Vincotech

10-FZ063BA040MF-M575L08
datasheet

***flow*3xBOOST 0** **600 V / 41 mΩ**

Features

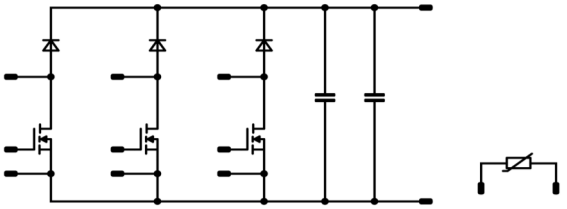
- High efficiency dual booster
- Low Inductance Layout
- Ultra fast switching frequency
- Integrated DC link capacitor
- Integrated temperature sensor

flow 0 12 mm housing

Target applications

- Charging Stations
- Solar Inverters
- UPS

Schematic



Types

- 10-FZ063BA040MF-M575L08

Maximum Ratings

T_j = 25 °C, unless otherwise specified

Parameter	Symbol	Condition	Value	Unit
Boost Switch				
Drain-source voltage	V_{DSS}	V_{GS} = 0 V I_D = 0,25 mA	600	V
Drain current	I_D	T_j = T_{jmax} T_s = 80 °C	34	A
Peak drain current	I_{Dpulse}	t_p limited by T_{jmax}	272	A
Avalanche energy, single pulse	E_{AS}	I_D = 13,4 A V_{DD} = 50 V	1954	mJ
Avalanche energy, repetitive	E_{AR}	I_D = 13,4 A V_{DD} = 50 V	2,96	mJ
Avalanche current, repetitive	I_{AR}	t_p limited by T_{jmax} P_{AV} = E_{AR}*f	13,4	A
MOSFET dv/dt ruggedness	dv/dt	V_{DS} = 0...480 V	50	V/ns
Total power dissipation	P_{tot}	T_j = T_{jmax} T_S = 80 °C	110	W
Gate-source voltage	V_{GSS}		±20	V
Reverse diode dv/dt	dv/dt	V_{DS} = 0...400 V	15	V/ns
Maximum Junction Temperature	T_{jmax}		150	°C
Boost Diode				
Peak repetitive reverse voltage	V_{RRM}		600	V
Continuous (direct) forward current	I_F	T_j = T_{jmax} T_s = 80 °C	38	A
Surge (non-repetitive) forward current	I_{FSM}	60 Hz Single Half Sine Wave t_p = 8,3 ms	300	A
Total power dissipation	P_{tot}	T_j = T_{jmax} T_s = 80 °C	65	W
Maximum junction temperature	T_{jmax}		175	°C
Capacitor (DC)				
Maximum DC voltage	V_{MAX}		630	V
Operation Temperature	T_{op}		-55...+125	°C

Maximum Ratings

T_j = 25 °C, unless otherwise specified

Parameter	Symbol	Condition	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
		AC Voltage t_p = 1 min	2500	V
Creepage distance			min. 12,7	mm
Clearance			min. 12,7	mm
Comparative Tracking Index	CTI		> 200	

*100 % tested in production

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	$r_{DS(on)}$		10		44,4	25 125		41 84	51,8	mΩ
Gate-source threshold voltage	$V_{GS(th)}$	$V_{GS} = V_{DS}$			0,00296	25	2,4	3	3,6	V
Gate to Source Leakage Current	I_{GSS}		20	0		25			100	nA
Zero Gate Voltage Drain Current	I_{DSS}		0	600		25			5	µA
Internal gate resistance	r_g	f= 1MHz	0	100		25		0,7		Ω
Gate charge	Q_g							290		
Gate to source charge	Q_{GS}		0/10	480	44,4	25		36		nC
Gate to drain charge	Q_{GD}							150		
Short-circuit input capacitance	C_{iss}	f= 1 MHz	0	100		25		6530		pF
Short-circuit output capacitance	C_{oss}							360		
Reverse Diode Static										
Diode forward voltage	V_{SD}		0		44,4	25		0,9		V
Thermal										
Thermal resistance junction to sink	$R_{th(j-s)}$	λ_{paste} = 3,4 W/mK (PSX)						0,64		K/W
Dynamic										
Turn-on delay time	$t_{d(on)}$					25 125		35 33		
Rise time	t_r					25 125		9 10		
Turn-off delay time	$t_{d(off)}$	R_{gon} = 8 Ω R_{goff} = 8 Ω	10/0	400	15	25 125		275 300		ns
Fall time	t_f					25 125		4 5		
Turn-on energy (per pulse)	E_{on}	Q_{rFWD} = 0,2 µC Q_{rFWD} = 0,6 µC				25 125		0,181 0,335		mWs
Turn-off energy (per pulse)	E_{off}					25 125		0,071 0,083		

Characteristic Values

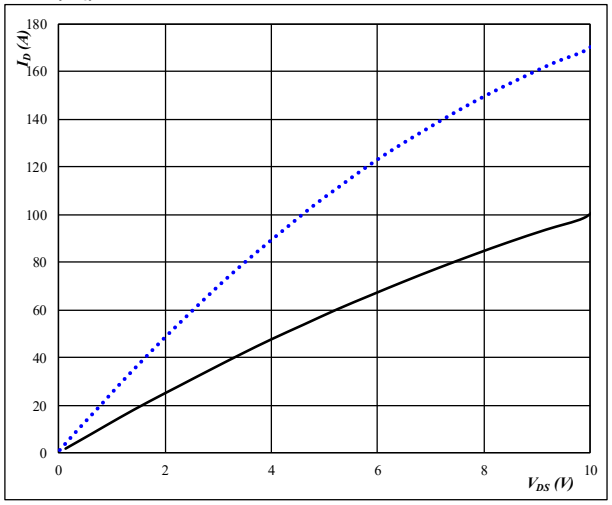
Parameter	Symbol	Conditions					Value			Unit
			V_{GE} [V] V_{GS} [V]	V_{CE} [V] V_{DS} [V] V_F [V]	I_C [A] I_D [A] I_F [A]	T_j [°C]	Min	Typ	Max	
Boost Diode										
Static										
Forward voltage	V_F				30	25 125 150		2,32 1,78 1,67	2,78	V
Reverse leakage current	I_R			600		25 150			100 500	µA
Thermal										
Thermal resistance junction to sink	$R_{th(j-s)}$	λ_{paste} = 3,4 W/mK (PSX)						1,46		K/W
Dynamic										
Peak recovery current	I_{RRM}	di/dt = 1844 A/µs di/dt = 1583 A/µs	10/0	400	15	25 125		18 30		A
Reverse recovery time	t_{rr}					25 125		14 32		ns
Recovered charge	Q_r					25 125		0,150 0,559		µC
Reverse recovered energy	E_{rec}					25 125		0,015 0,075		mWs
Peak rate of fall of recovery current	$(di_{rf}/dt)_{max}$					25 125		5321 1723		A/µs
Capacitor (DC)										
Capacitance	C							47		nF
Tolerance							-10		+10	%
Climatic category							55/125/56			
Thermistor										
Rated resistance	R					25		22		kΩ
Deviation of R_{100}	$\Delta R/R$	R_{100} = 1486 Ω				100	-12		+14	%
Power dissipation	P					25		200		mW
Power dissipation constant						25		2		mW/K
B-value	$B_{(25/50)}$	Tol. ±3%				25		3950		K
B-value	$B_{(25/100)}$	Tol. ±3%				25		3998		K
Vincotech NTC Reference									B	

Boost Switch Characteristics

figure 1. **MOSFET**

Typical output characteristics

$I_D = f(V_{DS})$

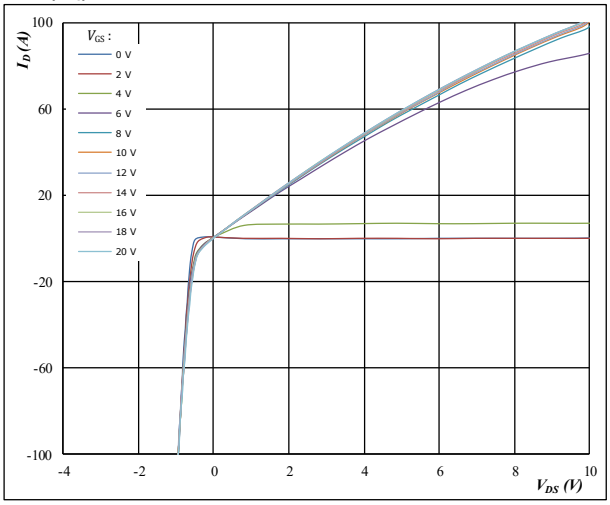


t_p =	250	µs	T_j:	25 °C	.....
V_{GS}=	10	V		125 °C	———

figure 2. **MOSFET**

Typical output characteristics

$I_D = f(V_{DS})$

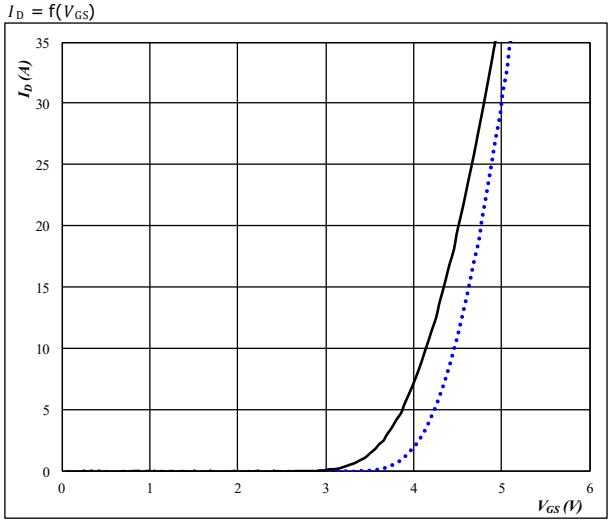


t_p =	250	µs
T_j =	125	°C
V_{GS} from	0 V to 20 V in steps of 2 V	

figure 3. **MOSFET**

Typical transfer characteristics

$I_D = f(V_{GS})$

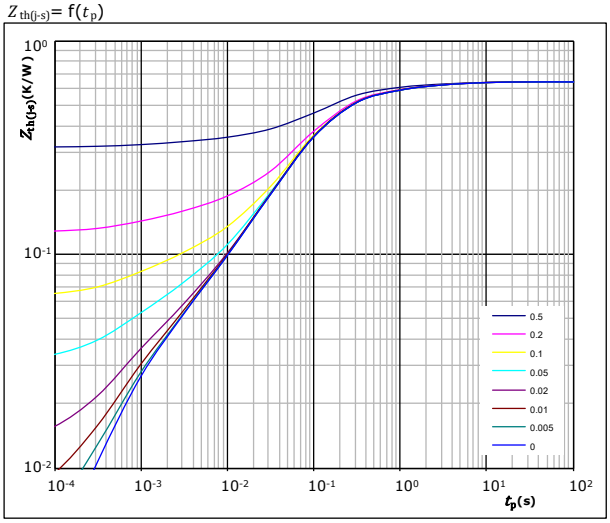


t_p =	100	µs	T_j:	25 °C	.....
V_{DS} =	10	V		125 °C	———

figure 4. **MOSFET**

Transient thermal impedance as a function of pulse width

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



D =	t_p / T	
$R_{th(j-s)}$ =	0,64	K/W

MOSFET thermal model values

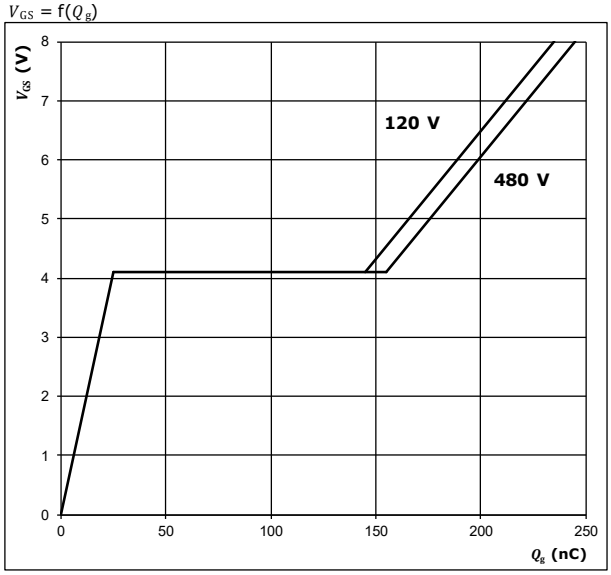
R (K/W)	τ (s)
3,27E-02	5,10E+00
7,82E-02	9,69E-01
2,46E-01	1,76E-01
2,22E-01	6,63E-02
3,32E-02	6,97E-03
2,51E-02	9,25E-04

Boost Switch Characteristics

figure 5. **MOSFET**

Gate voltage vs Gate charge

$V_{GS} = f(Q_g)$



At

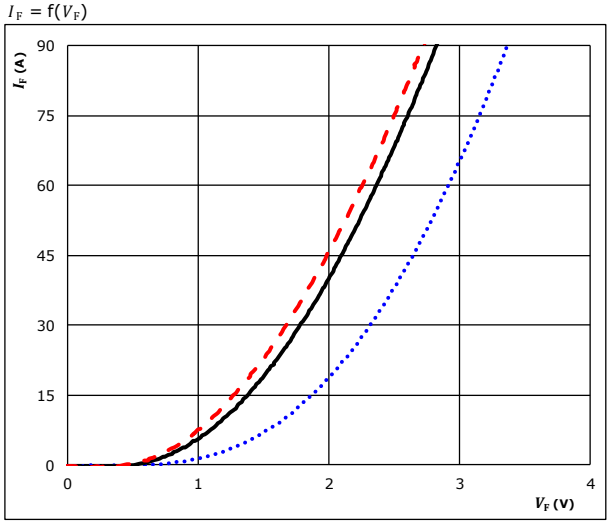
I_C= 44 A

Boost Diode Characteristics

figure 1. **FWD**

Typical forward characteristics

$I_F = f(V_F)$



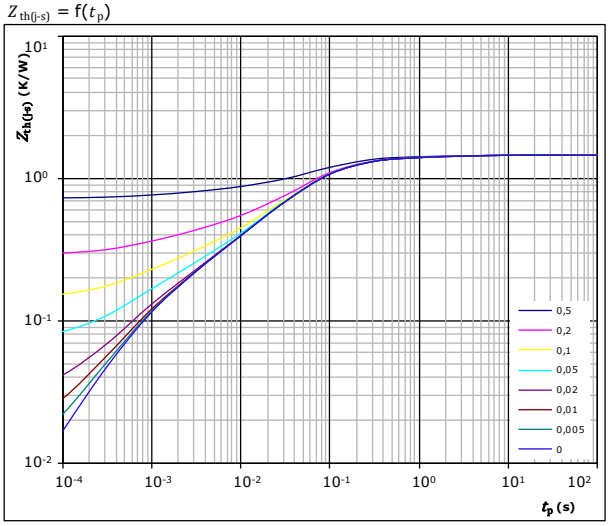
t_p = 250 µs

T_j: 25 °C, 125 °C, 150 °C

figure 2. **FWD**

Transient thermal impedance as a function of pulse width

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



D = t_p / T

$R_{th(j-s)}$ = 1,46 K/W

FWD thermal model values

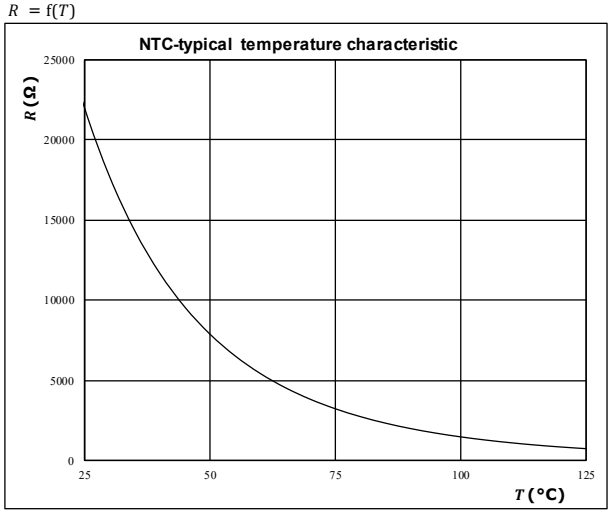
R (K/W)	τ (s)
6,84E-02	2,71E+00
1,85E-01	3,24E-01
7,77E-01	6,88E-02
2,30E-01	1,94E-02
1,15E-01	3,46E-03
8,19E-02	7,02E-04

Thermistor Characteristics

figure 1. **Thermistor**

Typical NTC characteristic as a function of temperature

$R = f(T)$

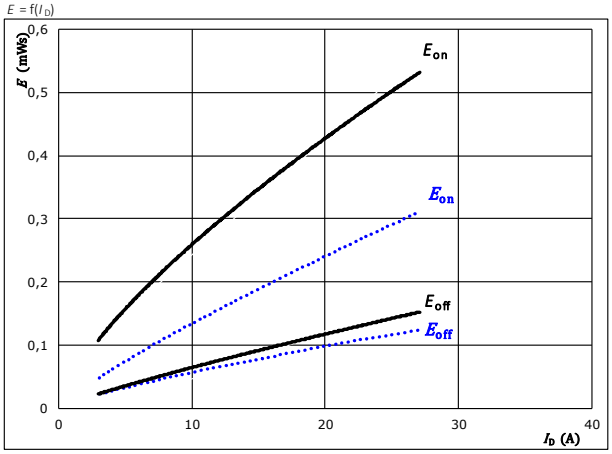


Boost Switching Characteristics

figure 1. **MOSFET**

Typical switching energy losses as a function of drain current

$E = f(I_D)$



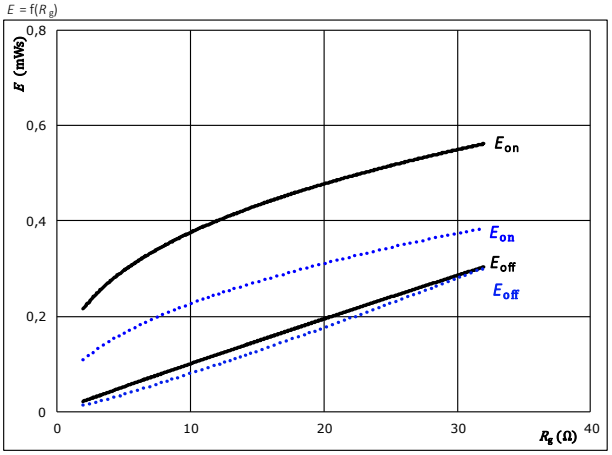
With an inductive load at

V_{DS} =	400	V	T_j:	25 °C	·····
V_{GS} =	10/0	V		125 °C	———
R_{gon} =	8	Ω			
R_{goff} =	8	Ω			

figure 2. **MOSFET**

Typical switching energy losses as a function of gate resistor

$E = f(R_g)$



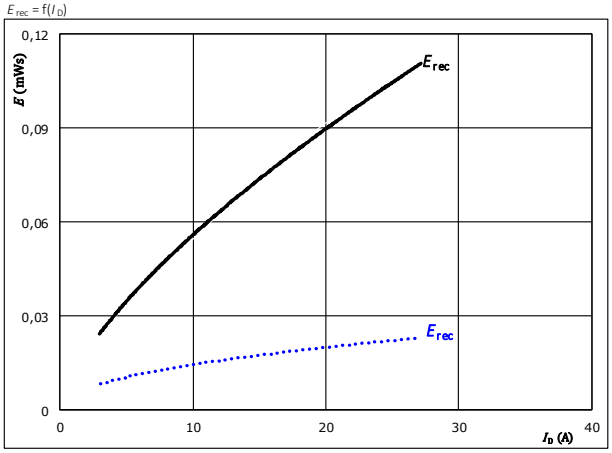
With an inductive load at

V_{DS} =	400	V	T_j:	25 °C	·····
V_{GS} =	10/0	V		125 °C	———
I_D =	15	A			

figure 3. **FWD**

Typical reverse recovered energy loss as a function of drain current

$E_{rec} = f(I_D)$



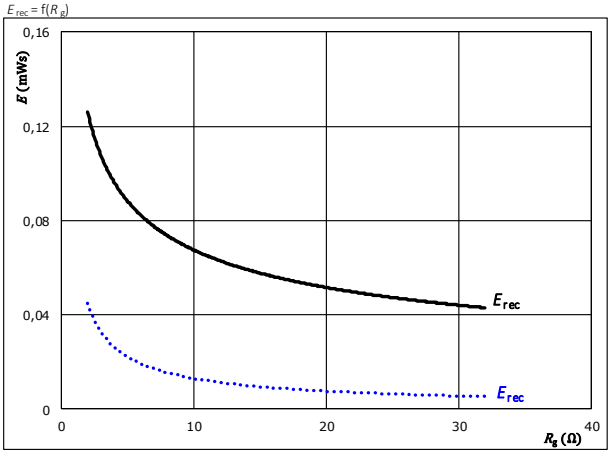
With an inductive load at

V_{DS} =	400	V	T_j:	25 °C	·····
V_{GS} =	10/0	V		125 °C	———
R_{gon} =	8	Ω			

figure 4. **FWD**

Typical reverse recovered energy loss as a function of gate resistor

$E_{rec} = f(R_g)$



With an inductive load at

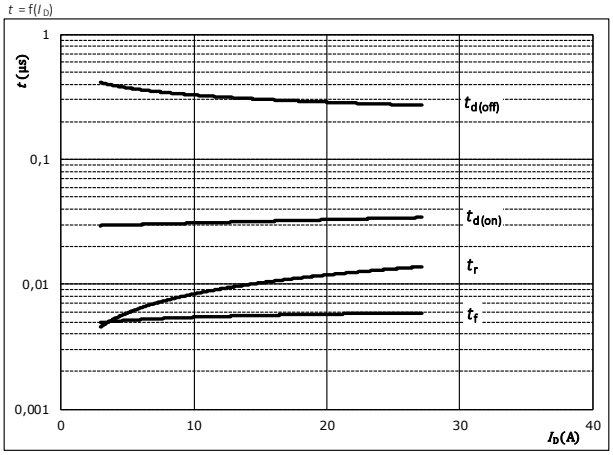
V_{DS} =	400	V	T_j:	25 °C	·····
V_{GS} =	10/0	V		125 °C	———
I_D =	15	A			

Boost Switching Characteristics

figure 5. **MOSFET**

Typical switching times as a function of drain current

$t = f(I_D)$



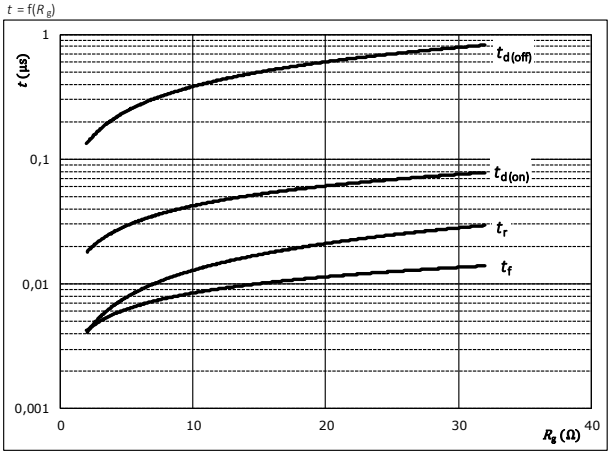
With an inductive load at

T_j =	125	°C
V_{DS} =	400	V
V_{GS} =	10/0	V
R_{gon} =	8	Ω
R_{goff} =	8	Ω

figure 6. **MOSFET**

Typical switching times as a function of gate resistor

$t = f(R_g)$



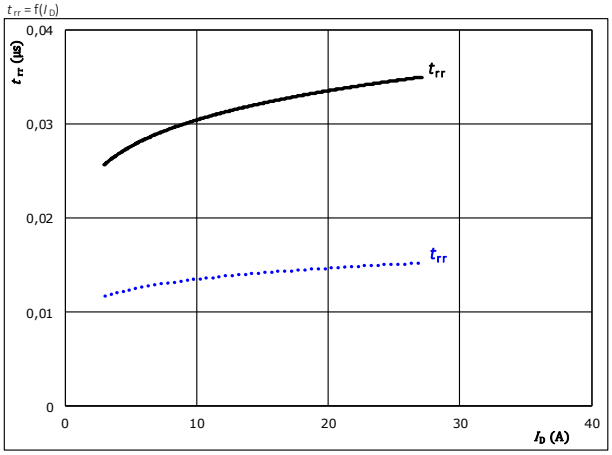
With an inductive load at

T_j =	125	°C
V_{DS} =	400	V
V_{GS} =	10/0	V
I_D =	15	A

figure 7. **FWD**

Typical reverse recovery time as a function of drain current

$t_{rr} = f(I_D)$



At

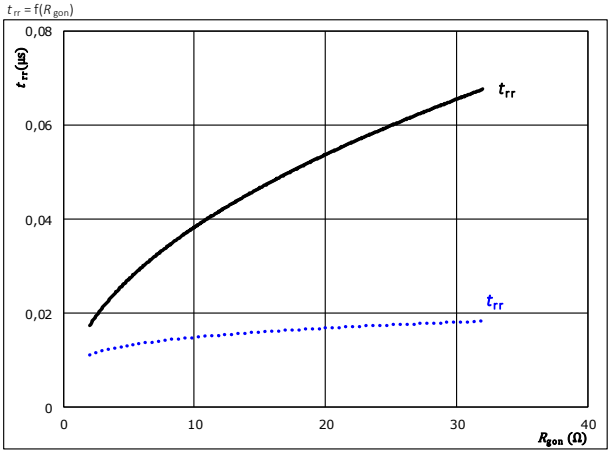
V_{DS} =	400	V
V_{GS} =	10/0	V
R_{gon} =	8	Ω

T_j: 25 °C, 125 °C

figure 8. **FWD**

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

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



At

V_{DS} =	400	V
V_{GS} =	10/0	V
I_D =	15	A

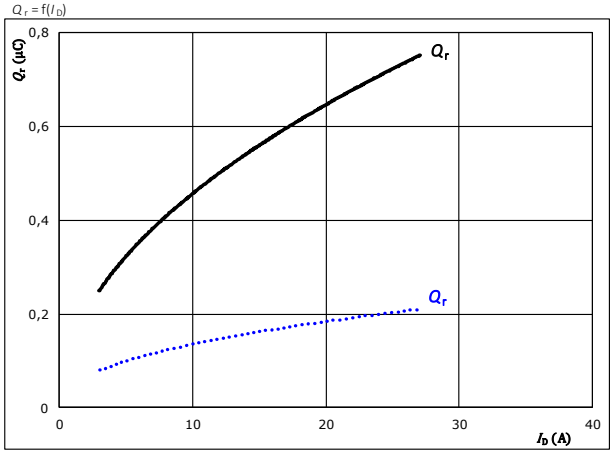
T_j: 25 °C, 125 °C

Boost Switching Characteristics

figure 9. **FWD**

Typical recovered charge as a function of drain current

$Q_r = f(I_D)$

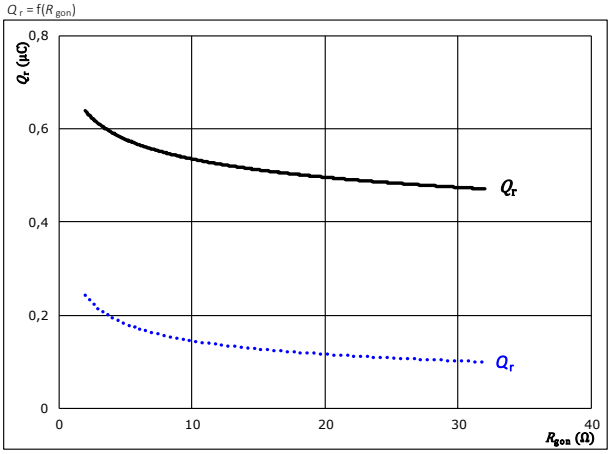


At						
	V_{DS} =	400	V		25 °C	·····
	V_{GS} =	10/0	V	T_j:	125 °C	———
	R_{gon} =	8	Ω			

figure 10. **FWD**

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

$Q_r = f(R_{gon})$

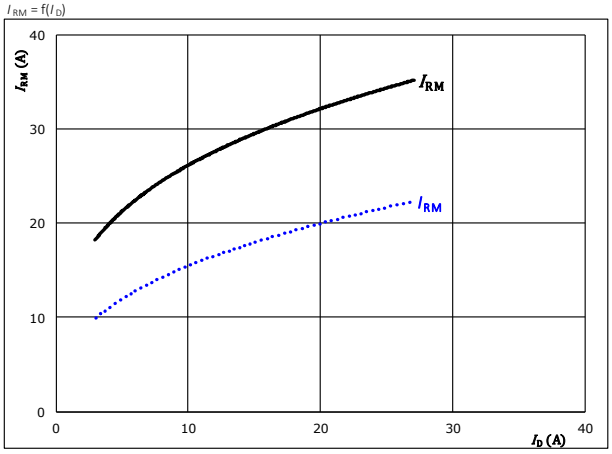


At						
	V_{DS} =	400	V		25 °C	·····
	V_{GS} =	10/0	V	T_j:	125 °C	———
	I_D =	15	A			

figure 11. **FWD**

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

$I_{RM} = f(I_D)$

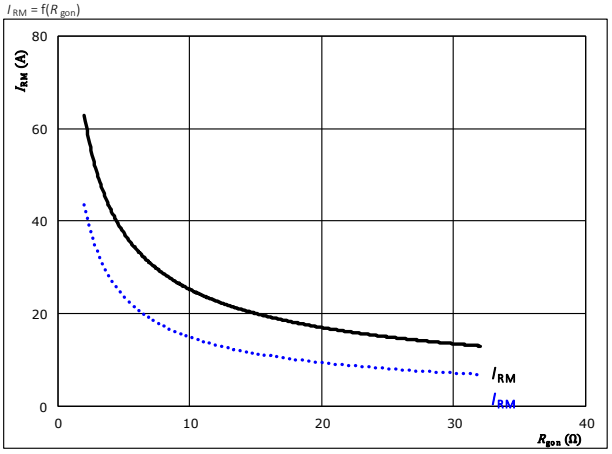


At						
	V_{DS} =	400	V		25 °C	·····
	V_{GS} =	10/0	V	T_j:	125 °C	———
	R_{gon} =	8	Ω			

figure 12. **FWD**

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

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



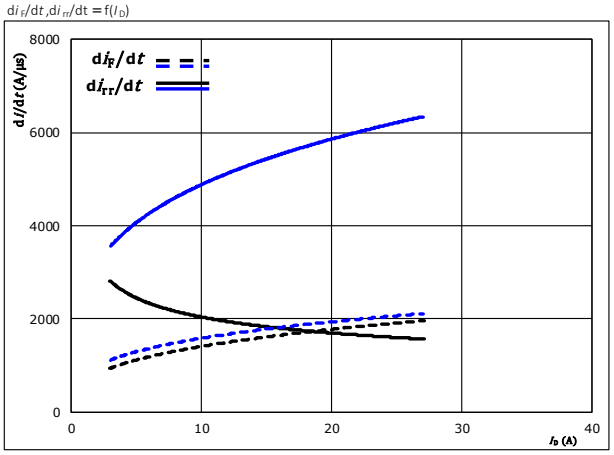
At						
	V_{DS} =	400	V		25 °C	·····
	V_{GS} =	10/0	V	T_j:	125 °C	———
	I_D =	15	A			

Boost Switching Characteristics

figure 13. **FWD**

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

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

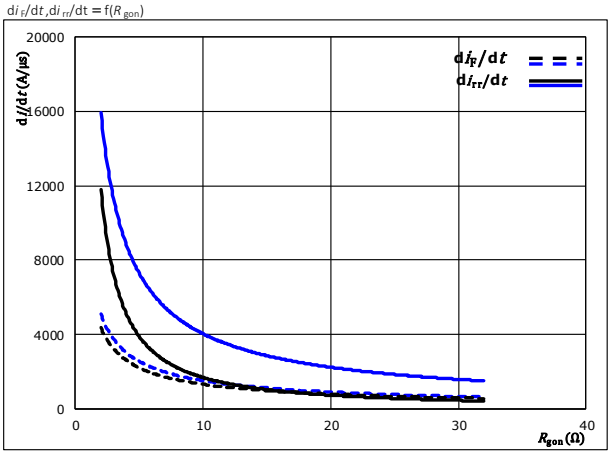


At	V_{DS} =	400	V		25 °C	·····
	V_{GS} =	10/0	V	T_j:	125 °C	———
	R_{gon} =	8	Ω			

figure 14. **FWD**

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

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

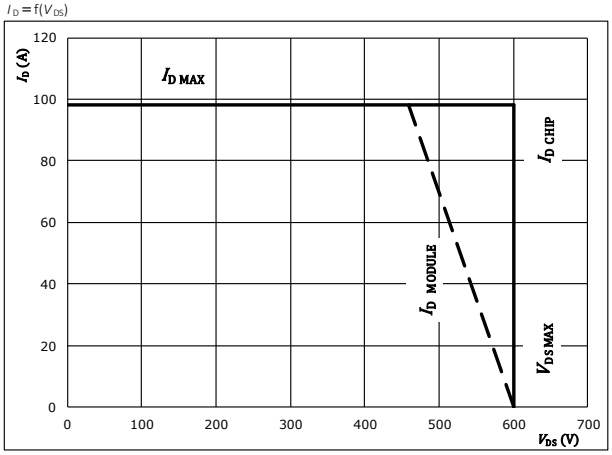


At	V_{DS} =	400	V		25 °C	·····
	V_{GS} =	10/0	V	T_j:	125 °C	———
	I_D =	15	A			

figure 15. **MOSFET**

Reverse bias safe operating area

$I_D = f(V_{DS})$



At

T_j =	125	°C	
R_{gon} =	8	Ω	
R_{goff} =	8	Ω	

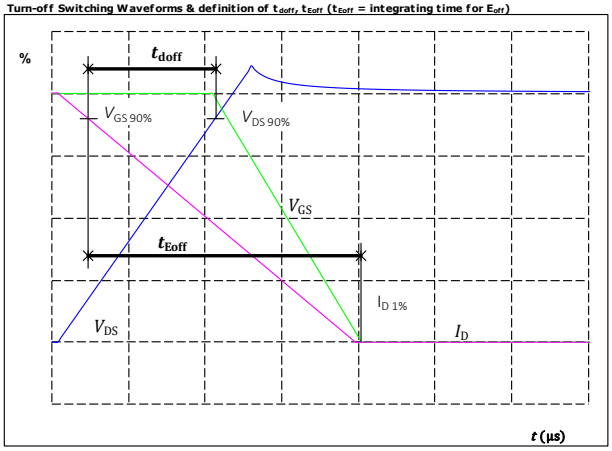
Boost Switching Definitions

General conditions

T_j	=	125 °C
R_{gon}	=	8 Ω
R_{goff}	=	8 Ω

figure 1. MOSFET

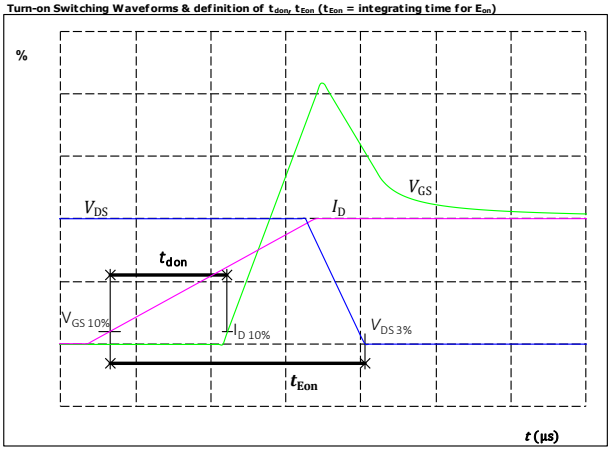
Turn-off Switching Waveforms & definition of t_{doff}, t_{Eoff} (t_{Eoff} = integrating time for E_{off})



V_{GS}(0%) =	0	V
V_{GS}(100%) =	10	V
V_{DS}(100%) =	400	V
I_D(100%) =	15	A
t_{doff} =	0,300	µs

figure 2. MOSFET

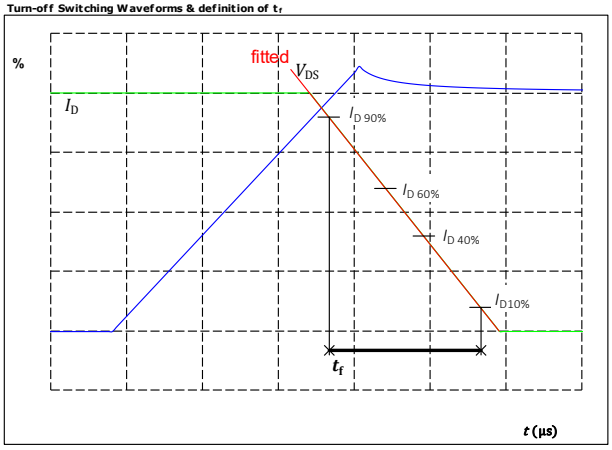
Turn-on Switching Waveforms & definition of t_{don}, t_{Eon} (t_{Eon} = integrating time for E_{on})



V_{GS}(0%) =	0	V
V_{GS}(100%) =	10	V
V_{DS}(100%) =	400	V
I_D(100%) =	15	A
t_{don} =	0,033	µs

figure 3. MOSFET

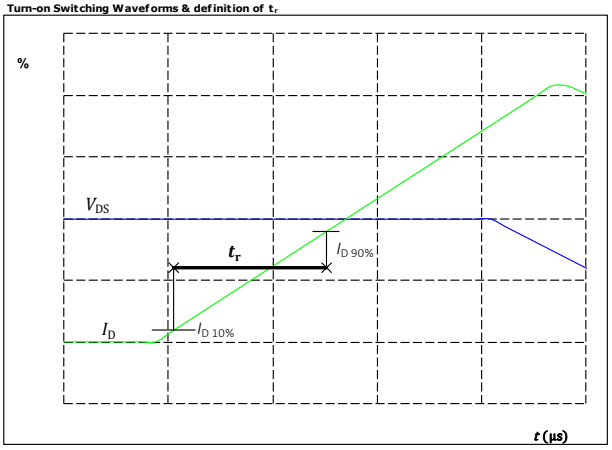
Turn-off Switching Waveforms & definition of t_f



V_{DS}(100%) =	400	V
I_D(100%) =	15	A
t_f =	0,005	µs

figure 4. MOSFET

Turn-on Switching Waveforms & definition of t_r

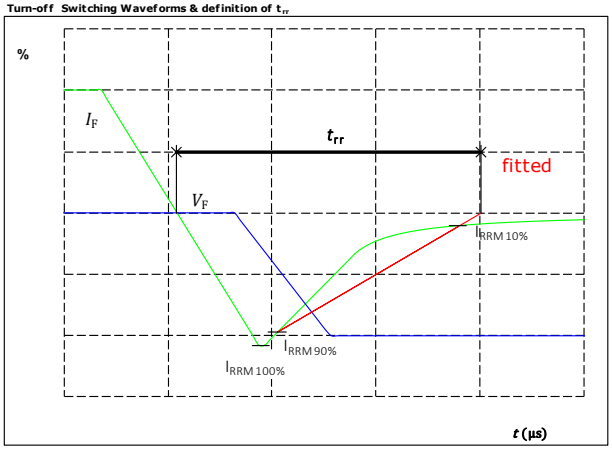


V_{DS}(100%) =	400	V
I_D(100%) =	15	A
t_r =	0,010	µs

Boost Switching Characteristics

figure 7. **FWD**

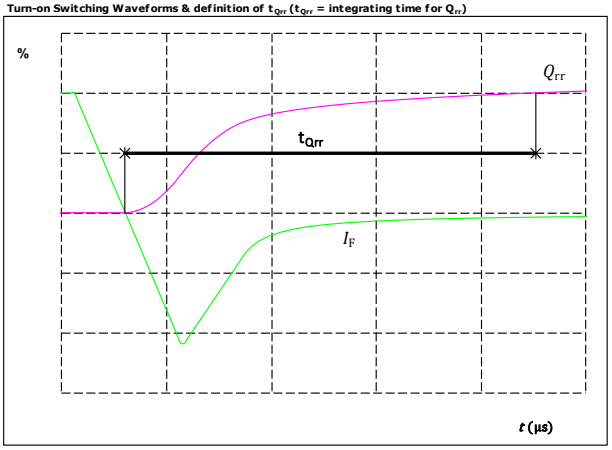
Turn-off Switching Waveforms & definition of t_{rr}



V_F (100%) =	400	V
I_F (100%) =	15	A
I_{RRM} (100%) =	30	A
t_{rr} =	0,032	µs

figure 8. **FWD**

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



I_F (100%) =	15	A
Q_{rr} (100%) =	0,56	µC

Vincotech

Ordering Code & Marking

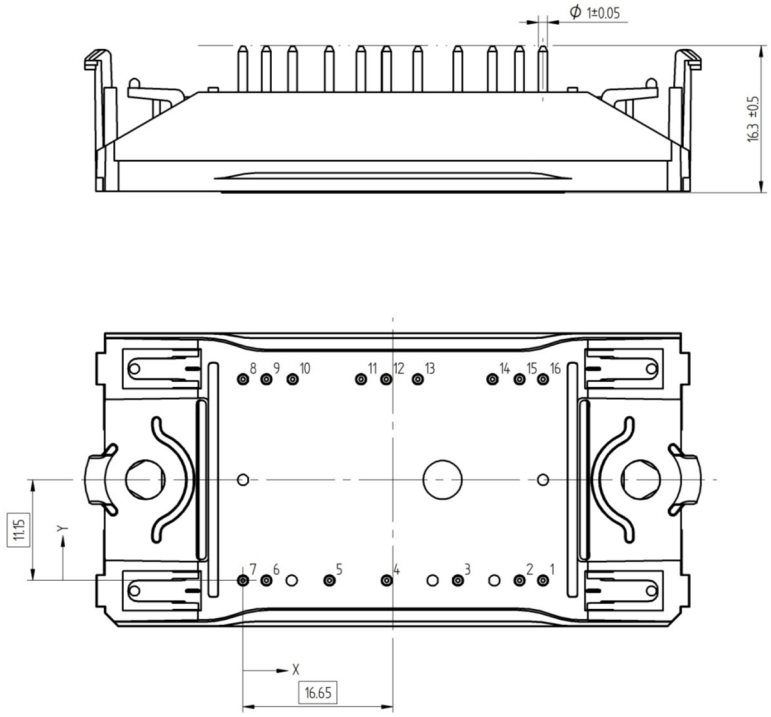
Version	Ordering Code
without thermal paste 12 mm housing with solder pins	10-FZ063BA040MF-M575L08
with thermal paste 12 mm housing with solder pins	10-FZ063BA040MF-M575L08-/3/

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

Outline

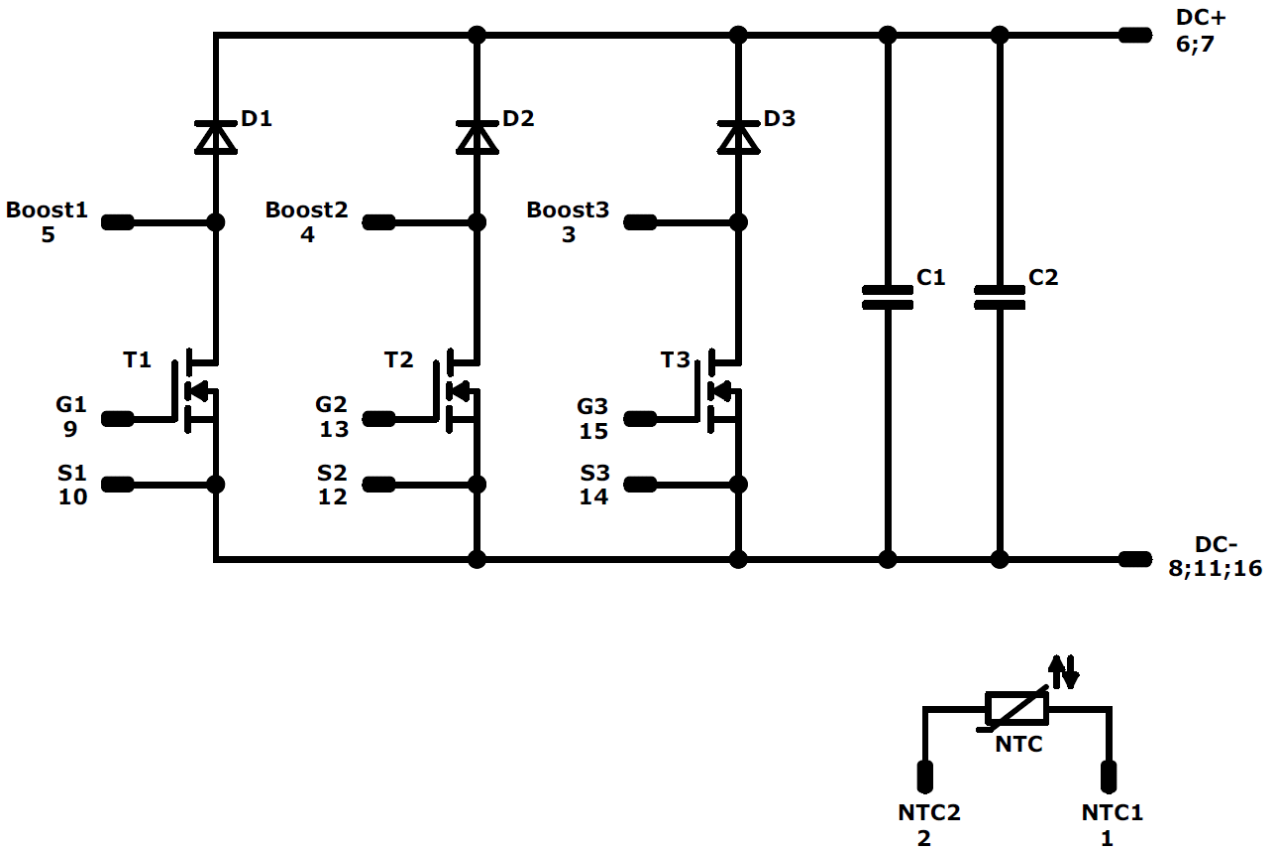
Pin table

Pin	X	Y	Function
1	33,3	0	NTC1
2	30,7	0	NTC2
3	23,85	0	Boost3
4	15,95	0	Boost2
5	9,6	0	Boost1
6	2,6	0	DC+
7	0	0	DC+
8	0	22,3	DC-
9	2,6	22,3	G1
10	5,5	22,3	S1
11	13,1	22,3	DC-
12	15,9	22,3	S2
13	19,4	22,3	G2
14	27,7	22,3	S3
15	30,7	22,3	G3
16	33,3	22,3	DC-



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, T2, T3	MOSFET	600 V	41 mΩ	Boost Switch	
D1, D2, D3	FWD	600 V	30 A	Boost Diode	
C1, C2	Capacitor	630 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.

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-FZ063BA040MF-M575L08-D6-14	22 Mar. 2019	Correction of I_c/I_f values	2