Vincotech

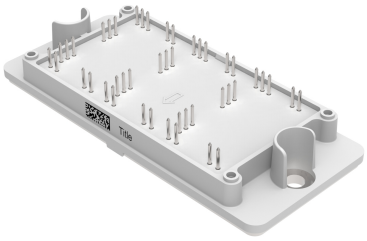
30-FT123BA040MR-L878L08
datasheet

***flow*3xBOOST 2 SIC** **1200 V / 40 mΩ**

Features

- Three-leg Booster module
- Full SiC for ultra fast switching frequency
- Low inductive package
- Ultra high efficient

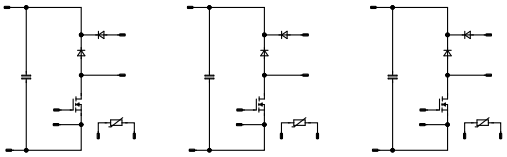
flow 2 13 mm housing



Target applications

- Solar Inverters

Schematic



Types

- 30-FT123BA040MR-L878L08

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}		137	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$	T_s = 80 °C	93	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	49	A
Repetitive peak forward current	I_{FRM}	t_p limited by T_{jmax}		138	A
Surge (non-repetitive) forward current	I_{FSM}	Single Half Sine Wave, t_p = 8,3 ms	T_j = 150 °C	99	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$	T_s = 80 °C	130	W
Maximum junction temperature	T_{jmax}			175	°C
ByPass Diode					
Peak repetitive reverse voltage	V_{RRM}			1600	V
Forward current (DC current)	I_F	$T_j = T_{jmax}$	T_s = 80 °C	83	A
Surge (non-repetitive) forward current	I_{FSM}	Single Half Sine Wave, t_p = 10 ms	T_j = 150 °C	490	A
Surge current capability	I^2t			1200	A^2s
Total power dissipation	P_{tot}	$T_j = T_{jmax}$	T_s = 80 °C	106	W
Maximum junction temperature	T_{jmax}			150	°C
Capacitor (DC)					
Maximum DC voltage	V_{MAX}			1500	V
Operation Temperature	T_{op}			-55 ... 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	4000	V
Isolation voltage	V_{isol}	AC Voltage t_p = 1 min	2500	V
Creepage distance			>12,7	mm
Clearance			>12,7	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)						1,02		K/W
Dynamic										
Turn-on delay time	$t_{d(on)}$	R_{gon} = 4 Ω R_{goff} = 4 Ω	-4/16	700	32	25 125 150		15,04 14,4 14,08		ns
Rise time	t_r					25 125 150		5,76 5,44 5,76		ns
Turn-off delay time	$t_{d(off)}$					25 125 150		52,8 60,16 62,08		ns
Fall time	t_f					25 125 150		15,52 22,62 23,25		ns
Turn-on energy (per pulse)	E_{on}	Q_{rFWD}=0,3 µC Q_{rFWD}=0,308 µC Q_{rFWD}=0,314 µC				25 125 150		0,406 0,382 0,38		mWs
Turn-off energy (per pulse)	E_{off}					25 125 150		0,224 0,246 0,255		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				30	25 125 150		1,43 1,77 1,9	1,6(1)	V
Reverse leakage current	I_R	V_r = 1200 V				25 150		30 240	600	µA
Thermal										
Thermal resistance junction to sink (2)	$R_{th(j-s)}$	λ_{paste} = 3,4 W/mK (PSX)						0,73		K/W
Dynamic										
Peak recovery current	I_{RRM}	di/dt=7016 A/µs di/dt=6714 A/µs di/dt=7030 A/µs	-4/16	700	32	25 125 150		37,85 38,81 38,95		A
Reverse recovery time	t_{rr}					25 125 150		11,9 11,89 12,27		ns
Recovered charge	Q_r					25 125 150		0,3 0,308 0,314		µC
Reverse recovered energy	E_{rec}					25 125 150		0,113 0,119 0,121		mWs
Peak rate of fall of recovery current	$(di_{rf}/dt)_{max}$					25 125 150		8972 9002 8948		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	
ByPass Diode										
Static										
Forward voltage	V_F				25	25 125		1 0,915	1,21(1) 1,1(1)	V
Reverse leakage current	I_R	V_r = 1600 V				25			50	µA
Thermal										
Thermal resistance junction to sink (2)	$R_{th(j-s)}$	λ_{paste} = 3,4 W/mK (PSX)						0,66		K/W
Capacitor (DC)										
Static										
Capacitance	C	DC bias voltage = 0 V				25		78		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

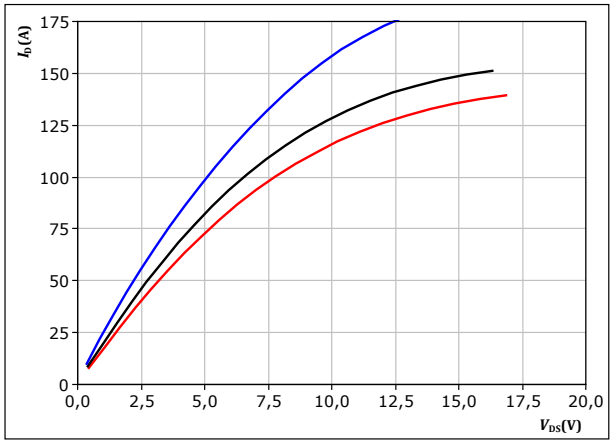
(2) Only valid with pre-applied Vincotech thermal interface material.

Boost Switch Characteristics

figure 1. **MOSFET**

Typical output characteristics

$I_D = f(V_{DS})$

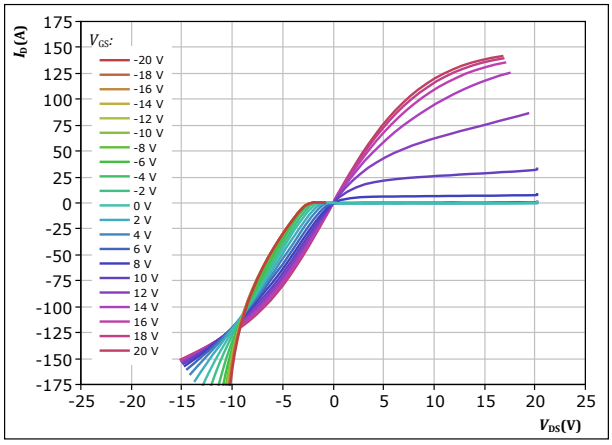


t_p =	250	µs		
V_{GS} =	18	V	T_j:	25 °C
				125 °C
				150 °C

figure 2. **MOSFET**

Typical output characteristics

$I_D = f(V_{DS})$



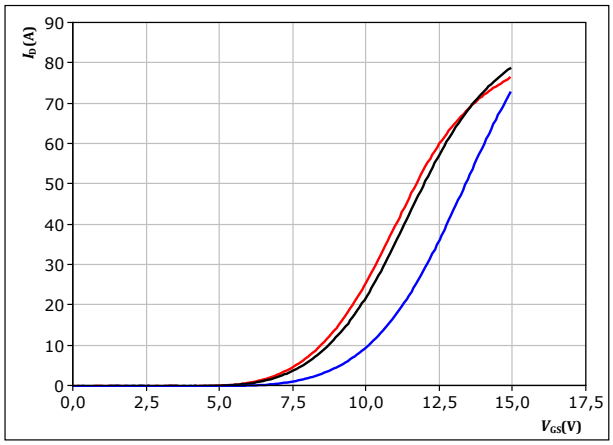
t_p =	250	µs
T_j =	150	°C

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

figure 3. **MOSFET**

Typical transfer characteristics

$I_D = f(V_{GS})$

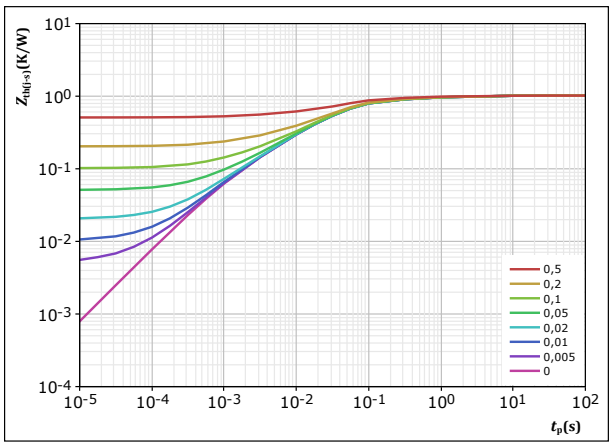


t_p =	250	µs		
V_{DS} =	10	V	T_j:	25 °C
				125 °C
				150 °C

figure 4. **MOSFET**

Transient thermal impedance as a function of pulse width

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



D =	t_p / T	
$R_{th(j-s)}$ =	1,019	K/W

MOSFET thermal model values

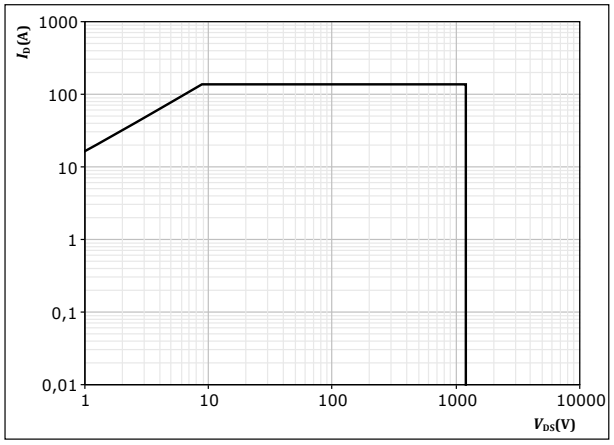
R (K/W)	τ (s)
6,36E-02	4,04E+00
1,62E-01	2,89E-01
6,09E-01	3,93E-02
1,43E-01	6,48E-03
4,28E-02	1,03E-03

Boost Switch Characteristics

figure 5. **MOSFET**

Safe operating area

$I_D = f(V_{DS})$



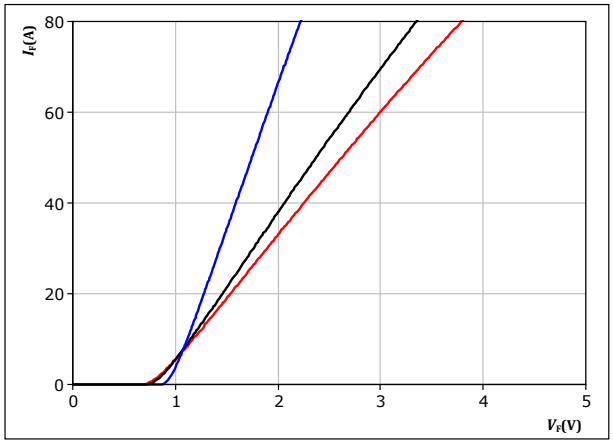
D =	single pulse	
T_s =	80	°C
V_{GS} =	18	V
T_j =	T_{jmax}	

Boost Diode Characteristics

figure 6. **FWD**

Typical forward characteristics

$I_F = f(V_F)$



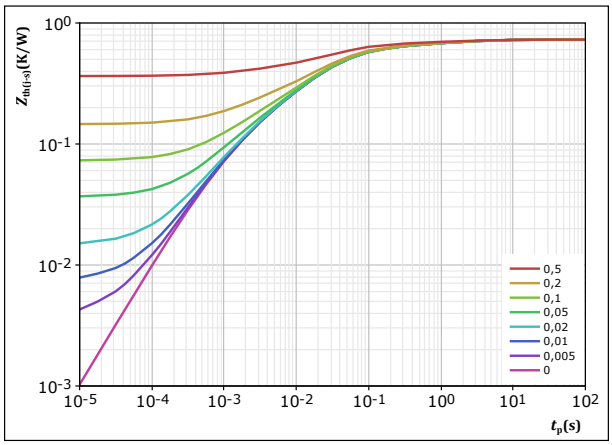
t_p = 250 µs

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

$R_{th(j-s)}$ = 0,728 K/W

FWD thermal model values

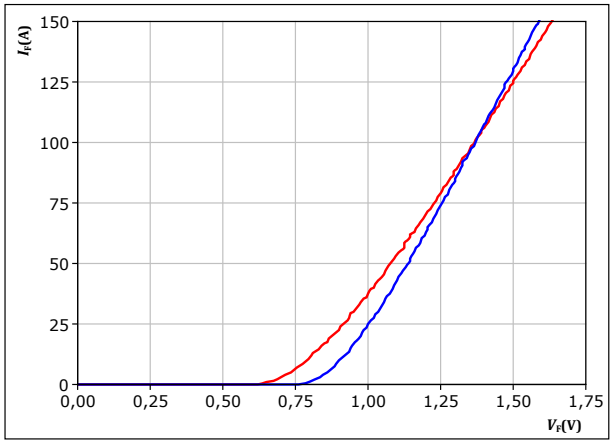
R (K/W)	τ (s)
3,25E-02	4,65E+00
5,33E-02	1,06E+00
1,02E-01	1,66E-01
3,02E-01	3,44E-02
1,46E-01	9,10E-03
7,71E-02	1,73E-03
1,59E-02	4,80E-04

ByPass Diode Characteristics

figure 8. **Rectifier**

Typical forward characteristics

$I_F = f(V_F)$



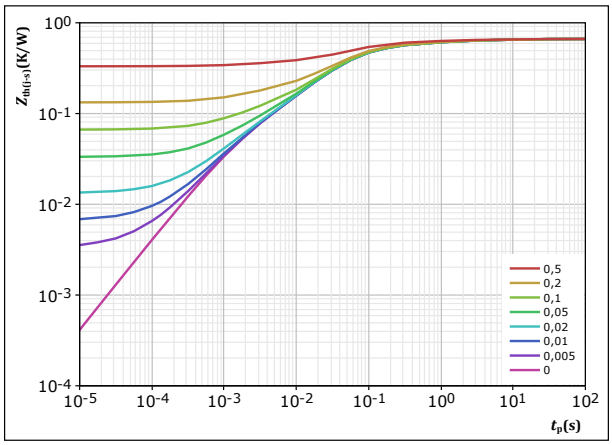
t_p = 250 µs

T_j: 25 °C, 125 °C

figure 9. **Rectifier**

Transient thermal impedance as a function of pulse width

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



D = t_p / T

$R_{th(j-s)}$ = 0,664 K/W

Rectifier thermal model values

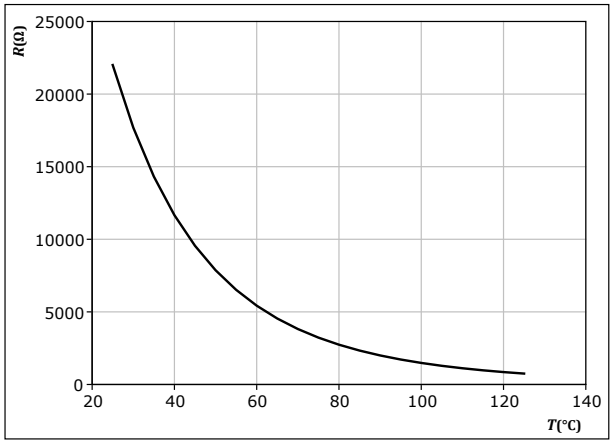
R (K/W)	τ (s)
2,64E-02	1,18E+01
6,63E-02	1,18E+00
1,36E-01	1,65E-01
3,29E-01	4,29E-02
6,63E-02	1,04E-02
3,95E-02	1,49E-03

Thermistor Characteristics

figure 10. **Thermistor**

Typical NTC characteristic as function of temperature

$R_T = f(T)$

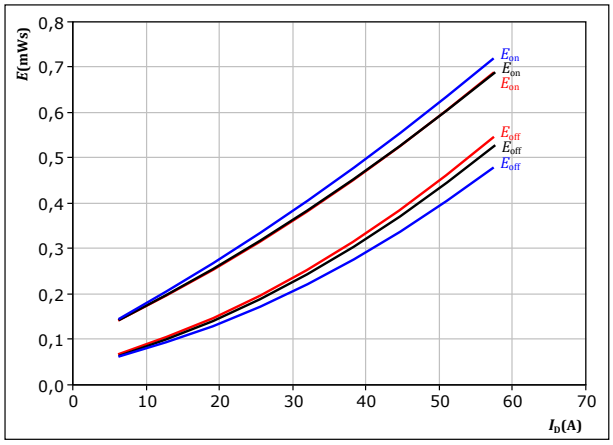


Boost Switching Characteristics

figure 11. **MOSFET**

Typical switching energy losses as a function of drain current

$E = f(I_D)$



With an inductive load at

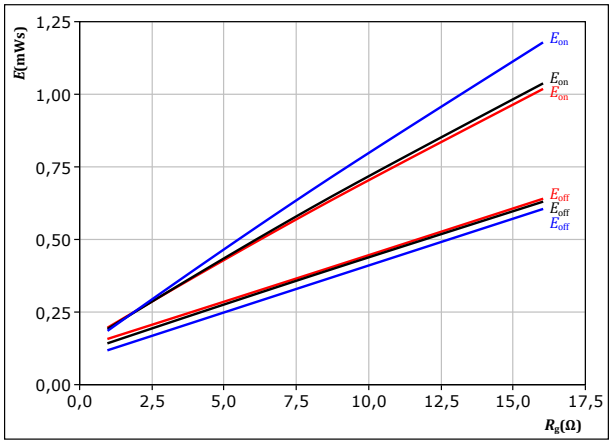
V_{DS} =	700	V	
V_{GS} =	-4/16	V	
R_{gon} =	4	Ω	
R_{goff} =	4	Ω	

T_j: 25 °C, 125 °C, 150 °C

figure 12. **MOSFET**

Typical switching energy losses as a function of gate resistor

$E = f(R_g)$



With an inductive load at

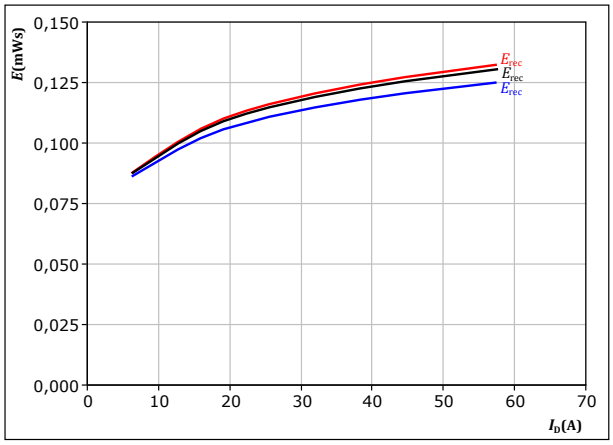
V_{DS} =	700	V	
V_{GS} =	-4/16	V	
I_D =	32	A	

T_j: 25 °C, 125 °C, 150 °C

figure 13. **FWD**

Typical reverse recovered energy loss as a function of drain current

$E_{rec} = f(I_D)$



With an inductive load at

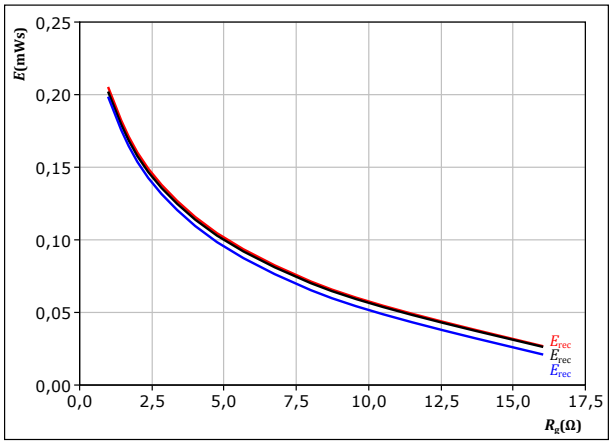
V_{DS} =	700	V	
V_{GS} =	-4/16	V	
R_{gon} =	4	Ω	

T_j: 25 °C, 125 °C, 150 °C

figure 14. **FWD**

Typical reverse recovered energy loss as a function of gate resistor

$E_{rec} = f(R_g)$



With an inductive load at

V_{DS} =	700	V	
V_{GS} =	-4/16	V	
I_D =	32	A	

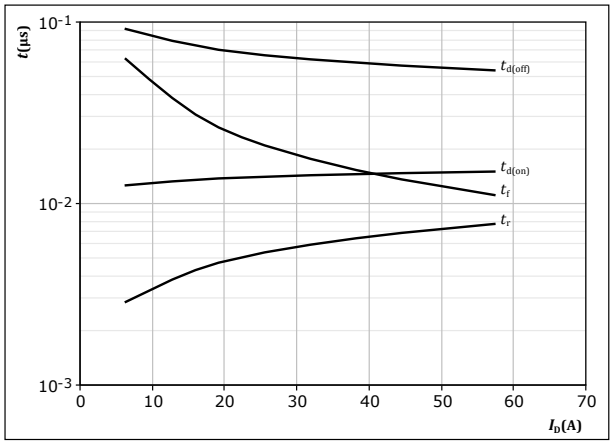
T_j: 25 °C, 125 °C, 150 °C

Boost Switching Characteristics

figure 15. **MOSFET**

Typical switching times as a function of drain current

t = f(I_D)



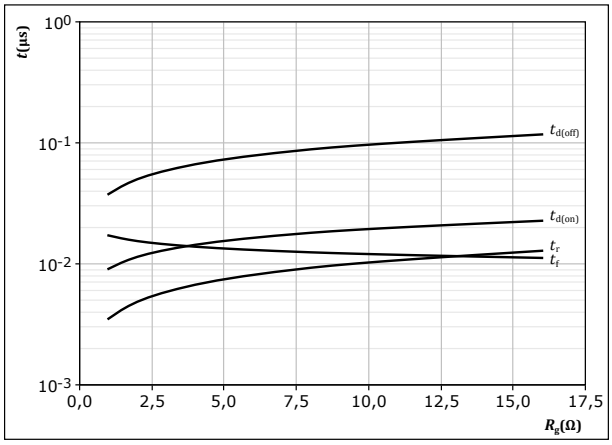
With an inductive load at

T_j =	150	°C
V_{DS} =	700	V
V_{GS} =	-4/16	V
R_{gon} =	4	Ω
R_{goff} =	4	Ω

figure 16. **MOSFET**

Typical switching times as a function of gate resistor

t = f(R_g)



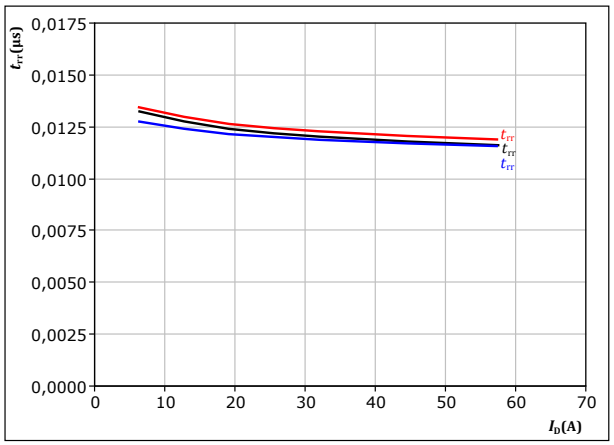
With an inductive load at

T_j =	150	°C
V_{DS} =	700	V
V_{GS} =	-4/16	V
I_D =	32	A

figure 17. **FWD**

Typical reverse recovery time as a function of drain current

t_{rr} = f(I_D)

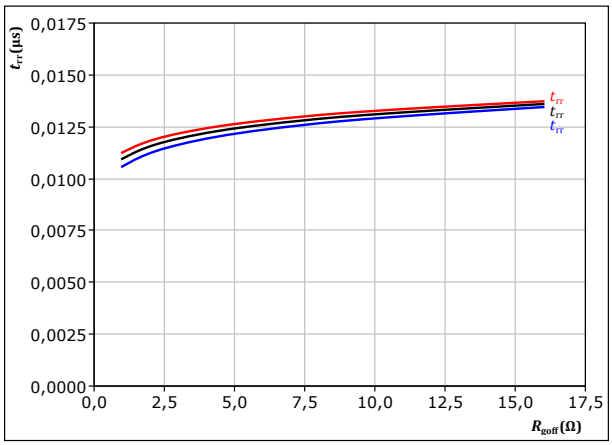


At	V_{DS} =	700	V	T_j: 25 °C
	V_{GS} =	-4/16	V	125 °C
	R_{gon} =	4	Ω	150 °C

figure 18. **FWD**

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

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



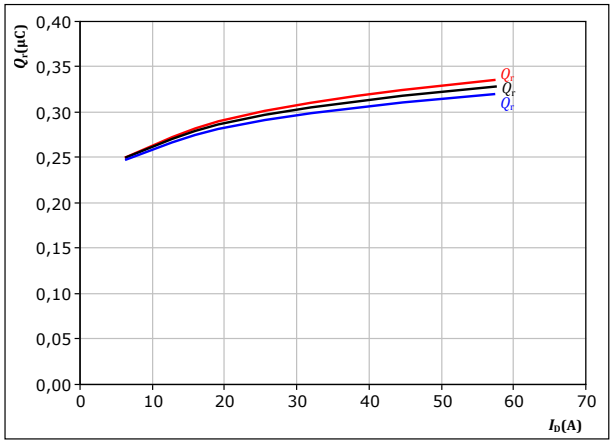
At	V_{DS} =	700	V	T_j: 25 °C
	V_{GS} =	-4/16	V	125 °C
	I_D =	32	A	150 °C

Boost Switching Characteristics

figure 19. **FWD**

Typical recovered charge as a function of drain current

$Q_r = f(I_D)$

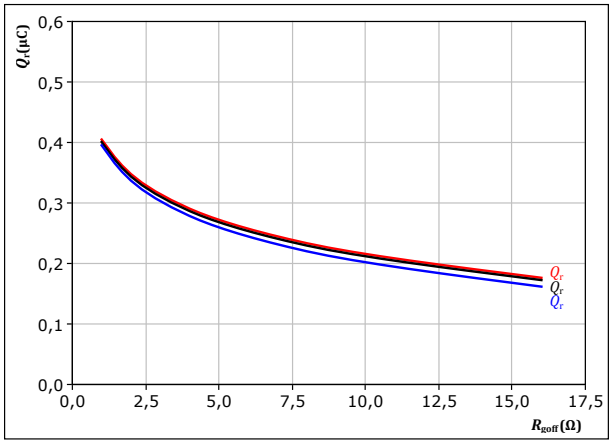


At				
V_{DS} =	700	V		
V_{GS} =	-4/16	V	T_j:	25 °C
R_{gon} =	4	Ω		125 °C
				150 °C

figure 20. **FWD**

Typical recovered charge as a function of turn off gate resistor

$Q_r = f(R_{goff})$

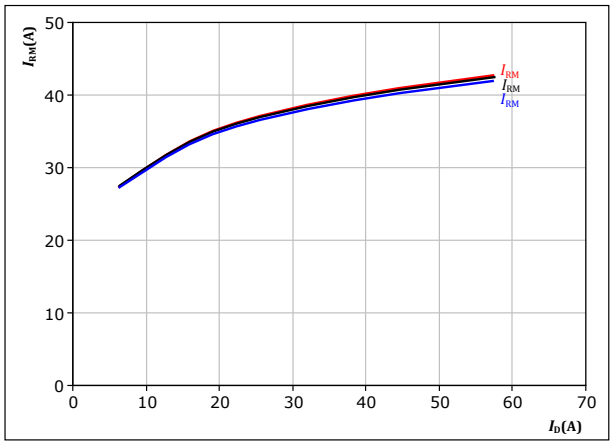


At				
V_{DS} =	700	V		
V_{GS} =	-4/16	V	T_j:	25 °C
I_D =	32	A		125 °C
				150 °C

figure 21. **FWD**

Typical peak reverse recovery current as a function of drain current

$I_{RM} = f(I_D)$

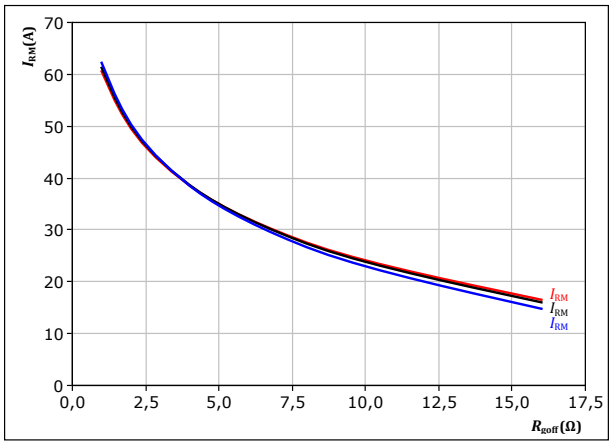


At				
V_{DS} =	700	V		
V_{GS} =	-4/16	V	T_j:	25 °C
R_{gon} =	4	Ω		125 °C
				150 °C

figure 22. **FWD**

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

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



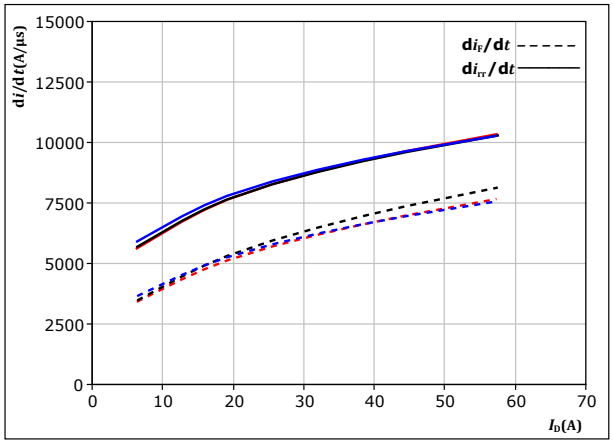
At				
V_{DS} =	700	V		
V_{GS} =	-4/16	V	T_j:	25 °C
I_D =	32	A		125 °C
				150 °C

Boost Switching Characteristics

figure 23. **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)

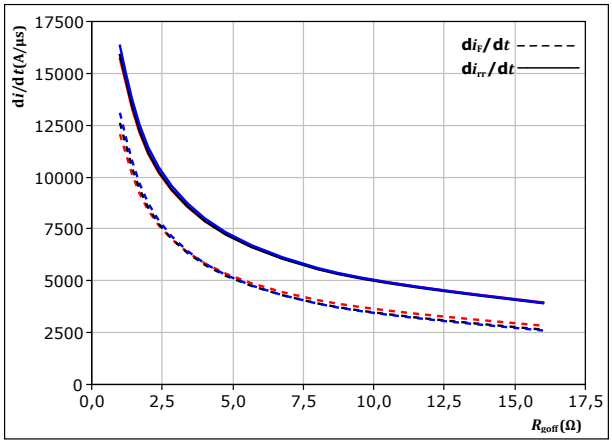


At				
	V_{DS} =	700	V	
	V_{GS} =	-4/16	V	
	R_{gon} =	4	Ω	
	T_j:			25 °C
				125 °C
				150 °C

figure 24. **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})

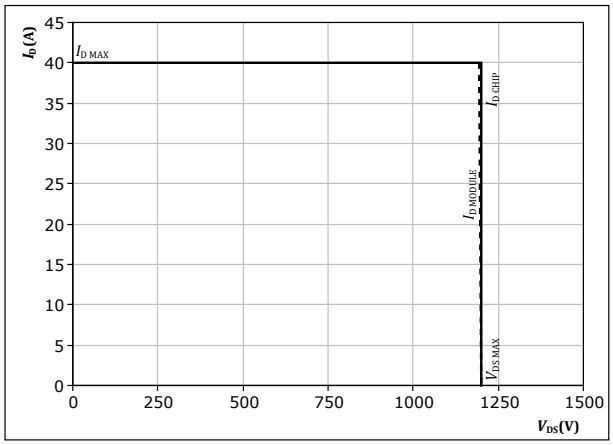


At				
	V_{DS} =	700	V	
	V_{GS} =	-4/16	V	
	I_D =	32	A	
	T_j:			25 °C
				125 °C
				150 °C

figure 25. **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 26. MOSFET

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

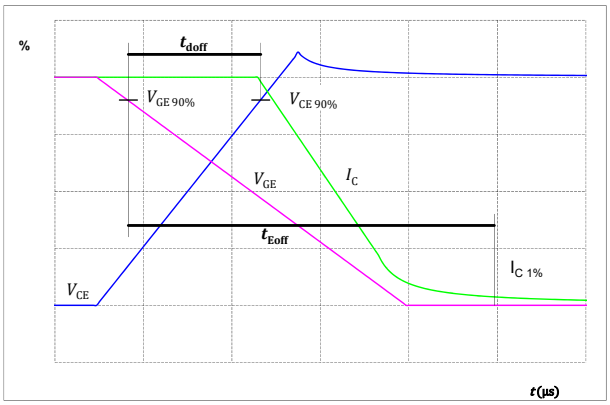


figure 27. MOSFET

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

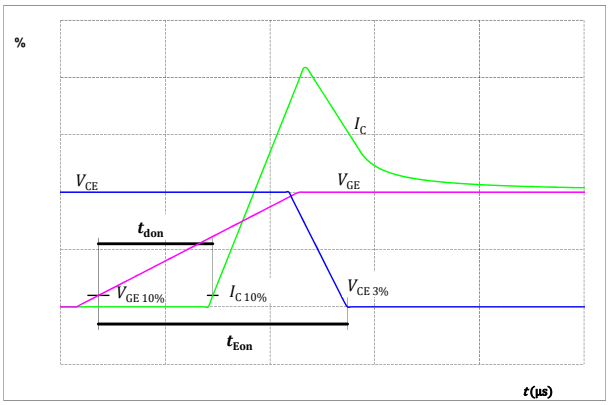


figure 28. MOSFET

Turn-off Switching Waveforms & definition of t_f

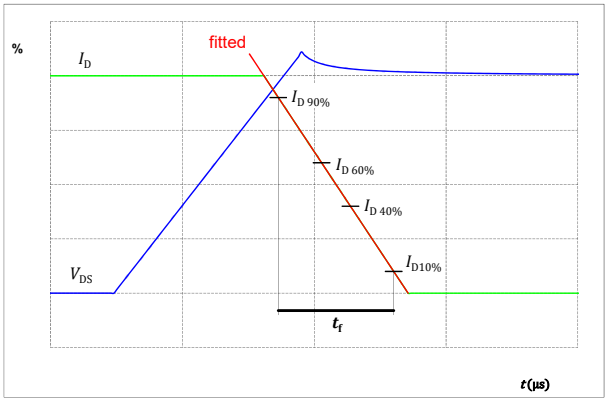
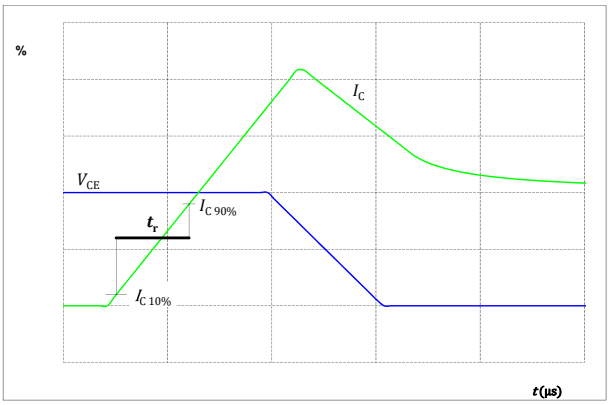


figure 29. MOSFET

Turn-on Switching Waveforms & definition of t_r



Boost Switching Definitions

figure 30. **FWD**

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

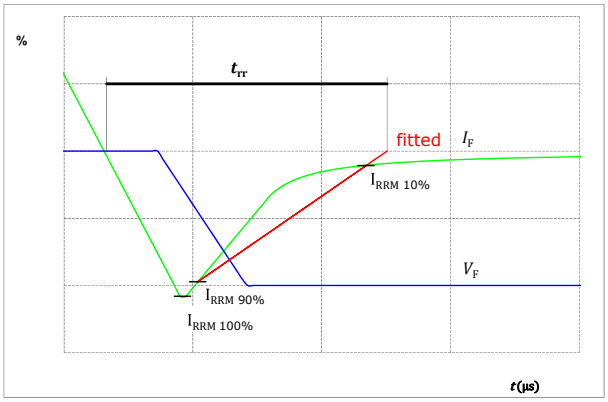


figure 31. **FWD**

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

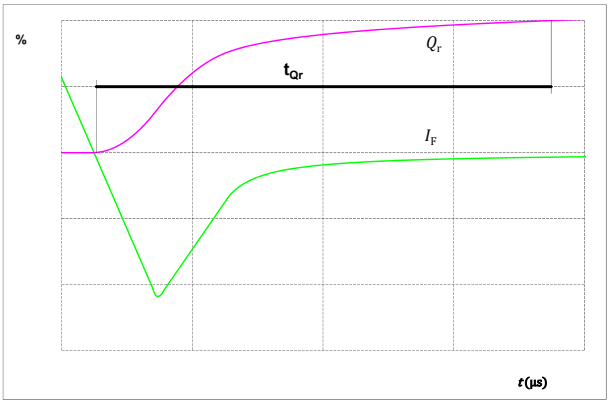
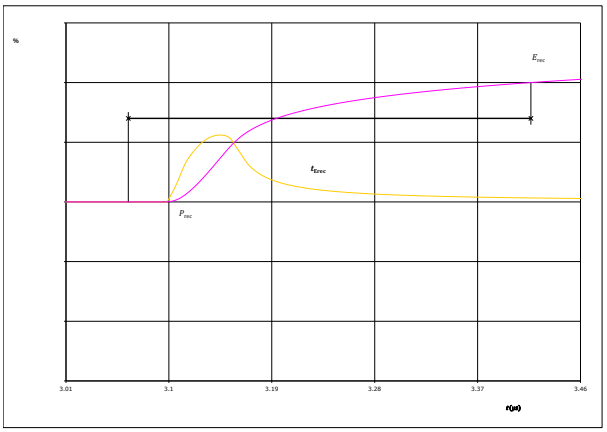


figure 32. **FWD**

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



Ordering Code

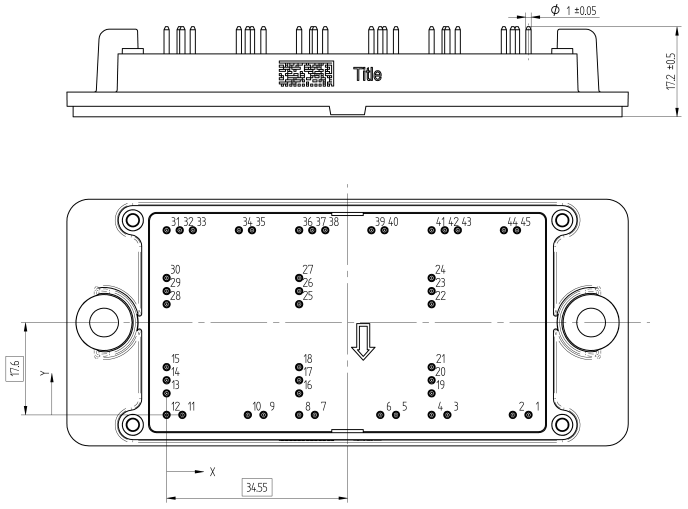
Version	Ordering Code
Without thermal paste	30-FT123BA040MR-L878L08
With thermal paste (3,4 W/mK, PSX-P7)	30-FT123BA040MR-L878L08-/3/

Marking

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

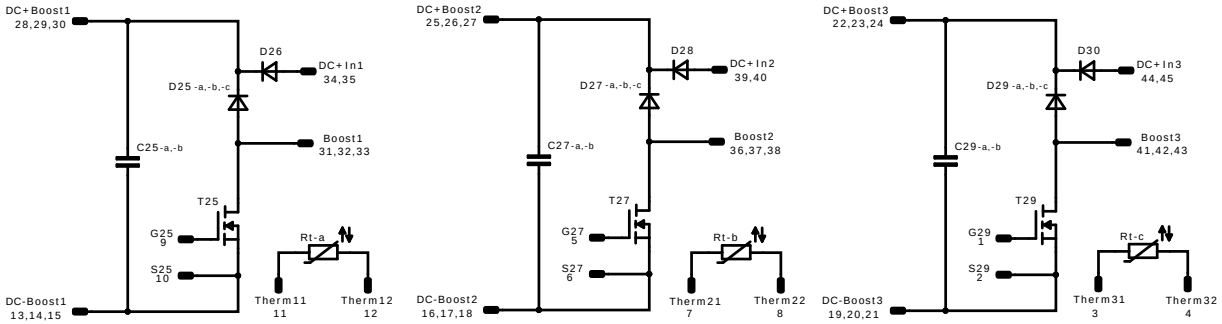
Outline

Pin table [mm]			
Pin	X	Y	Function
1	69,1	0	G29
2	66,1	0	S29
3	53,6	0	Therm31
4	50,6	0	Therm32
5	43,8	0	G27
6	40,8	0	S27
7	28,3	0	Therm21
8	25,3	0	Therm22
9	18,5	0	G25
10	15,5	0	S25
11	3	0	Therm11
12	0	0	Therm12
13	0	4,1	DC-Boost1
14	0	6,6	DC-Boost1
15	0	9,1	DC-Boost1
16	25,3	4,1	DC-Boost2
17	25,3	6,6	DC-Boost2
18	25,3	9,1	DC-Boost2
19	50,6	4,1	DC-Boost3
20	50,6	6,6	DC-Boost3
21	50,6	9,1	DC-Boost3
22	50,6	21,1	DC+Boost3
23	50,6	23,6	DC+Boost3
24	50,6	26,1	DC+Boost3
25	25,3	21,1	DC+Boost2
26	25,3	23,6	DC+Boost2
27	25,3	26,1	DC+Boost2
28	0	21,1	DC+Boost1
29	0	23,6	DC+Boost1
30	0	26,1	DC+Boost1
31	0	35,2	Boost1
32	2,5	35,2	Boost1
33	5	35,2	Boost1
34	13,8	35,2	DC+In1
35	16,3	35,2	DC+In1
36	25,3	35,2	Boost2
37	27,8	35,2	Boost2
38	30,3	35,2	Boost2
39	39,1	35,2	DC+In2
40	41,6	35,2	DC+In2
41	50,6	35,2	Boost3
42	53,1	35,2	Boost3
43	55,6	35,2	Boost3
44	64,4	35,2	DC+In3
45	66,9	35,2	DC+In3



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
T25, T27, T29	MOSFET	1200 V	40 mΩ	Boost Switch	
D25, D27, D29	FWD	1200 V	30 A	Boost Diode	
D26, D28, D30	Rectifier	1600 V	50 A	ByPass Diode	
C25, C27, C29	Capacitor	1500 V		Capacitor (DC)	
Rt-a, Rt-b, Rt-c	Thermistor			Thermistor	

Packaging instruction				
Standard packaging quantity (SPQ) 36	>SPQ	Standard	<SPQ	Sample

Handling instruction
Handling instructions for *flow* 2 packages see vincotech.com website.

Package data
Package data for *flow* 2 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
30-FT123BA040MR-L878L08-D1-14	7 Sep. 2021		