Vincotech

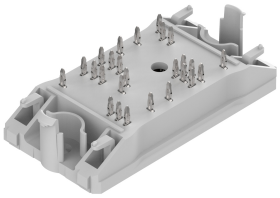
10-PZ123BA040MR01-M909L68Y
datasheet

flow3xBOOST 0 SIC **1200 V / 45 mΩ**

Features

- 3x booster with SiC MOSFET and SiC diode
- ultrafast switching
- low inductive design

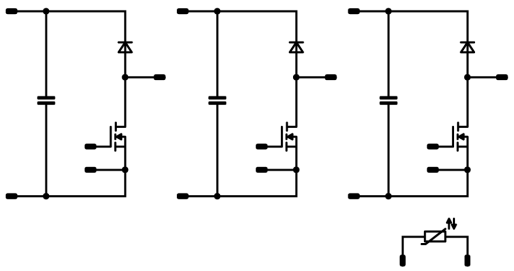
flow 0 12 mm housing



Target applications

- Solar Inverters
- UPS

Schematic



Types

- 10-PZ123BA040MR01-M909L68Y

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	33	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 °C	68	W
Gate-source voltage	V_{GSS}		-4 / 22	V
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	19	A
Repetitive peak forward current	I_{FRM}	t_p limited by T_{jmax}	50	A
Surge (non-repetitive) forward current	I_{FSM}	Single Half Sine Wave, t_p = 8,3 ms T_j = 150 °C	36	A
Total power dissipation	P_{tot}	T_j = T_{jmax} T_s = 80 °C	56	W
Maximum junction temperature	T_{jmax}		175	°C
Capacitor (DC)				
Maximum DC voltage	V_{MAX}		1000	V
Operation Temperature	T_{op}		0 ... 125	°C

Maximum Ratings

T_j = 25 °C, unless otherwise specified

Parameter	Symbol	Conditions	Value	Unit
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			10,19	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	$r_{DS(on)}$		18		20	25 125 150		39 51 60	50(1)	mΩ
Gate-source threshold voltage	$V_{GS(th)}$		0		0,01	25	2,7	3,9	5,6	V
Gate to Source Leakage Current	I_{GSS}		22	0		25			100	nA
Zero Gate Voltage Drain Current	I_{DSS}		0	1200		25		1	10	µA
Internal gate resistance	r_g							7		Ω
Gate charge	Q_g	V_{DD} = 600 V	18		20	25		107		nC
Short-circuit input capacitance	C_{iss}	f = 1 Mhz	0	800	0	25		1337		pF
Short-circuit output capacitance	C_{oss}							76		
Reverse transfer capacitance	C_{rss}							27		
Diode forward voltage	V_{SD}		0		20	25		3,2		V
Thermal										
Thermal resistance junction to sink (2)	$R_{th(j-s)}$	λ_{paste} = 3,4 W/mK (PSX)						1,41		K/W
Dynamic										
Turn-on delay time	$t_{d(on)}$	R_{gon} = 4 Ω R_{goff} = 4 Ω	0/18	700	32	25 125 150		11,45 10,53 10,46		ns
Rise time	t_r					25 125 150		7,57 7,3 7,3		ns
Turn-off delay time	$t_{d(off)}$					25 125 150		65,75 77,98 81,09		ns
Fall time	t_f					25 125 150		6,89 7,29 7,17		ns
Turn-on energy (per pulse)	E_{on}	Q_{rFWD}=0,048 µC Q_{rFWD}=0,053 µC Q_{rFWD}=0,056 µC				25 125 150		0,329 0,309 0,307		mWs
Turn-off energy (per pulse)	E_{off}					25 125 150		0,435 0,484 0,497		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				10	25 125 150		1,45 1,76 1,89	1,6(1)	V
Reverse leakage current	I_R	V_r = 1200 V				25 150		10 80	200	µA
Thermal										
Thermal resistance junction to sink (2)	$R_{th(j-s)}$	λ_{paste} = 3,4 W/mK (PSX)						1,7		K/W
Dynamic										
Peak recovery current	I_{RRM}	di/dt=4100 A/µs di/dt=4306 A/µs di/dt=4470 A/µs	0/18	700	32	25 125 150		12,82 13,5 13,85		A
Reverse recovery time	t_{rr}					25 125 150		6,89 7,35 7,61		ns
Recovered charge	Q_r					25 125 150		0,048 0,053 0,056		µC
Reverse recovered energy	E_{rec}					25 125 150		$9{,}723 \times 10^{-3}$ 0,011 0,012		mWs
Peak rate of fall of recovery current	$(di_{rf}/dt)_{max}$					25 125 150		6588,31 6038,64 6120,43		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	
Capacitor (DC)										
Static										
Capacitance	C	DC bias voltage = 0 V				25		47		nF
Tolerance							-10		10	%
Thermistor										
Static										
Rated resistance	R					25		22		kΩ
Deviation of R_{100}	$\Delta_{R/R}$	R_{100} = 1484 Ω				100	-5		5	%
Power dissipation	P							5		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

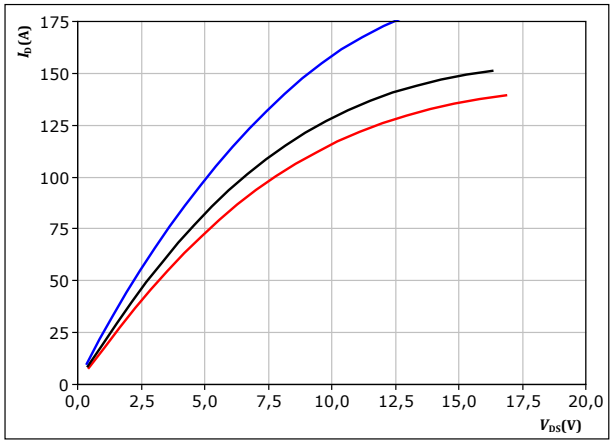
(2) Only valid with pre-applied Vincotech thermal interface material.

Boost Switch Characteristics

figure 1. **MOSFET**

Typical output characteristics

$I_D = f(V_{DS})$

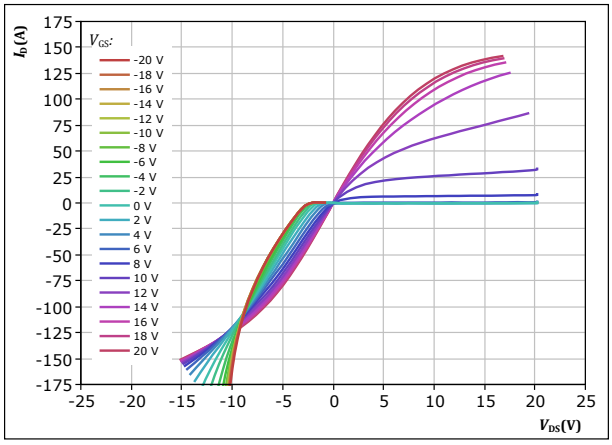


t_p =	250	µs		
V_{GS} =	18	V	T_j:	25 °C
				125 °C
				150 °C

figure 2. **MOSFET**

Typical output characteristics

$I_D = f(V_{DS})$



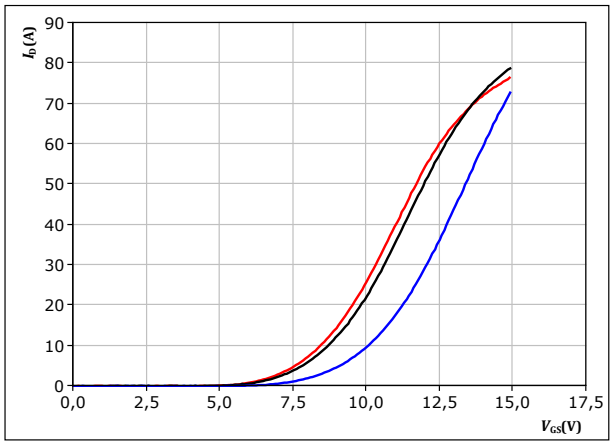
t_p =	250	µs
T_j =	150	°C

V_{GS} from -20 V to 20 V in steps of 2 V

figure 3. **MOSFET**

Typical transfer characteristics

$I_D = f(V_{GS})$

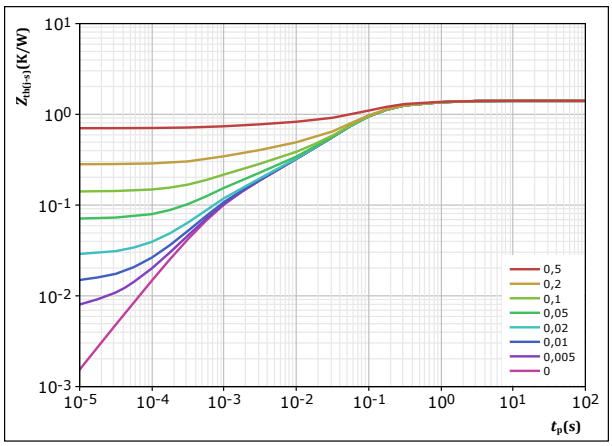


t_p =	250	µs		
V_{DS} =	10	V	T_j:	25 °C
				125 °C
				150 °C

figure 4. **MOSFET**

Transient thermal impedance as a function of pulse width

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



D =	t_p / T	
$R_{th(j-s)}$ =	1,407	K/W

MOSFET thermal model values

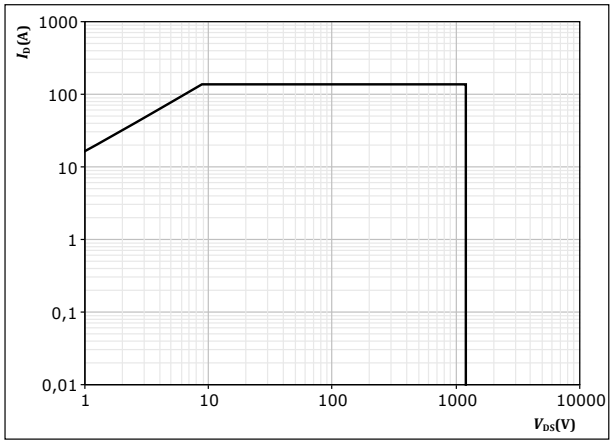
R (K/W)	τ (s)
1,24E-01	1,00E+00
3,91E-01	1,66E-01
6,76E-01	6,11E-02
1,21E-01	5,50E-03
9,55E-02	8,02E-04

Boost Switch Characteristics

figure 5. **MOSFET**

Safe operating area

$I_D = f(V_{DS})$



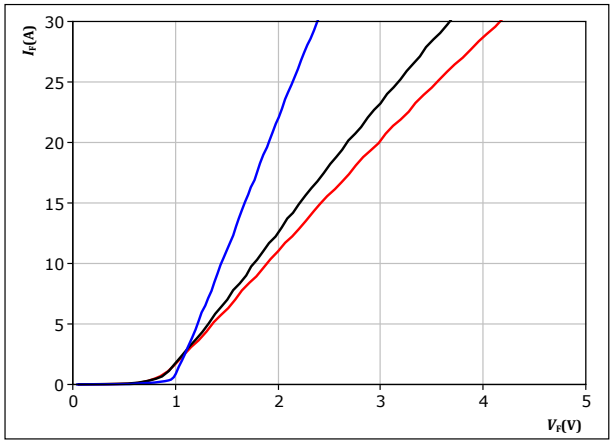
D =	single pulse	
T_s =	80	°C
V_{GS} =	18	V
T_j =	T_{jmax}	

Boost Diode Characteristics

figure 6. **FWD**

Typical forward characteristics

$I_F = f(V_F)$



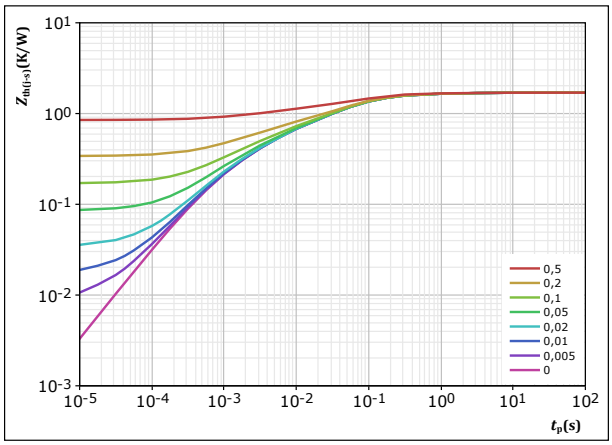
t_p = 250 µs

T_j: 25 °C, 125 °C, 150 °C

figure 7. **FWD**

Transient thermal impedance as a function of pulse width

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



D = t_p / T

$R_{th(j-s)}$ = 1,699 K/W

FWD thermal model values

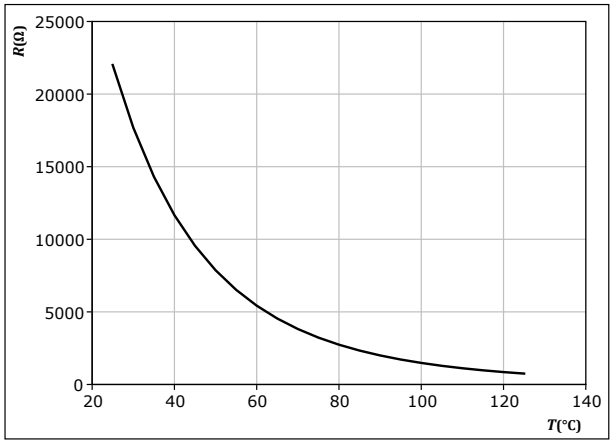
R (K/W)	τ (s)
4,56E-02	3,21E+00
1,65E-01	3,88E-01
7,86E-01	6,52E-02
3,27E-01	1,11E-02
2,54E-01	2,71E-03
1,20E-01	6,15E-04

Thermistor Characteristics

figure 8. **Thermistor**

Typical NTC characteristic as function of temperature

$R_T = f(T)$

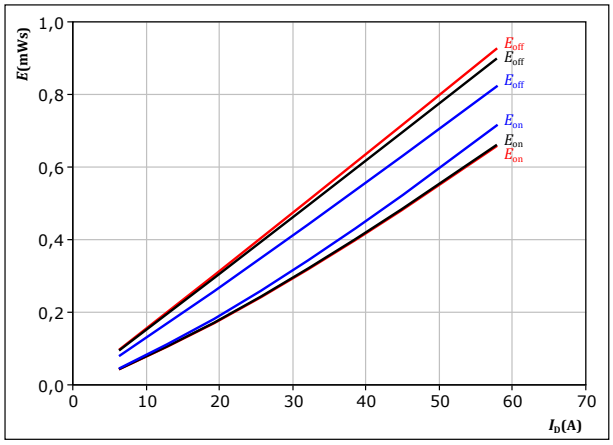


Boost Switching Characteristics

figure 9. **MOSFET**

Typical switching energy losses as a function of drain current

$E = f(I_D)$



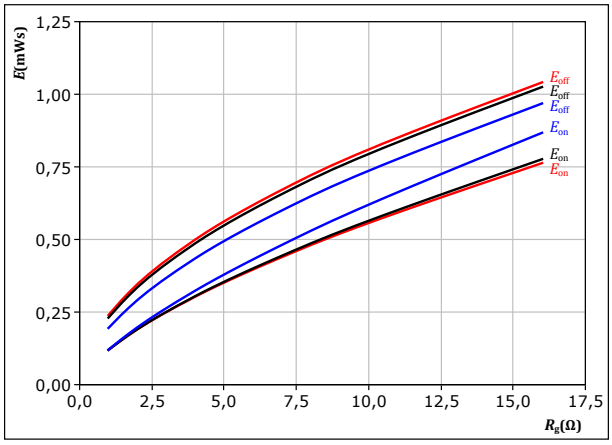
With an inductive load at

			T_j:	
V_{DS} =	700	V		25 °C
V_{GS} =	0/18	V		125 °C
R_{gon} =	4	Ω		150 °C
R_{goff} =	4	Ω		

figure 10. **MOSFET**

Typical switching energy losses as a function of gate resistor

$E = f(R_g)$



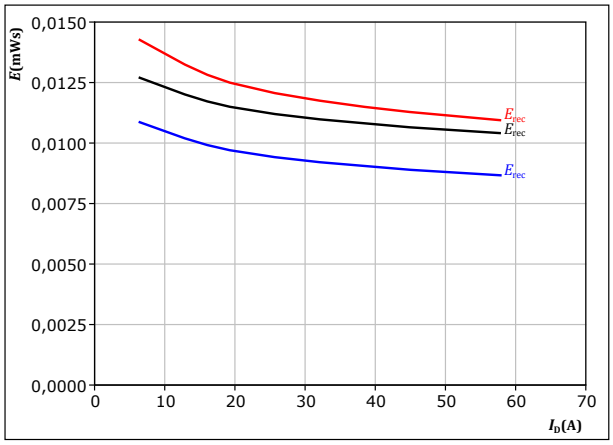
With an inductive load at

			T_j:	
V_{DS} =	700	V		25 °C
V_{GS} =	0/18	V		125 °C
I_D =	32	A		150 °C

figure 11. **FWD**

Typical reverse recovered energy loss as a function of drain current

$E_{rec} = f(I_D)$



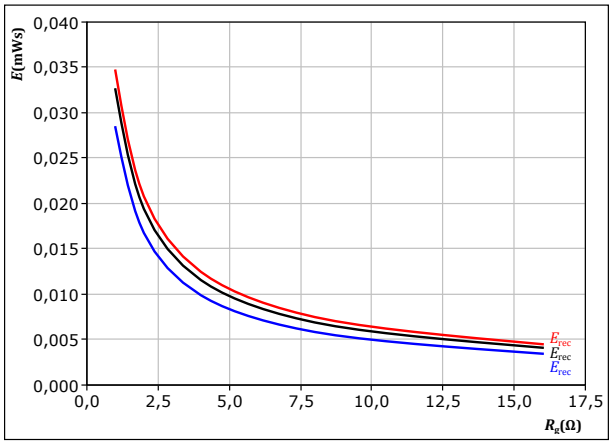
With an inductive load at

			T_j:	
V_{DS} =	700	V		25 °C
V_{GS} =	0/18	V		125 °C
R_{gon} =	4	Ω		150 °C

figure 12. **FWD**

Typical reverse recovered energy loss as a function of gate resistor

$E_{rec} = f(R_g)$



With an inductive load at

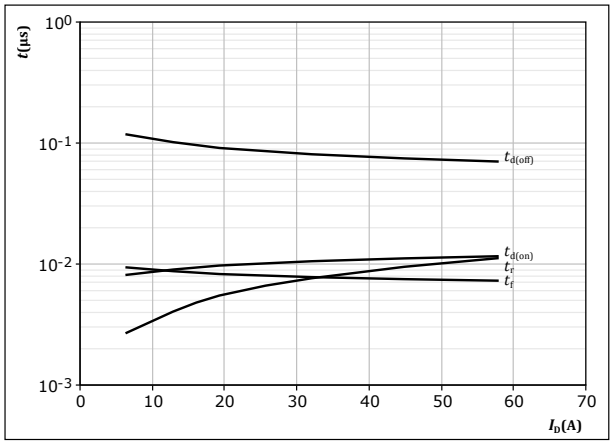
			T_j:	
V_{DS} =	700	V		25 °C
V_{GS} =	0/18	V		125 °C
I_D =	32	A		150 °C

Boost Switching Characteristics

figure 13. **MOSFET**

Typical switching times as a function of drain current

t = f(I_D)



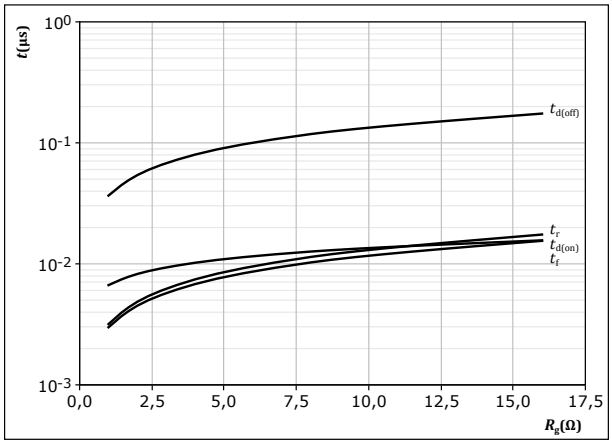
With an inductive load at

T_j =	150	°C
V_{DS} =	700	V
V_{GS} =	0/18	V
R_{gon} =	4	Ω
R_{goff} =	4	Ω

figure 14. **MOSFET**

Typical switching times as a function of gate resistor

t = f(R_g)



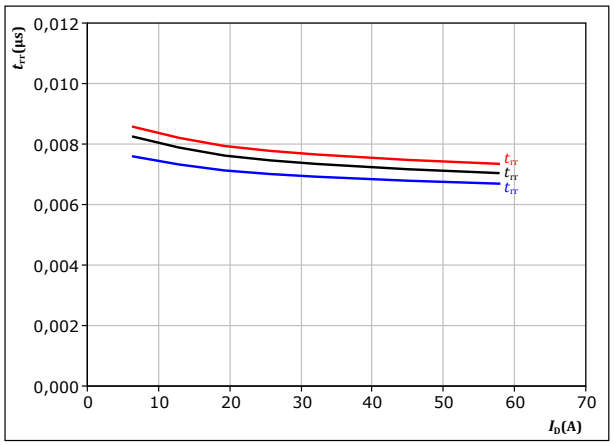
With an inductive load at

T_j =	150	°C
V_{DS} =	700	V
V_{GS} =	0/18	V
I_D =	32	A

figure 15. **FWD**

Typical reverse recovery time as a function of drain current

t_{rr} = f(I_D)



At

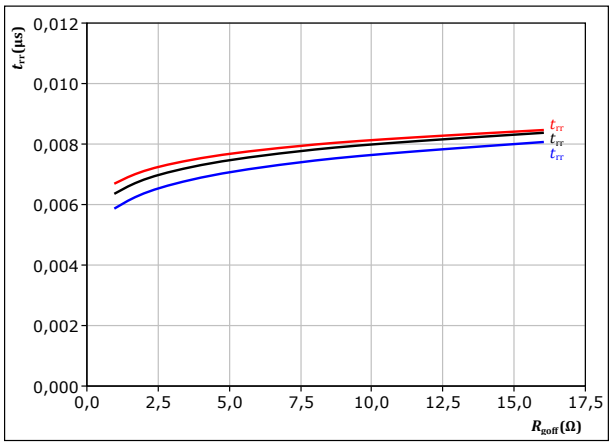
V_{DS} =	700	V
V_{GS} =	0/18	V
R_{gon} =	4	Ω

T_j: 25 °C, 125 °C, 150 °C

figure 16. **FWD**

Typical reverse recovery time as a function of turn off gate resistor

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



At

V_{DS} =	700	V
V_{GS} =	0/18	V
I_D =	32	A

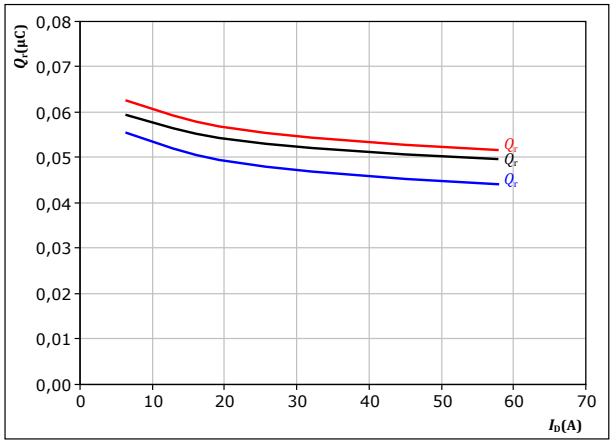
T_j: 25 °C, 125 °C, 150 °C

Boost Switching Characteristics

figure 17. **FWD**

Typical recovered charge as a function of drain current

$Q_r = f(I_D)$

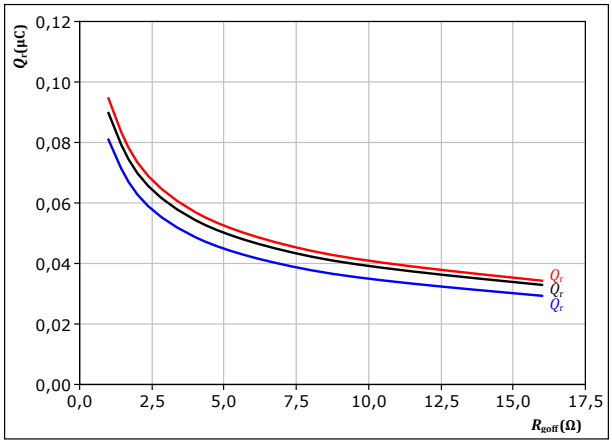


At					
	V_{DS} =	700	V		
	V_{GS} =	0/18	V	T_j:	25 °C
	R_{gon} =	4	Ω		125 °C
					150 °C

figure 18. **FWD**

Typical recovered charge as a function of turn off gate resistor

$Q_r = f(R_{goff})$

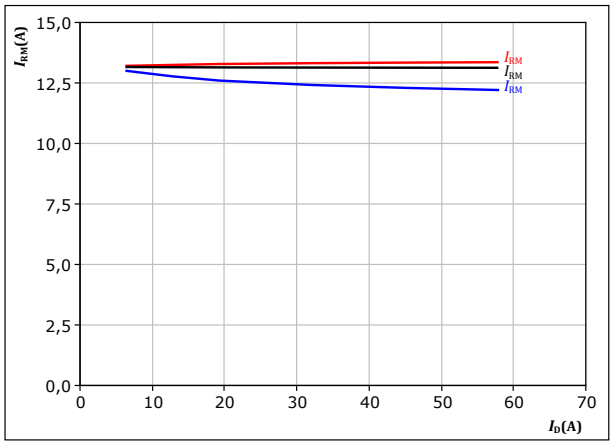


At					
	V_{DS} =	700	V		
	V_{GS} =	0/18	V	T_j:	25 °C
	I_D =	32	A		125 °C
					150 °C

figure 19. **FWD**

Typical peak reverse recovery current as a function of drain current

$I_{RM} = f(I_D)$

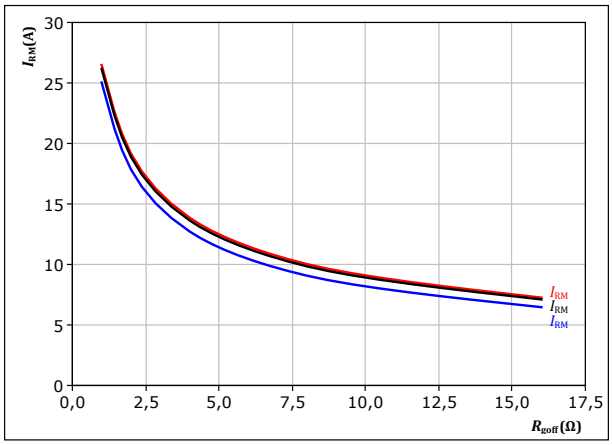


At					
	V_{DS} =	700	V		
	V_{GS} =	0/18	V	T_j:	25 °C
	R_{gon} =	4	Ω		125 °C
					150 °C

figure 20. **FWD**

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

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



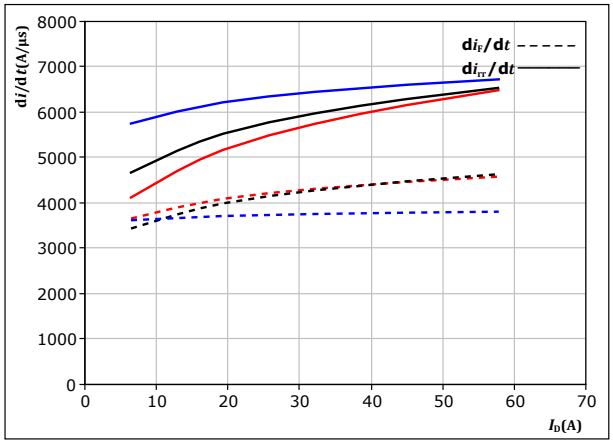
At					
	V_{DS} =	700	V		
	V_{GS} =	0/18	V	T_j:	25 °C
	I_D =	32	A		125 °C
					150 °C

Boost Switching Characteristics

figure 21. **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)

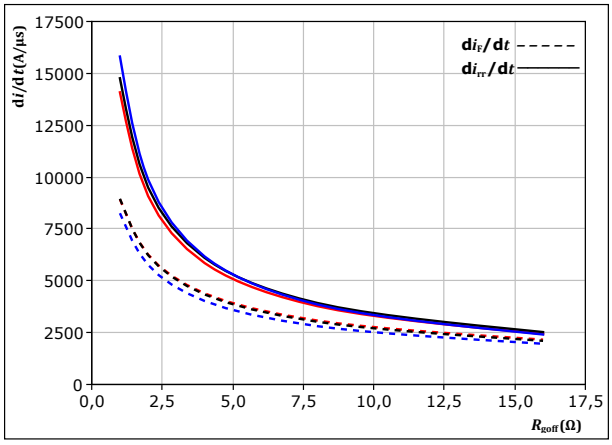


At				
V_{DS} =	700	V	T_j:	25 °C
V_{GS} =	0/18	V		125 °C
R_{gon} =	4	Ω		150 °C

figure 22. **FWD**

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

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

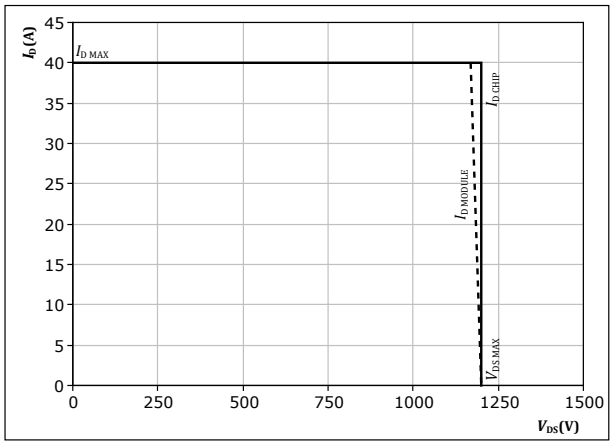


At				
V_{DS} =	700	V	T_j:	25 °C
V_{GS} =	0/18	V		125 °C
I_D =	32	A		150 °C

figure 23. **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 24. MOSFET

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

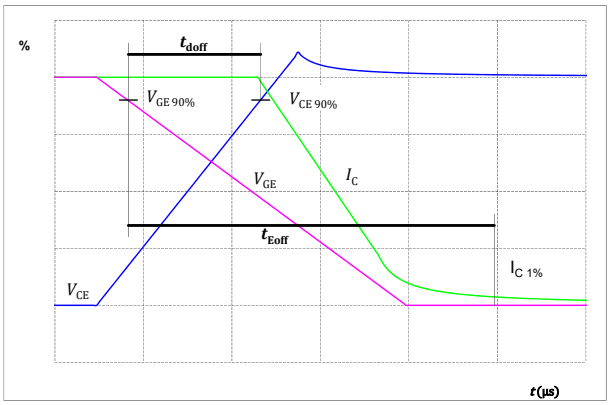


figure 25. MOSFET

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

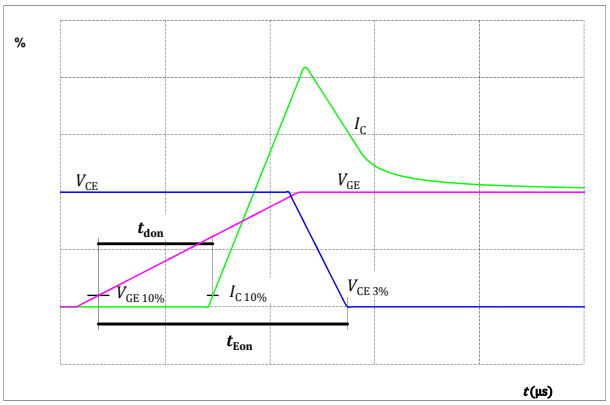


figure 26. MOSFET

Turn-off Switching Waveforms & definition of t_f

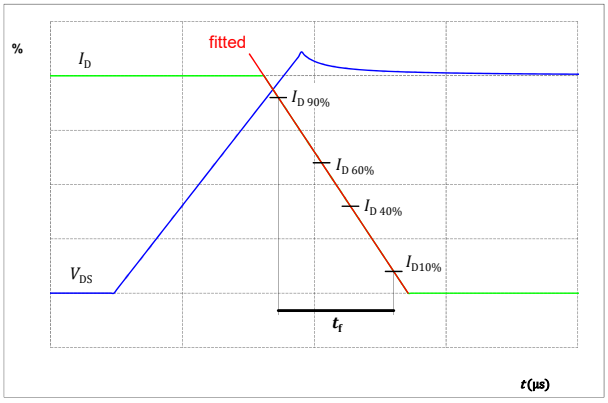
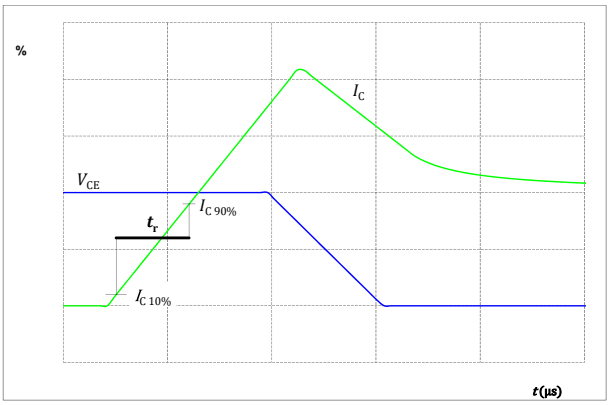


figure 27. MOSFET

Turn-on Switching Waveforms & definition of t_r



Boost Switching Definitions

figure 28. **FWD**

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

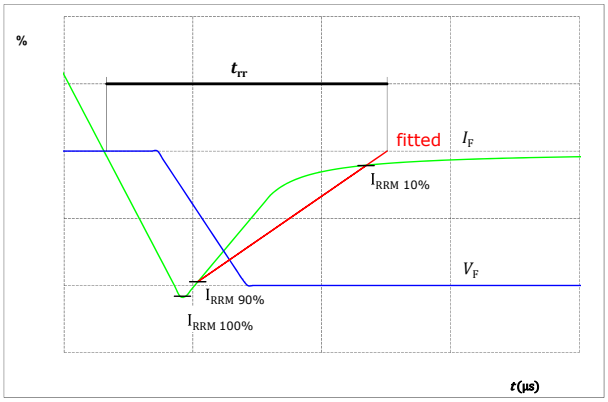


figure 29. **FWD**

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

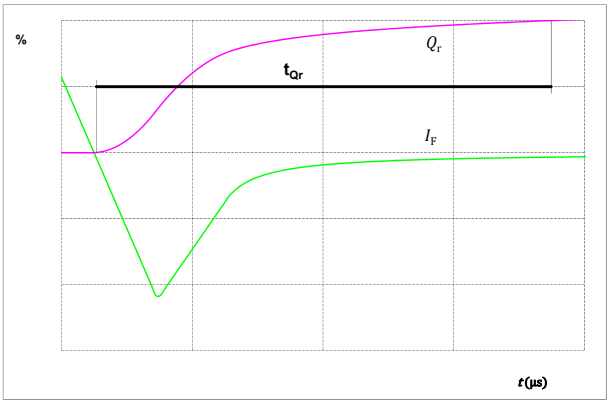
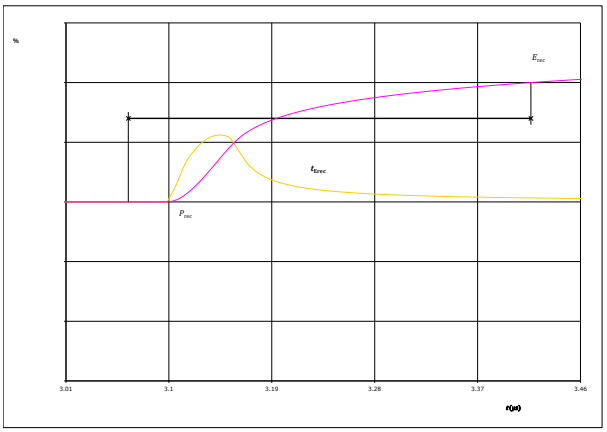


figure 30. **FWD**

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



Ordering Code

Version	Ordering Code
Without thermal paste	10-PZ123BA040MR01-M909L68Y
With thermal paste (5,2 W/mK, PTM6000HV)	10-PZ123BA040MR01-M909L68Y-/7/
With thermal paste (3,4 W/mK, PSX-P7)	10-PZ123BA040MR01-M909L68Y-/3/

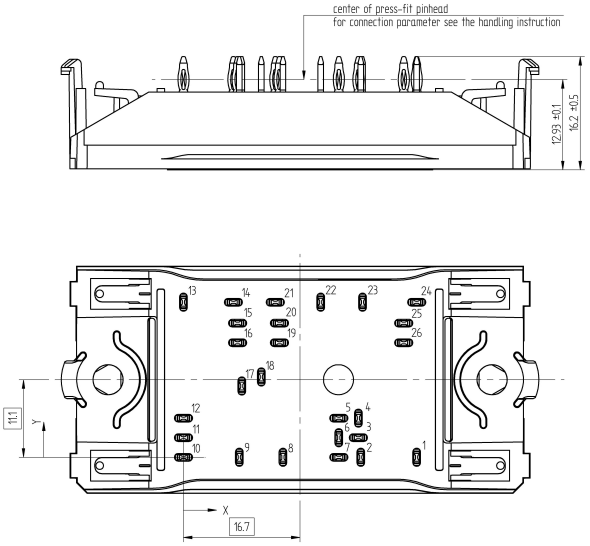
Marking

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

Outline

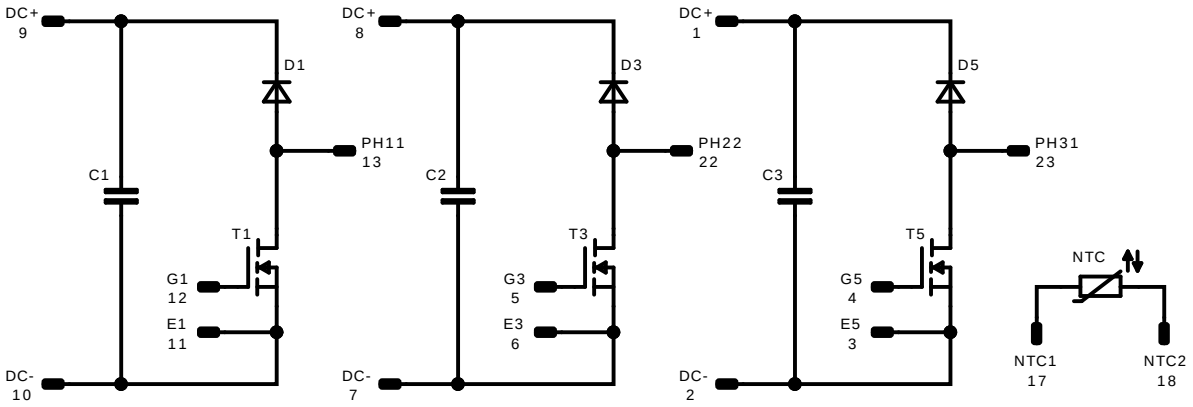
Pin table [mm]

Pin	X	Y	Function
1	33,4	0	DC+
2	25,4	0	DC-
3	25,05	2,8	E5
4	25,05	5,6	G5
5	22,25	5,6	G3
6	22,25	2,8	E3
7	22,25	0	DC-
8	14,25	0	DC+
9	8	0	DC+
10	0	0	DC-
11	0	2,8	E1
12	0	5,6	G1
13	0	22,2	PH11
14	7,15	22,2	PH12
15	7,75	19,2	G2
16	7,75	16,4	E2
17	8,35	10,2	NTC1
18	11,15	11,5	NTC2
19	13,75	16,4	E4
20	13,75	19,2	G4
21	13,15	22,2	PH21
22	19,65	22,2	PH22
23	25,65	22,2	PH31
24	33,4	22,2	PH32
25	31,55	19,2	G6
26	31,55	16,4	E6



Tolerance of pinpositions ±0,5mm at the end of pins
Dimension of coordinate axis is only offset without tolerance

Pinout



Identification

ID	Component	Voltage	Current	Function	Comment
T1, T3, T5	MOSFET	1200 V	40 mΩ	Boost Switch	
D1, D3, D5	FWD	1200 V	10 A	Boost Diode	
C2, C3, C1	Capacitor	1000 V		Capacitor (DC)	
NTC	NTC			Thermistor	

Packaging instruction				
Standard packaging quantity (SPQ) 135	>SPQ	Standard	<SPQ	Sample

Handling instruction
Handling instructions for *flow* 0 packages see vincotech.com website.

Package data
Package data for *flow* 0 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-PZ123BA040MR01-M909L68Y-D1-14	19 Sep. 2021		