D3,D4	FWD	1600 V	35 A	Bypass Diode	
C1,C2	Capacitor	1000 V		Capacitor (DC)	
NTC	Thermistor			Thermistor	



Vincotech

10-FY12B2A040MR-L387L68
datasheet

Packaging instruction			
Standard packaging quantity (SPQ)	100	>SPQ	Standard
		<SPQ	Sample

Handling instruction
Handling instructions for <i>flow 1</i> packages see vincotech.com website.

Package data
Package data for <i>flow 1</i> packages see vincotech.com website.

UL recognition and file number
This device is certified according to UL 1557 standard, UL file number E192116. For more information see vincotech.com website.



Document No.:	Date:	Modification:	Pages
10-FY12B2A040MR-L387L68-D1-14	13 Jul. 2016		

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2. A critical component is any component of a life support device or system whose failure to perform can be reasonably expected to cause the failure of the life support device or system, or to affect its safety or effectiveness.