10-PY12B2A032ME-L387L28T
datasheet

flowBOOST 1 dual SiC | **1200 V / 32 mΩ**

Topology features

- Kelvin Emitter for improved switching performance
- Dual Booster
- Bypass Diode
- Integrated DC capacitor
- Temperature sensor

Component features

- High Blocking Voltage with low drain source on state resistance
- High speed SiC-MOSFET technology
- Resistant to Latch-up

Housing features

- Base isolation: Al_2O_3
- Convex shaped substrate for superior thermal contact
- Thermo-mechanical push-and-pull force relief
- Press-fit pin
- Reliable cold welding connection

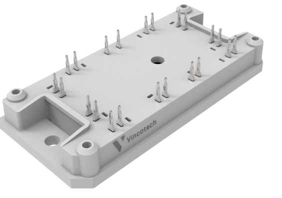
Target applications

- Energy Storage Systems
- Solar Inverters
- UPS

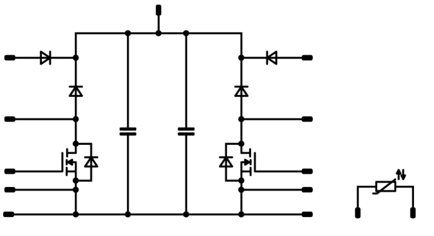
Types

- 10-PY12B2A032ME-L387L28T

flow 1 12 mm housing



Schematic



Maximum Ratings

T_j = 25 °C, unless otherwise specified

Parameter	Symbol	Conditions		Value	Unit
Boost Switch					
Drain-source voltage	V_{DSS}			1200	V
Drain current (DC current)	I_D	$T_j = T_{jmax}$	T_s = 80 °C	38	A
Peak drain current	I_{DM}	t_p limited by T_{jmax}		120	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$	T_s = 80 °C	70	W
Gate-source voltage	V_{GSS}			-4 / 15	V
		dynamic		-8 / 19	
Maximum Junction Temperature	T_{jmax}			175	°C
Boost Diode					
Peak repetitive reverse voltage	V_{RRM}			1200	V
Forward current (DC current)	I_F	$T_j = T_{jmax}$	T_s = 80 °C	36	A
Repetitive peak forward current	I_{FRM}	t_p limited by T_{jmax}		104	A
Surge (non-repetitive) forward current	I_{FSM}	Single Half Sine Wave, t_p = 10 ms	T_j = 25 °C	184	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$	T_s = 80 °C	107	W
Maximum junction temperature	T_{jmax}			175	°C
Boost Sw. Protection Diode					
Peak repetitive reverse voltage	V_{RRM}			1600	V
Forward current (DC current)	I_F	$T_j = T_{jmax}$	T_s = 80 °C	44	A
Surge (non-repetitive) forward current	I_{FSM}	Single Half Sine Wave, t_p = 10 ms	T_j = 150 °C	270	A
Surge current capability	I^2t			370	A^2s
Total power dissipation	P_{tot}	$T_j = T_{jmax}$	T_s = 80 °C	51	W
Maximum junction temperature	T_{jmax}			150	°C

Maximum Ratings

T_j = 25 °C, unless otherwise specified

Parameter	Symbol	Conditions		Value	Unit
ByPass Diode					
Peak repetitive reverse voltage	V_{RRM}			1600	V
Forward current (DC current)	I_F	$T_j = T_{jmax}$	T_s = 80 °C	44	A
Surge (non-repetitive) forward current	I_{FSM}	Single Half Sine Wave, t_p = 10 ms	T_j = 150 °C	270	A
Surge current capability	I^2t	Single Half Sine Wave, t_p = 10 ms	T_j = 150 °C	370	A^2s
Total power dissipation	P_{tot}	$T_j = T_{jmax}$	T_s = 80 °C	51	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 s	6000	V
Isolation voltage	V_{isol}	AC Voltage	t_p = 1 min	2500	V
Creepage distance				>12,7	mm
Clearance				9,6	mm
Comparative Tracking Index	CTI			≥ 200	

*100 % tested in production

Characteristic Values

Parameter	Symbol	Conditions					Values			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	$r_{DS(on)}$		15		40	25 125 150	22,4	31,2 41,5 46,3	41,6(1)	mΩ
Gate-source threshold voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}$			0,0115	25	1,8	2,5	3,6	V
Gate to Source Leakage Current	I_{GSS}		15	0		25		10	250	nA
Zero Gate Voltage Drain Current	I_{DSS}		0	1200		25		1	19	μA
Internal gate resistance	r_g							1,7		Ω
Gate charge	Q_g		-4/15	800	40	25		118		nC
Short-circuit input capacitance	C_{iss}	f = 100 kHz	0	1000	0	25		3357		pF
Short-circuit output capacitance	C_{oss}							129		
Reverse transfer capacitance	C_{rss}							8		
Diode forward voltage	V_{SD}		0		20	25		4,6		V
Thermal										
Thermal resistance junction to sink(2)	$R_{th(j-s)}$	λ_{paste} = 3,4 W/mK (PSX)						1,36		K/W
Dynamic										
Turn-on delay time	$t_{d(on)}$	R_{gon} = 4 Ω R_{goff} = 4 Ω	0/15	700	32	25 125 150		18,15 16,19 16,01		ns
Rise time	t_r					25 125 150		6,58 6,03 6,01		ns
Turn-off delay time	$t_{d(off)}$					25 125 150		47,16 53,66 55,43		ns
Fall time	t_f					25 125 150		14,33 14,38 13,91		ns
Turn-on energy (per pulse)	E_{on}	Q_{rFWD}=0,123 μC Q_{rFWD}=0,115 μC Q_{rFWD}=0,115 μC				25 125 150		0,254 0,218 0,212		mWs
Turn-off energy (per pulse)	E_{off}					25 125 150		0,15 0,161 0,163		mWs

Characteristic Values

Parameter	Symbol	Conditions					Values			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		1,46 1,8	1,8[1]	V
Reverse leakage current	I_R	V_r = 1200 V				25		80	600	µA
Thermal										
Thermal resistance junction to sink[2]	$R_{th(j-s)}$	λ_{paste} = 3,4 W/mK (PSX)						0,89		K/W
Dynamic										
Peak recovery current	I_{RM}	d*i*/d*t*=6028 A/µs d*i*/d*t*=6886 A/µs d*i*/d*t*=6726 A/µs	0/15	700	32	25 125 150		30,46 34,74 35,01		A
Reverse recovery time	t_{rr}					25 125 150		10,03 10,09 10,08		ns
Recovered charge	Q_r					25 125 150		0,123 0,115 0,115		µC
Reverse recovered energy	E_{rec}					25 125 150		0,019 0,017 0,018		mWs
Peak rate of fall of recovery current	$(di_{rf}/dt)_{max}$					25 125 150		7545,18 9847,67 10227,23		A/µs

Characteristic Values

Parameter	Symbol	Conditions					Values			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 Sw. Protection Diode										
Static										
Forward voltage	V_F				28	25 125 150		1,1 1,04 1,03	1,5(1)	V
Reverse leakage current	I_R	V_r = 1600 V				25 150			100 1000	µA
Thermal										
Thermal resistance junction to sink(2)	$R_{th(j-s)}$	λ_{paste} = 3,4 W/mK (PSX)						1,37		K/W
ByPass Diode										
Static										
Forward voltage	V_F				28	25 125 150		1,1 1,04 1,03	1,5(1)	V
Reverse leakage current	I_R	V_r = 1600 V				25 150			100 1000	µA
Thermal										
Thermal resistance junction to sink(2)	$R_{th(j-s)}$	λ_{paste} = 3,4 W/mK (PSX)						1,37		K/W
Capacitor (DC)										
Static										
Capacitance	C	DC bias voltage = 0 V				25		47		nF
Tolerance							-10		10	%
Dissipation factor		f = 1 kHz				25		2,5		%

Characteristic Values

Parameter	Symbol	Conditions					Values			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										
Static										
Rated resistance	R					25		22		kΩ
Deviation of R100	$\Delta_{R/R}$	R_{100} = 1484 Ω				100	-5		5	%
Power dissipation	P					25		130		mW
Power dissipation constant	d					25		1,5		mW/K
B-value	$B_{(25/50)}$	Tol. ±1 %						3962		K
B-value	$B_{(25/100)}$	Tol. ±1 %						4000		K
Vincotech Thermistor Reference									I	

(1) Value at chip level

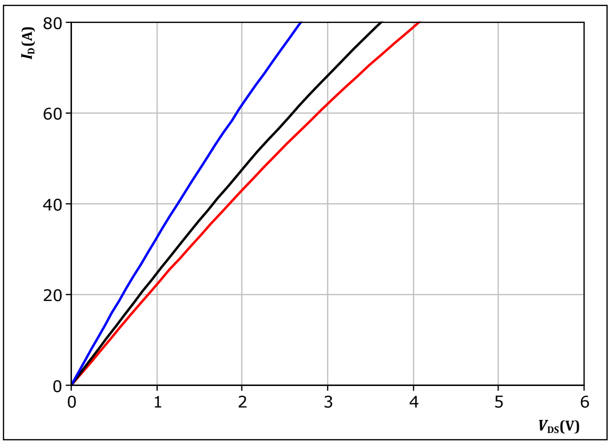
(2) Only valid with pre-applied Vincotech thermal interface material.

Boost Switch Characteristics

figure 1. **MOSFET**

Typical output characteristics

I_D = f(V_{DS})



t_p = 250 µs

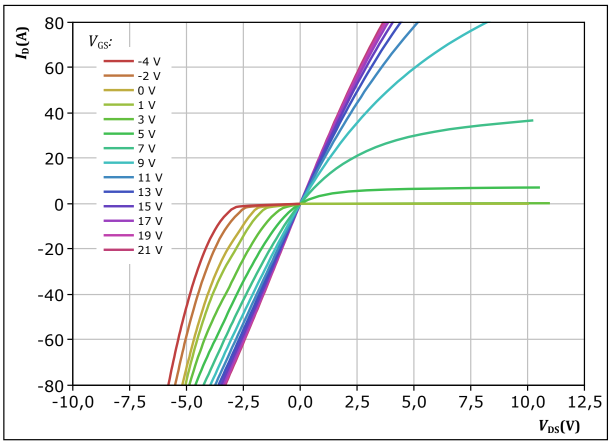
V_{GS} = 15 V

T_j: 25 °C, 125 °C, 150 °C

figure 2. **MOSFET**

Typical output characteristics

I_D = f(V_{DS})



t_p = 250 µs

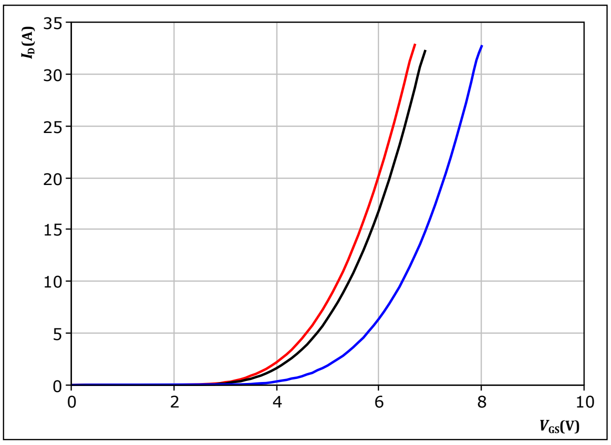
T_j = 150 °C

V_{GS} from -4 V to 21 V in steps of 2 V

figure 3. **MOSFET**

Typical transfer characteristics

I_D = f(V_{GS})



t_p = 250 µs

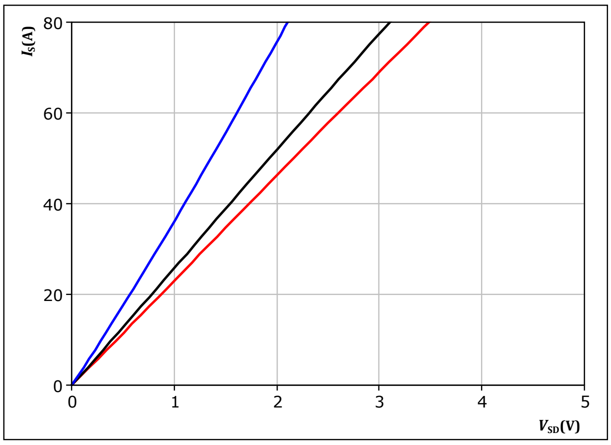
V_{DS} = 10 V

T_j: 25 °C, 125 °C, 150 °C

figure 4. **MOSFET**

Typical reverse drain current characteristics

I_{SD} = f(V_{SD})



t_p = 250 µs

V_{GS} = 15 V

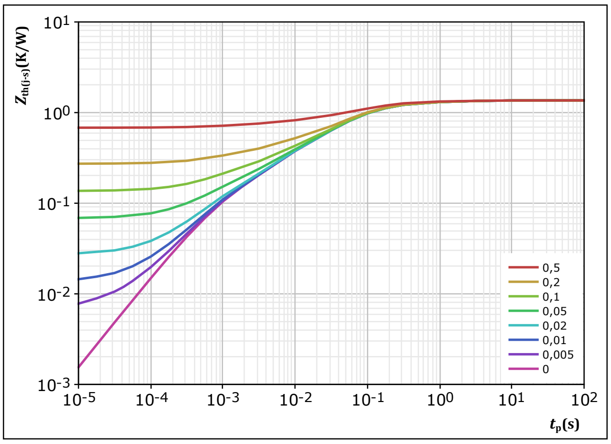
T_j: 25 °C, 125 °C, 150 °C

Boost Switch Characteristics

figure 5. **MOSFET**

Transient thermal impedance as a function of pulse width

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



D = t_p / T

$R_{th(j-s)}$ = 1,362 K/W

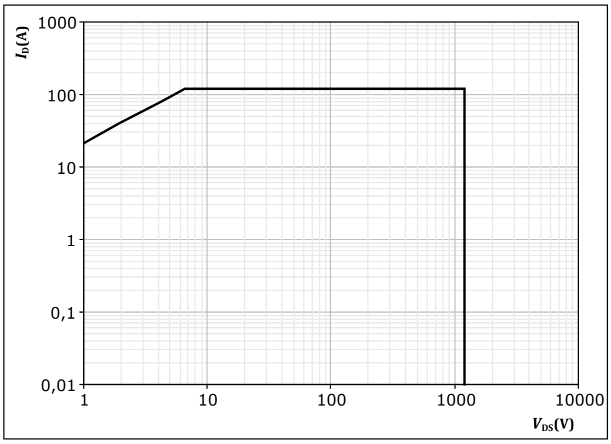
MOSFET thermal model values

R (K/W)	τ (s)
7,53E-02	2,27E+00
2,27E-01	2,80E-01
7,32E-01	6,31E-02
2,40E-01	7,73E-03
8,78E-02	7,83E-04

figure 6. **MOSFET**

Safe operating area

I_D = f(V_{DS})



D = single pulse

T_s = 80 °C

V_{GS} = 15 V

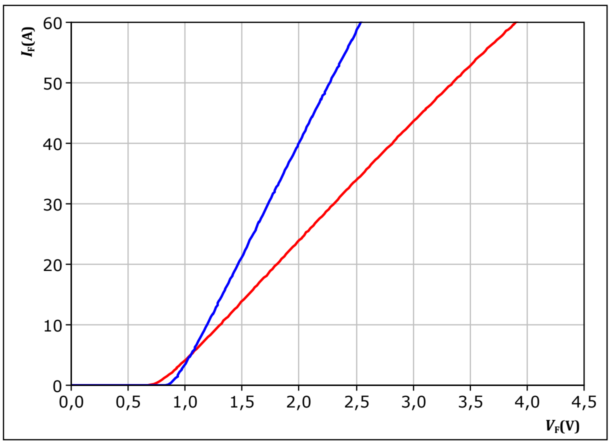
T_j = T_{jmax}

Boost Diode Characteristics

figure 7. **FWD**

Typical forward characteristics

I_F = f(V_F)



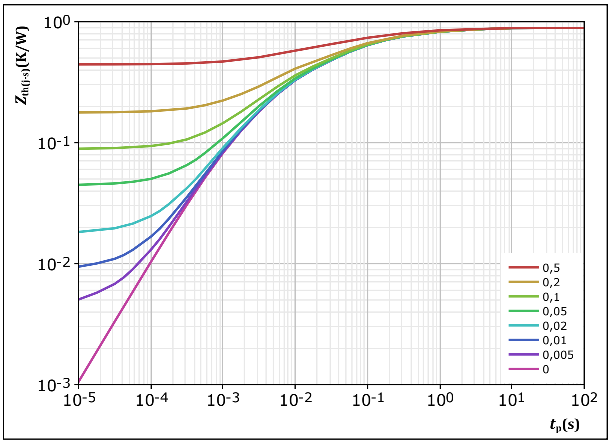
t_p = 250 µs

T_j: 25 °C, 125 °C

figure 8. **FWD**

Transient thermal impedance as a function of pulse width

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



D = t_p / T

$R_{th(j-s)}$ = 0,887 K/W

FWD thermal model values

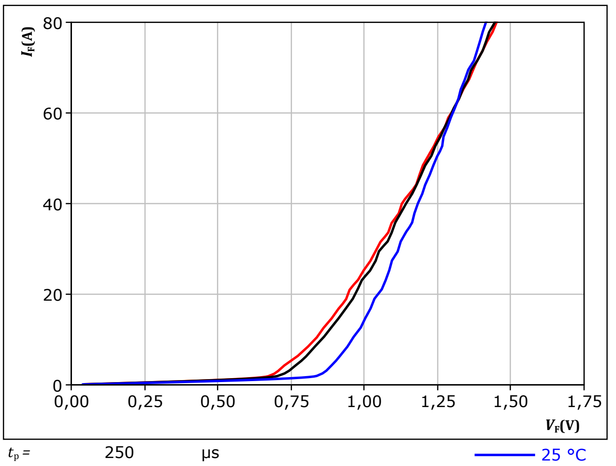
R (K/W)	τ (s)
8,81E-02	2,37E+00
2,02E-01	2,36E-01
2,88E-01	4,46E-02
2,49E-01	6,04E-03
6,09E-02	1,06E-03

Boost Sw. Protection Diode Characteristics

figure 9. Rectifier

Typical forward characteristics

$I_F = f(V_F)$



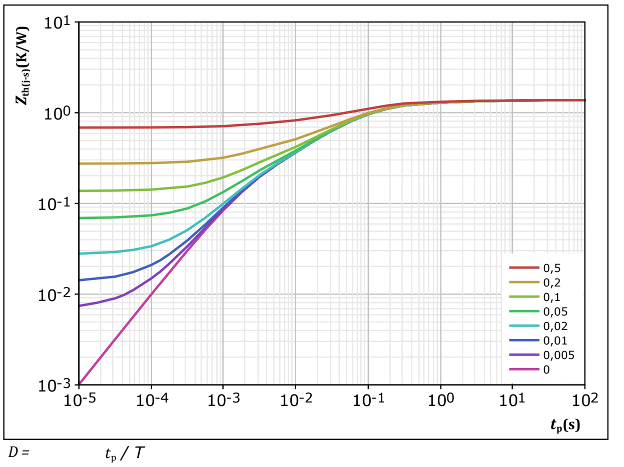
t_p = 250 µs

T_j: 25 °C, 125 °C, 150 °C

figure 10. Rectifier

Transient thermal impedance as a function of pulse width

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



$D = t_p / T$

$R_{th(j-s)}$ = 1,372 K/W

Rectifier thermal model values

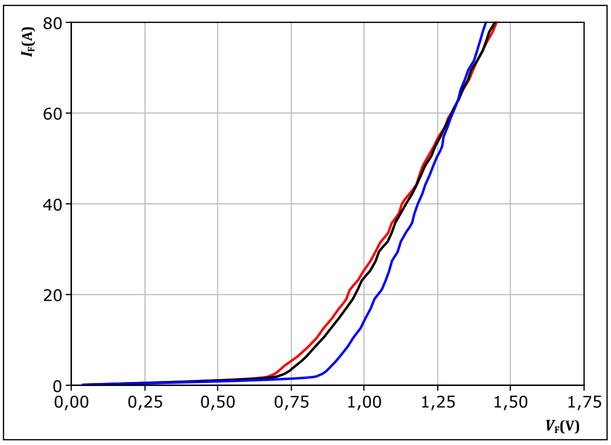
R (K/W)	τ (s)
5,28E-02	6,37E+00
1,59E-01	6,68E-01
6,89E-01	8,84E-02
3,22E-01	1,74E-02
1,49E-01	2,00E-03

ByPass Diode Characteristics

figure 11. **Rectifier**

Typical forward characteristics

I_F = f(V_F)



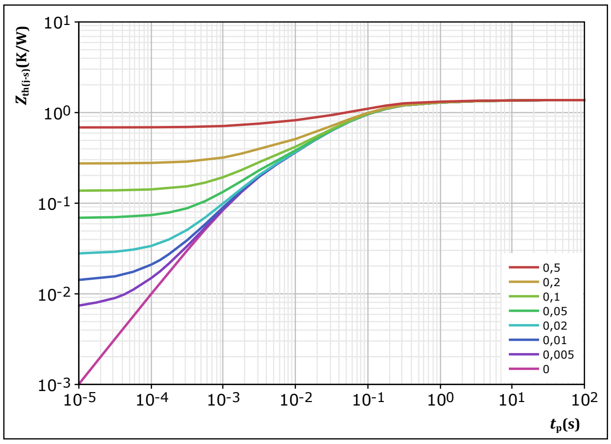
t_p = 250 µs

T_j: 25 °C, 125 °C, 150 °C

figure 12. **Rectifier**

Transient thermal impedance as a function of pulse width

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



D = t_p / T

$R_{th(j-s)}$ = 1,372 K/W

Rectifier thermal model values

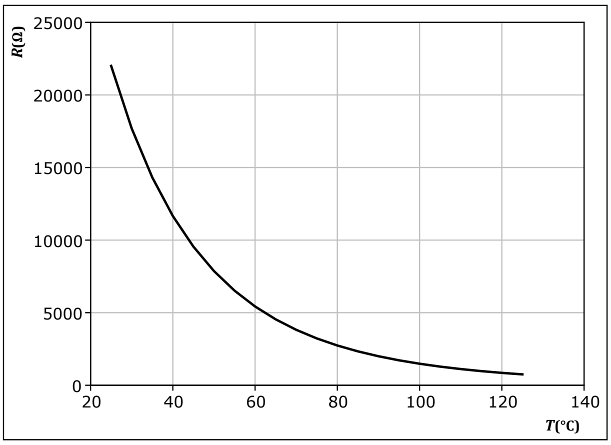
R (K/W)	τ (s)
5,28E-02	6,37E+00
1,59E-01	6,68E-01
6,89E-01	8,84E-02
3,22E-01	1,74E-02
1,49E-01	2,00E-03

Thermistor Characteristics

figure 13.	Thermistor

Typical NTC characteristic as function of temperature

R_T = f(T)

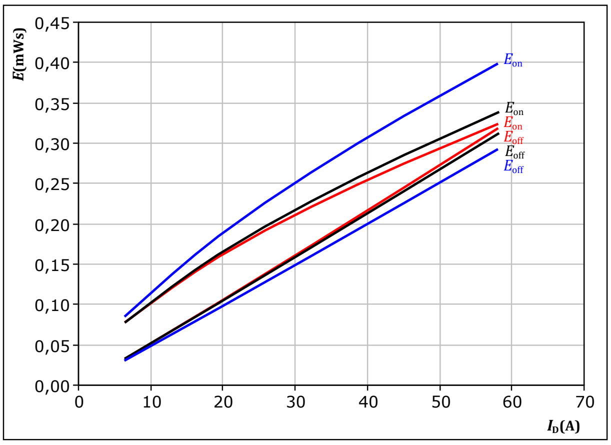


Boost Switching Characteristics

figure 14. **MOSFET**

Typical switching energy losses as a function of drain current

$E = f(I_D)$



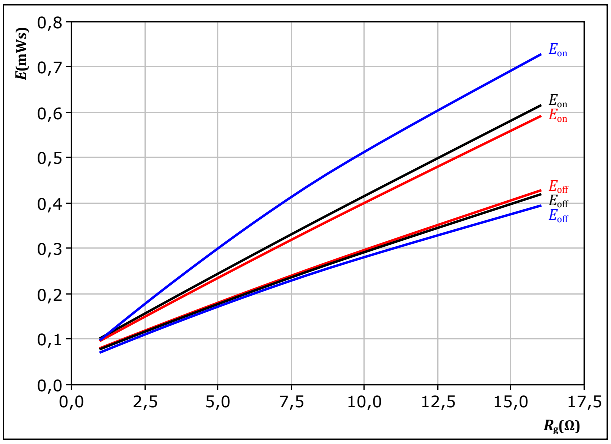
With an inductive load at

V_{DS} =	700	V	T_j:	25 °C
V_{GS} =	0/15	V		125 °C
R_{gon} =	4	Ω		150 °C
R_{goff} =	4	Ω		

figure 15. **MOSFET**

Typical switching energy losses as a function of MOSFET turn on gate resistor

$E = f(R_g)$



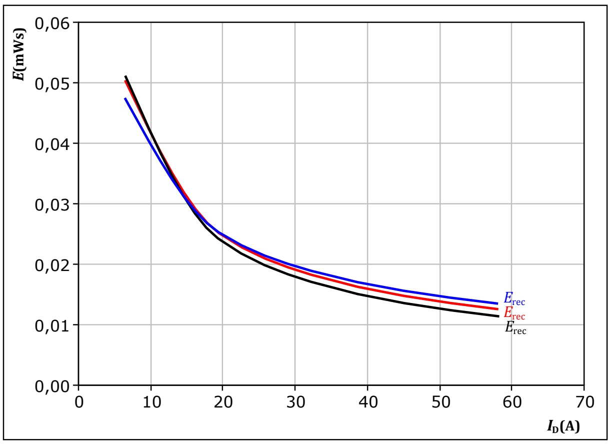
With an inductive load at

V_{DS} =	700	V	T_j:	25 °C
V_{GS} =	0/15	V		125 °C
I_D =	32	A		150 °C

figure 16. **FWD**

Typical reverse recovered energy loss as a function of drain current

$E_{rec} = f(I_D)$



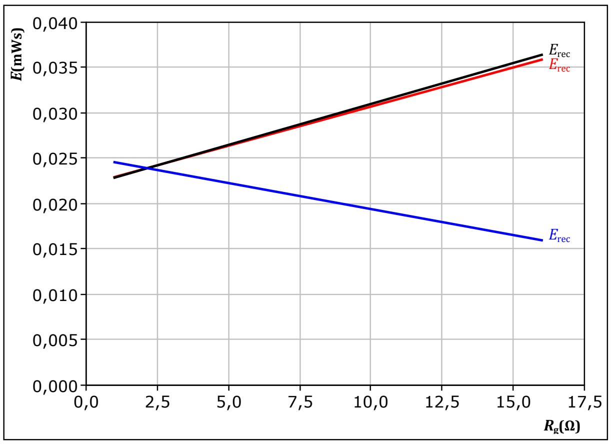
With an inductive load at

V_{DS} =	700	V	T_j:	25 °C
V_{GS} =	0/15	V		125 °C
R_{gon} =	4	Ω		150 °C

figure 17. **FWD**

Typical reverse recovered energy loss as a function of MOSFET turn on gate resistor

$E_{rec} = f(R_g)$



With an inductive load at

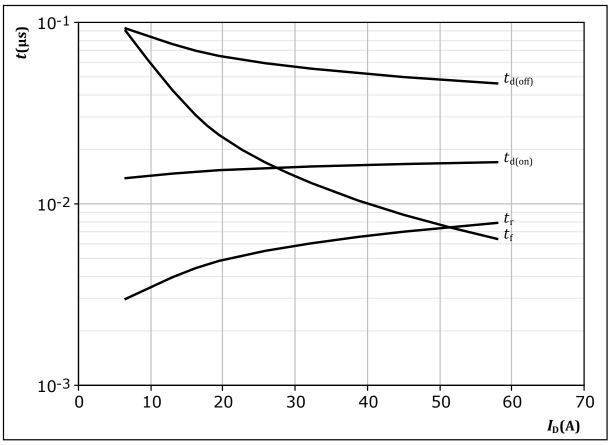
V_{DS} =	700	V	T_j:	25 °C
V_{GS} =	0/15	V		125 °C
I_D =	32	A		150 °C

Boost Switching Characteristics

figure 18.	**MOSFET**

Typical switching times as a function of drain current

t = f(I_D)



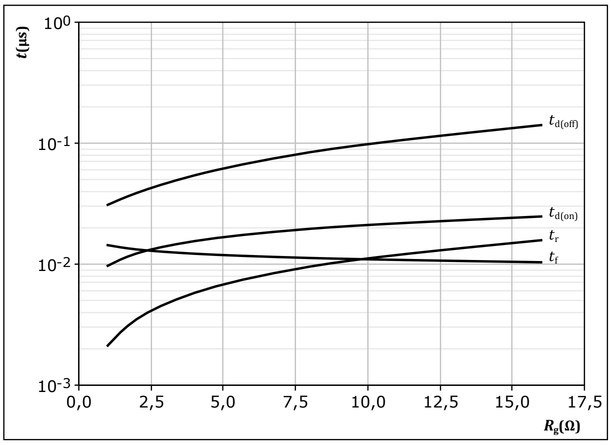
With an inductive load at

T_j =	150	°C
V_{DS} =	700	V
V_{GS} =	0/15	V
R_{gon} =	4	Ω
R_{goff} =	4	Ω

figure 19.	**MOSFET**

Typical switching times as a function of MOSFET turn on gate resistor

t = f(R_g)



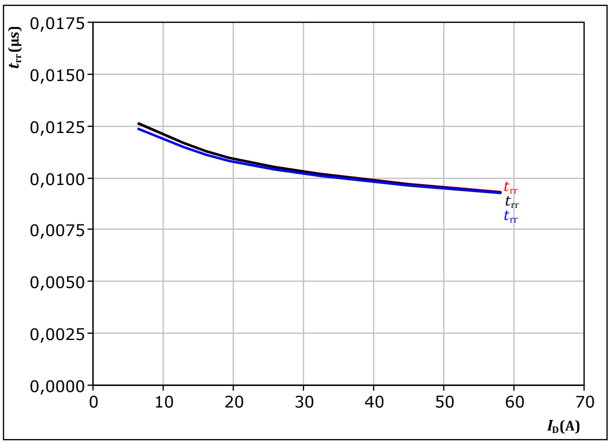
With an inductive load at

T_j =	150	°C
V_{DS} =	700	V
V_{GS} =	0/15	V
I_D =	32	A

figure 20.	**FWD**

Typical reverse recovery time as a function of drain current

t_{rr} = f(I_D)



At

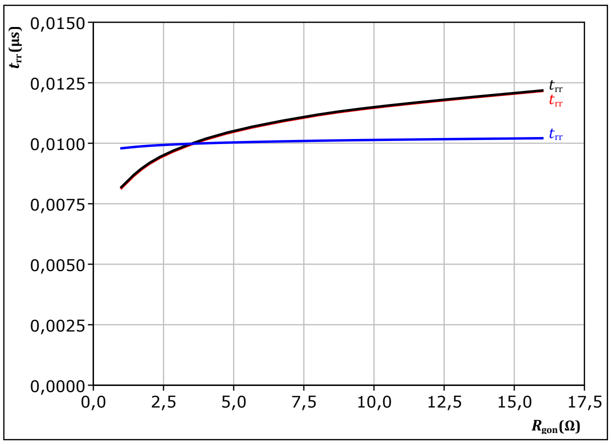
V_{DS} =	700	V
V_{GS} =	0/15	V
R_{gon} =	4	Ω

T_j: 25 °C, 125 °C, 150 °C

figure 21.	**FWD**

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

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



At

V_{DS} =	700	V
V_{GS} =	0/15	V
I_D =	32	A

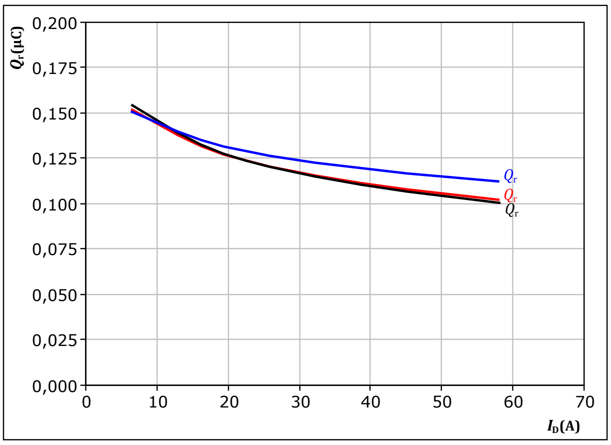
T_j: 25 °C, 125 °C, 150 °C

Boost Switching Characteristics

figure 22. **FWD**

Typical recovered charge as a function of drain current

$Q_r = f(I_D)$

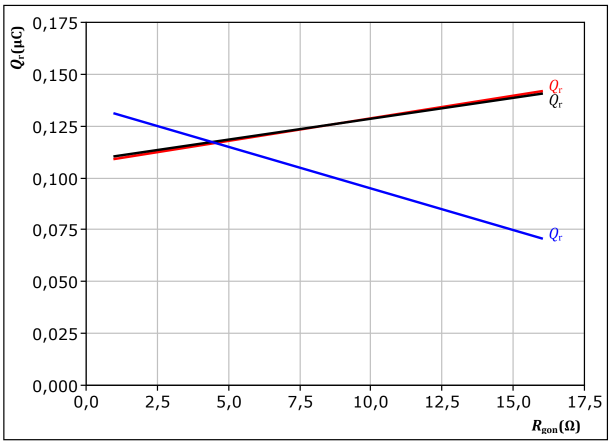


At				
V_{DS} =	700	V		25 °C
V_{GS} =	0/15	V	T_j:	125 °C
R_{gon} =	4	Ω		150 °C

figure 23. **FWD**

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

$Q_r = f(R_{gon})$

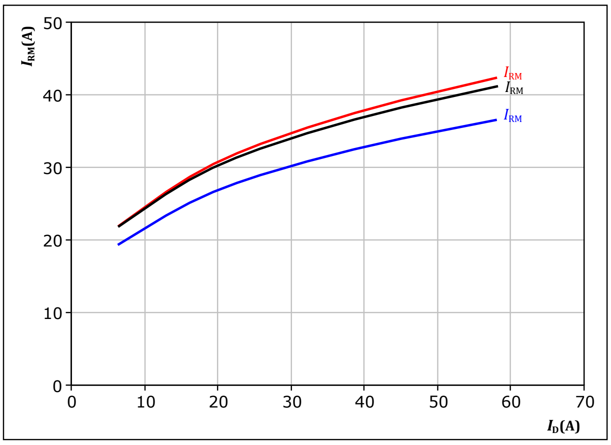


At				
V_{DS} =	700	V		25 °C
V_{GS} =	0/15	V	T_j:	125 °C
I_D =	32	A		150 °C

figure 24. **FWD**

Typical peak reverse recovery current as a function of drain current

$I_{RM} = f(I_D)$

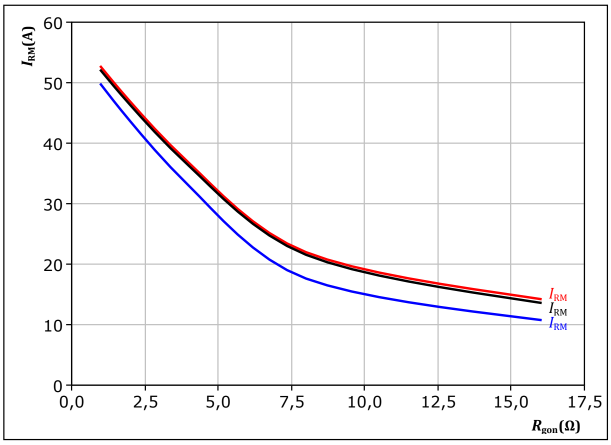


At				
V_{DS} =	700	V		25 °C
V_{GS} =	0/15	V	T_j:	125 °C
R_{gon} =	4	Ω		150 °C

figure 25. **FWD**

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

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



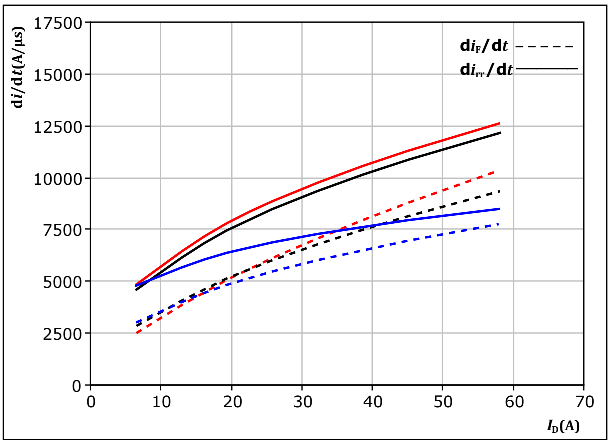
At				
V_{DS} =	700	V		25 °C
V_{GS} =	0/15	V	T_j:	125 °C
I_D =	32	A		150 °C

Boost Switching Characteristics

figure 26. **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)

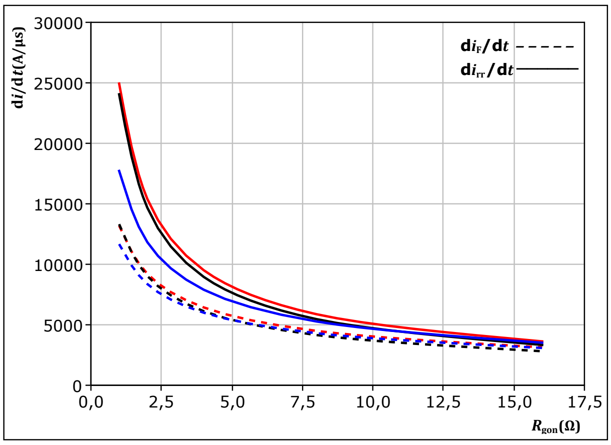


At					
	V_{DS} =	700	V	T_j:	25 °C
	V_{GS} =	0/15	V		125 °C
	R_{gon} =	4	Ω		150 °C

figure 27. **FWD**

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

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

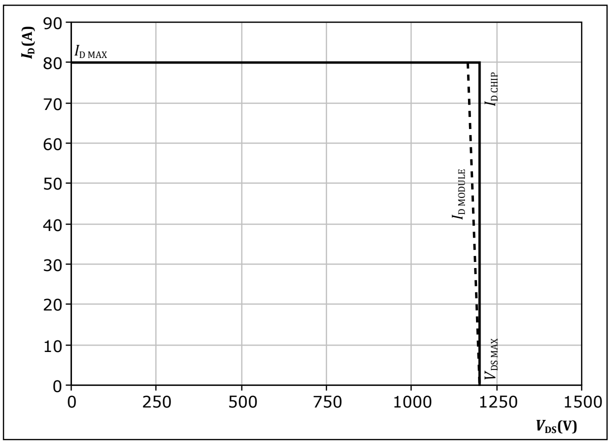


At					
	V_{DS} =	700	V	T_j:	25 °C
	V_{GS} =	0/15	V		125 °C
	I_D =	32	A		150 °C

figure 28. **MOSFET**

Reverse bias safe operating area

I_D = f(V_{DS})



At			
	T_j =	150	°C
	R_{gon} =	4	Ω
	R_{goff} =	4	Ω

Boost Switching Definitions

figure 29. **MOSFET**

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

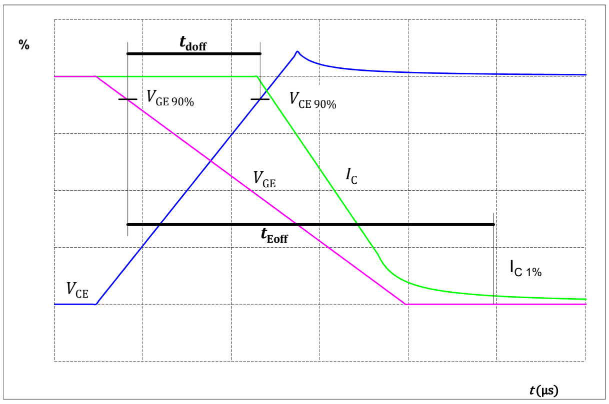


figure 30. **MOSFET**

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

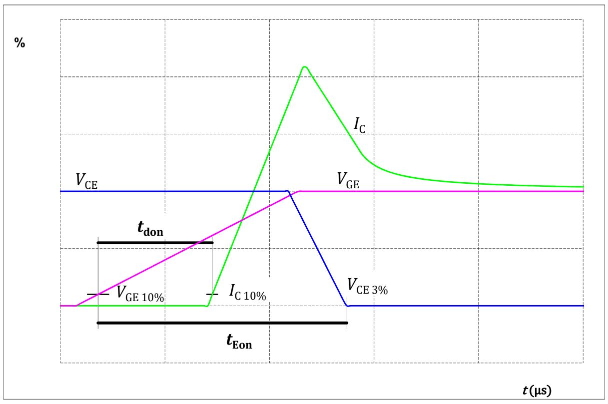


figure 31. **MOSFET**

Turn-off Switching Waveforms & definition of t_f

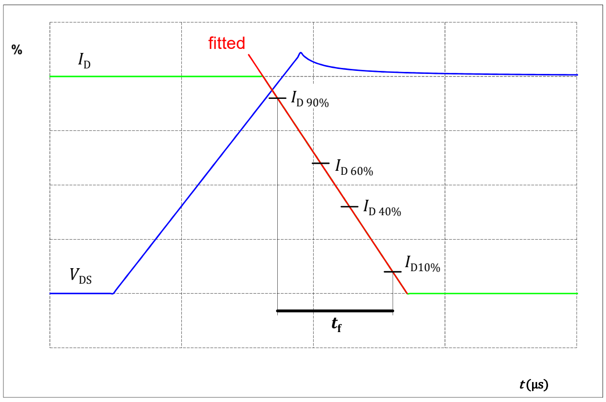
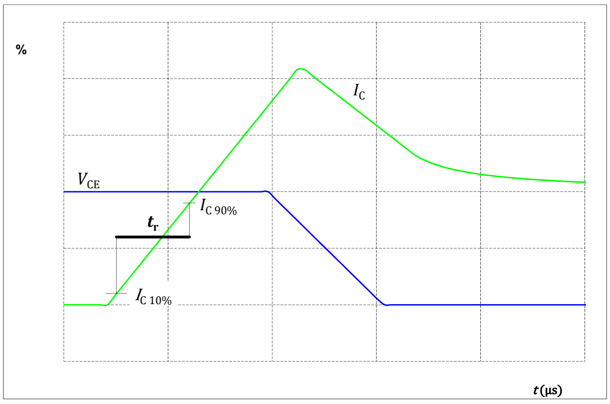


figure 32. **MOSFET**

Turn-on Switching Waveforms & definition of t_r



Boost Switching Definitions

figure 33. **FWD**

Turn-off Switching Waveforms & definition of t_{rr}

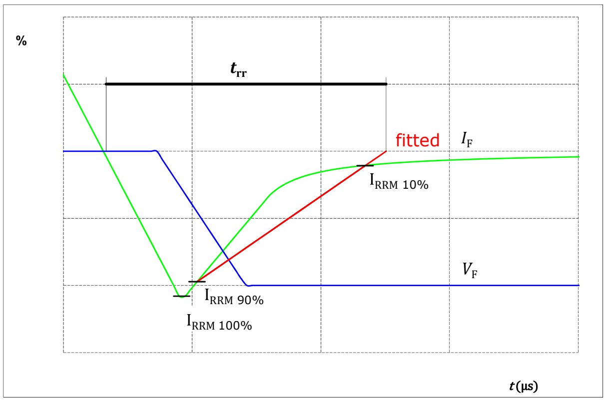


figure 34. **FWD**

Turn-on Switching Waveforms & definition of t_{Qrr} (t_{Qrr} = integrating time for Q_{rr})

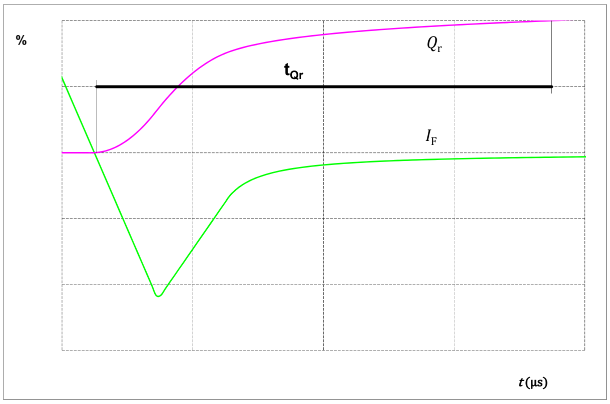
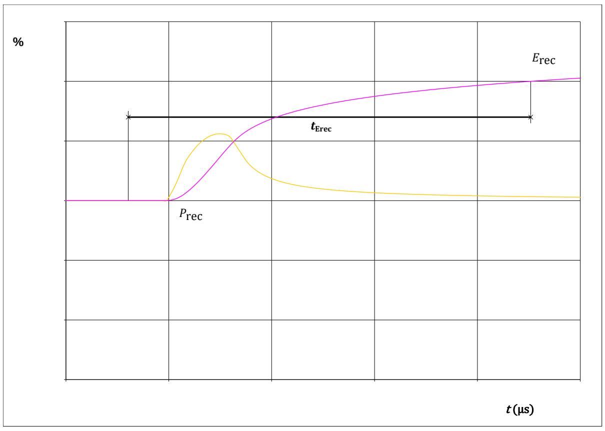


figure 35. **FWD**

Turn-on Switching Waveforms & definition of t_{Erec} (t_{Erec} = integrating time for E_{rec})



Vincotech

Ordering Code

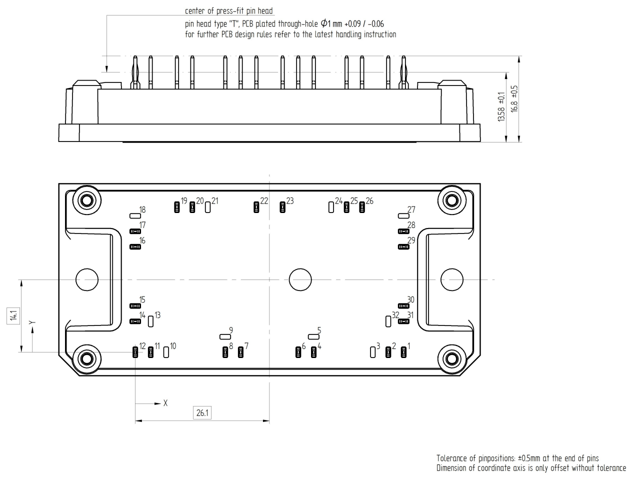
Version	Ordering Code
Without thermal paste	10-PY12B2A032ME-L387L28T
With thermal paste (5,2 W/mK, PTM6000HV)	10-PY12B2A032ME-L387L28T-/7/
With thermal paste (3,4 W/mK, PSX-P7)	10-PY12B2A032ME-L387L28T-/3/

Marking

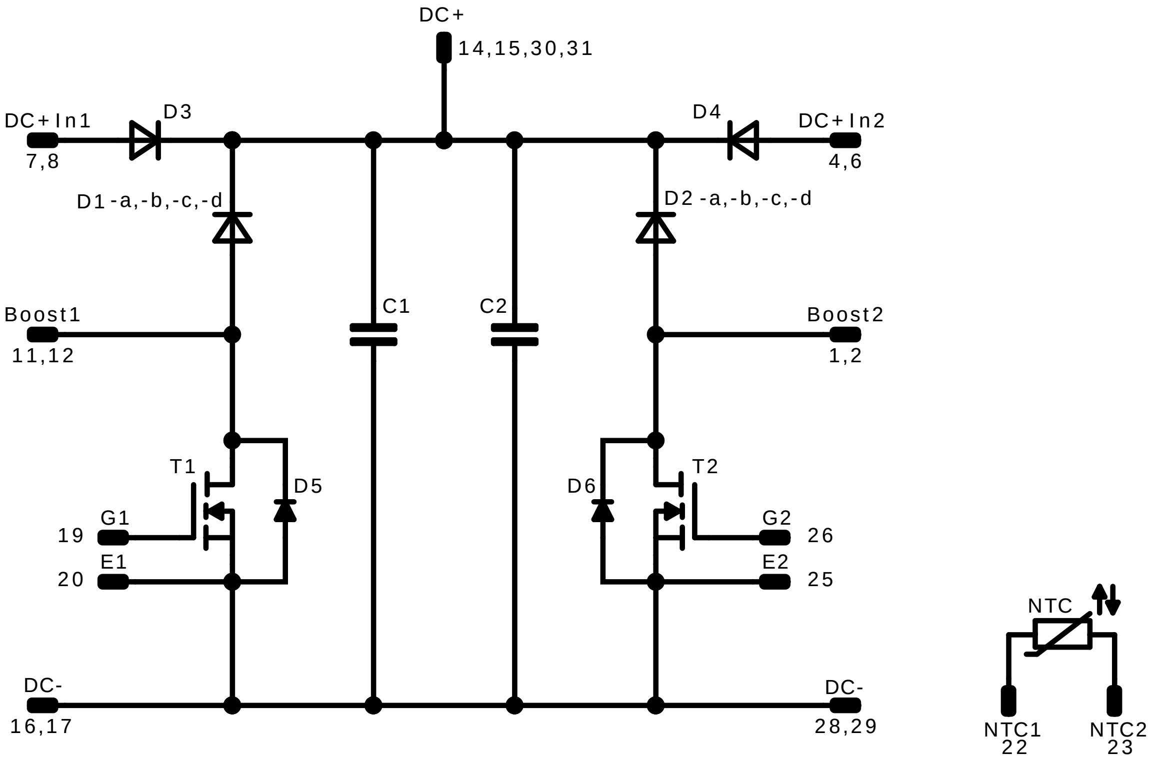
		**Name**	**Date code**	**UL & VIN**	**Lot**	**Serial**
	Text	NN-NNNNNNNNNNNNNN-TTTTTTTVV	WWYY	UL VIN	LLLLL	SSSS
		Type&Ver	**Lot number**	**Serial**	**Date code**	
	Datamatrix	TTTTTTTVV	LLLLL	SSSS	WWYY	

Outline

Pin table [mm]			
Pin	X	Y	Function
1	52,2	0	Boost2
2	49,2	0	Boost2
3	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-
30	52,2	9	DC+
31	52,2	6	DC+
32	not assembled		



Pinout



Identification

ID	Component	Voltage	Current	Function	Comment
T1, T2	MOSFET	1200 V	32 mΩ	Boost Switch	
D1, D2	FWD	1200 V	20 A	Boost Diode	
D5, D6	Rectifier	1600 V	28 A	Boost Sw. Protection Diode	
D3, D4	Rectifier	1600 V	28 A	ByPass Diode	
C1, C2	Capacitor	1000 V		Capacitor (DC)	
Rt	Thermistor			Thermistor	

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

Handling instruction
Handling instructions for *flow* 1 packages see vincotech.com website.

Package data
Package data for *flow* 1 packages see vincotech.com website.

Vincotech thermistor reference
See Vincotech thermistor reference table at 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-PY12B2A032ME-L387L28T-D1-14	26 Jun. 2023		