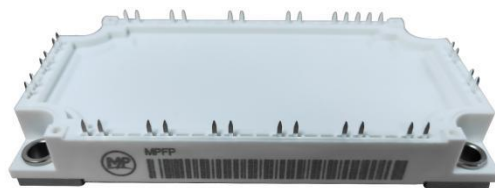


### Electrical Features

- Trench/Fieldstop IGBT
- $V_{CEsat}$  with positive Temperature Coefficient
- Low  $V_{CEsat}$

### Typical Applications

- Auxiliary inverters
- Motor drives
- Servo drives



### Mechanical Features

- High power density
- Integrated NTC temperature sensor
- Copper base plate
- Solder contact technology
- Standard housing

### IGBT, Inverter

Maximum Rated Values							
Symbol	Item	Conditions	Rating	Unit			
IGBT							
$V_{CES}$	Collector-emitter voltage	$T_{vj}=25^{\circ}C$	1200	V			
$V_{GES}$	Gate-emitter voltage	-	$\pm 20$	V			
$I_C$	Collector current,DC	$T_C=100^{\circ}C, T_{vj}=175^{\circ}C$	50	A			
$I_{CRM}$	Repetitive peak collector current	$t_p=1ms$	100	A			
$P_{tot}$	Total power dissipation	$T_C=25^{\circ}C, T_{vj}=175^{\circ}C$	278	W			
Characteristics Values							
Symbol	Item	Conditions	Values			Unit	
			Min.	Typ.	Max.		
$I_{CES}$	Collector-emitter cut-off current	$V_{CE}=1200V, V_{GE}=0V, T_{vj}=25^{\circ}C$	-	-	1	mA	
$I_{GES}$	Gate leakage current	$V_{CE}=0V, V_{GE}=20V, T_{vj}=25^{\circ}C$	-	-	400	nA	
$V_{GE(th)}$	Gate-emitter threshold voltage	$I_C=1.5mA, V_{CE}=V_{GE}, T_{vj}=25^{\circ}C$	5.2	5.72	6.5	V	
$V_{CEsat}$	Collector-emitter saturation voltage	$I_C=50A$ $V_{GE}=15V$	$T_{vj}=25^{\circ}C$	-	1.94	-	V
			$T_{vj}=125^{\circ}C$	-	-	-	
			$T_{vj}=150^{\circ}C$	-	-	-	
$C_{ies}$	Input capacitance	$V_{CE}=25V, V_{GE}=0V$ $f=1MHz, T_{vj}=25^{\circ}C$	-	3.535	-	nF	
$C_{oes}$	Output capacitance		-	0.231	-		
$C_{res}$	Reverse transfer capacitance		-	0.119	-		
$Q_G$	Gate charge	$V_{CC}=600V, I_C=50A$ $V_{GE}=-15...+15V, T_{vj}=25^{\circ}C$	-	0.201	-	$\mu C$	
$R_g$	Internal gate resistance	$T_{vj}=25^{\circ}C$	-	4	-	$\Omega$	

$t_{d(on)}$	Turn-on delay time	$V_{CC}=600V$ $I_C=50A$ $V_{GE}=\pm 15V$ $R_{G(on)}=41\Omega$ $R_{G(off)}=41\Omega$	$T_{vj}=25^\circ C$	-	408	-	ns
			$T_{vj}=125^\circ C$	-	-	-	
			$T_{vj}=150^\circ C$	-	-	-	
$t_r$	Rise time		$T_{vj}=25^\circ C$	-	324	-	
			$T_{vj}=125^\circ C$	-	-	-	
			$T_{vj}=150^\circ C$	-	-	-	
$t_{d(off)}$	Turn-off delay time		$T_{vj}=25^\circ C$	-	773	-	
			$T_{vj}=125^\circ C$	-	-	-	
			$T_{vj}=150^\circ C$	-	-	-	
$t_f$	Fall time		$T_{vj}=25^\circ C$	-	300	-	
			$T_{vj}=125^\circ C$	-	-	-	
			$T_{vj}=150^\circ C$	-	-	-	
$E_{on}$	Turn-on energy (per pulse)	$T_{vj}=25^\circ C$	-	24.4	-	mJ	
		$T_{vj}=125^\circ C$	-	-	-		
		$T_{vj}=150^\circ C$	-	-	-		
$E_{off}$	Turn-off energy (per pulse)	$T_{vj}=25^\circ C$	-	4.93	-		
		$T_{vj}=125^\circ C$	-	-	-		
		$T_{vj}=150^\circ C$	-	-	-		
SC data	Short-circuit current	$V_{CC}=600V, V_{GE}\leq 15V, T_{vj}=25^\circ C$ $V_{CES}\leq 1200V, t_p\leq 10\mu s$	-	350	-	A	
$R_{thJC}$	Thermal resistance, junction to case	Per IGBT	-	-	0.54	K/W	
$R_{thCH}$	Thermal resistance, case to heatsink	Per IGBT $\lambda_{grease}=1W/(m\cdot K)$	-	0.135	-	K/W	
$T_{vjop}$	Temperature under switching conditions		-40		150	$^\circ C$	

**Diode, Inverter**
**Maximum Rated Values**

Symbol	Item	Conditions	Rating	Unit
$V_{RRM}$	Repetitive peak reverse voltage	$T_{vj}=25^\circ C$	1200	V
$I_F$	Forward current, DC		50	A
$I_{FRM}$	Repetitive peak forward current	$t_p=1ms$	100	A
$I^2t$	$I^2t$ -value	$V_R=0V, t_p=10ms, T_{vj}=25^\circ C$	1800	$A^2s$

**Characteristic Values**

$V_F$	Continuous forward voltage	$I_F=50A$ $V_{GE}=0V$	$T_{vj}=25^\circ C$	-	2.27	-	V
			$T_{vj}=125^\circ C$	-	-	-	
			$T_{vj}=150^\circ C$	-	-	-	
$I_{RM}$	Peak reverse recovery current		$T_{vj}=25^\circ C$	-	8.8	-	A
			$T_{vj}=125^\circ C$	-	-	-	
			$T_{vj}=150^\circ C$	-	-	-	
$t_{rr}$	Reverse recovery time	$V_R=600V$ $I_F=50A$ $V_{GE}=-15V$	$T_{vj}=25^\circ C$	-	382	-	ns
			$T_{vj}=125^\circ C$	-	-	-	
			$T_{vj}=150^\circ C$	-	-	-	
$Q_r$	Recovered charge		$T_{vj}=25^\circ C$	-	1.14	-	$\mu C$
			$T_{vj}=125^\circ C$	-	-	-	
			$T_{vj}=150^\circ C$	-	-	-	

E <sub>rec</sub>	Reverse recovery energy		T <sub>vj</sub> =25°C	-	0.37	-	mJ
			T <sub>vj</sub> =125°C	-	-	-	
			T <sub>vj</sub> =150°C	-	-	-	
R <sub>thJC</sub>	Thermal resistance, junction to case	per diode	-	-	0.81	-	K/W
R <sub>thCH</sub>	Thermal resistance, case to heatsink	per diode, λ <sub>grease</sub> =1 W/(m • K)	-	0.2	-	-	K/W
T <sub>vjop</sub>	Temperature under switching conditions		-40		150		°C

**Diode, Rectifier**

Maximum Rated Values				
Symbol	Item	Conditions	Rating	Unit
V <sub>RRM</sub>	Repetitive peak reverse voltage	T <sub>vj</sub> =25°C	1600	V
I <sub>FRMSM</sub>	Maximum RMS forward current per chip	T <sub>C</sub> =80°C	80	A
I <sub>RMSM</sub>	Maximum RMS current at rectifier output	T <sub>C</sub> = 80°C	115	A
I <sub>FSM</sub>	Surge forward current	tp = 10 ms, T <sub>vj</sub> =25°C	600	A
I <sup>2</sup> t	I <sup>2</sup> t-value	V <sub>R</sub> =0V, t <sub>p</sub> =10ms, T <sub>vj</sub> =25°C	1800	A <sup>2</sup> s

Characteristic Values							
Symbol	Item	Conditions	Values			Unit	
			Min.	Typ.	Max.		
V <sub>F</sub>	Continuous forward voltage	I <sub>F</sub> =50A V <sub>GE</sub> =0V	T <sub>vj</sub> =25°C	-	1.16	-	V
			T <sub>vj</sub> =125°C	-	-	-	
			T <sub>vj</sub> =150°C	-	-	-	
I <sub>R</sub>	Reverse current	V <sub>R</sub> =1800V	T <sub>vj</sub> =25°C	-	-	10	uA
			T <sub>vj</sub> =125°C	-	-	-	
			T <sub>vj</sub> =150°C	-	-	-	
T <sub>vjop</sub>	Temperature under switching conditions		-40		150		°C

**IGBT, Brake-Chopper**

Maximum Rated Values				
Symbol	Item	Conditions	Values	Unit
V <sub>CES</sub>	Collector-emitter voltage	T <sub>vj</sub> =25°C	1200	V
V <sub>GES</sub>	Gate-emitter voltage	-	±20	V
I <sub>C</sub>	Collector current,DC	T <sub>C</sub> =100°C, T <sub>vj</sub> =175°C	40	A
I <sub>CRM</sub>	Repetitive peak collector current	t <sub>p</sub> =1ms	80	A
P <sub>tot</sub>	Total power dissipation	T <sub>C</sub> =25°C, T <sub>vj</sub> =175°C	250	W

Characteristic Values						
Symbol	Item	Conditions	Values			Unit
			Min.	Typ.	Max.	
I <sub>CES</sub>	Collector-emitter cut-off current	V <sub>CE</sub> =1200V, V <sub>GE</sub> =0V, T <sub>vj</sub> =25°C	-	-	1	mA
I <sub>GES</sub>	Gate leakage current	V <sub>CE</sub> =0V, V <sub>GE</sub> =20V, T <sub>vj</sub> =25°C	-	-	400	nA
V <sub>GE(th)</sub>	Gate-emitter threshold voltage	I <sub>C</sub> =1.5mA, V <sub>CE</sub> =V <sub>GE</sub> , T <sub>vj</sub> =25°C	5.2	5.5	6.5	V

V <sub>CEsat</sub>	Collector-emitter saturation voltage	I <sub>C</sub> =40A V <sub>GE</sub> =15V	T <sub>vj</sub> =25°C	-	2.0	-	
			T <sub>vj</sub> =125°C	-	-	-	
			T <sub>vj</sub> =150°C	-	-	-	
C <sub>ies</sub>	Input capacitance	V <sub>CE</sub> =25V, V <sub>GE</sub> =0V f=1MHz, T <sub>vj</sub> =25°C	-	3.13	-	nF	
C <sub>oes</sub>	Output capacitance		-	0.17	-		
C <sub>res</sub>	Reverse transfer capacitance		-	0.09	-		
Q <sub>G</sub>	Gate charge	V <sub>CC</sub> =600V, I <sub>C</sub> =40A V <sub>GE</sub> =-15...+15V, T <sub>vj</sub> =25°C	-	0.24	-	μC	
R <sub>g</sub>	Internal gate resistance	T <sub>vj</sub> =25°C	-	-	-	Ω	
t <sub>d(on)</sub>	Turn-on delay time	V <sub>CC</sub> =600V I <sub>C</sub> =40A V <sub>GE</sub> =±15V R <sub>G(on)</sub> =41Ω R <sub>G(off)</sub> =41Ω	T <sub>vj</sub> =25°C	-	321	-	ns
			T <sub>vj</sub> =125°C	-	-	-	
			T <sub>vj</sub> =150°C	-	-	-	
t <sub>r</sub>	Rise time		T <sub>vj</sub> =25°C	-	339	-	
			T <sub>vj</sub> =125°C	-	-	-	
			T <sub>vj</sub> =150°C	-	-	-	
t <sub>d(off)</sub>	Turn-off delay time		T <sub>vj</sub> =25°C	-	606	-	
			T <sub>vj</sub> =125°C	-	-	-	
			T <sub>vj</sub> =150°C	-	-	-	
t <sub>f</sub>	Fall time	T <sub>vj</sub> =25°C	-	259	-		
		T <sub>vj</sub> =125°C	-	-	-		
		T <sub>vj</sub> =150°C	-	-	-		
E <sub>on</sub>	Turn-on energy (per pulse)	T <sub>vj</sub> =25°C	-	14	-	mJ	
		T <sub>vj</sub> =125°C	-	-	-		
		T <sub>vj</sub> =150°C	-	-	-		
E <sub>off</sub>	Turn-off energy (per pulse)	T <sub>vj</sub> =25°C	-	2.67	-		
		T <sub>vj</sub> =125°C	-	-	-		
		T <sub>vj</sub> =150°C	-	-	-		
SC data	Short-circuit current	V <sub>CC</sub> =600V, V <sub>GE</sub> ≤15V, T <sub>vj</sub> =25°C V <sub>CES</sub> ≤1200V, t <sub>p</sub> ≤10μs	-	280	-	A	
R <sub>thJC</sub>	Thermal resistance, junction to case	Per IGBT	-	-	0.6	K/W	
R <sub>thCH</sub>	Thermal resistance, case to heatsink	Per IGBT λgrease=1W/(m·K)	-	-	-	K/W	
T <sub>vjop</sub>	Temperature under switching conditions		-40		150	°C	
<b>Diode, Brake-Chopper</b>							
<b>Maximum Rated Values</b>							
Symbol	Item	Conditions		Rating		Unit	
V <sub>RRM</sub>	Repetitive peak reverse voltage	T <sub>vj</sub> =25°C		1200		V	
I <sub>F</sub>	Forward current, DC			15		A	
I <sub>FRM</sub>	Repetitive peak forward current	t <sub>p</sub> =1ms		30		A	
I <sup>2</sup> t	I <sup>2</sup> t-value	V <sub>R</sub> =0V, t <sub>p</sub> =10ms, T <sub>vj</sub> =25°C		166		A <sup>2</sup> s	
<b>Characteristic Values</b>							
V <sub>F</sub>	Continuous forward voltage	I <sub>F</sub> =15A V <sub>GE</sub> =0V	T <sub>vj</sub> =25°C	-	1.97	-	V
			T <sub>vj</sub> =125°C	-	-	-	
			T <sub>vj</sub> =150°C	-	-	-	

I <sub>RM</sub>	Peak reverse recovery current	V <sub>R</sub> =600V I <sub>F</sub> =40A V <sub>GE</sub> =-15V R <sub>G(on)</sub> =41Ω R <sub>G(off)</sub> =41Ω	T <sub>vj</sub> =25°C	-	7	-	A
			T <sub>vj</sub> =125°C	-	-	-	
			T <sub>vj</sub> =150°C	-	-	-	
t <sub>rr</sub>	Reverse recovery time		T <sub>vj</sub> =25°C	-	667	-	ns
			T <sub>vj</sub> =125°C	-	-	-	
Q <sub>r</sub>	Recovered charge		T <sub>vj</sub> =25°C	-	1.52	-	μC
			T <sub>vj</sub> =125°C	-	-	-	
E <sub>rec</sub>	Reverse recovery energy		T <sub>vj</sub> =25°C	-	0.48	-	mJ
			T <sub>vj</sub> =125°C	-	-	-	
R <sub>thJC</sub>	Thermal resistance, junction to case	per diode	-	-	1.5	-	K/W
R <sub>thCH</sub>	Thermal resistance, case to heatsink	per diode, λ <sub>grease</sub> =1 W/(m • K)	-	0.37	-	-	K/W
T <sub>vjop</sub>	Temperature under switching conditions			-40		150	°C

Note:

IGBT electrical characteristics according to IEC 60747 – 9

Diode electrical characteristics according to IEC 60747 – 2

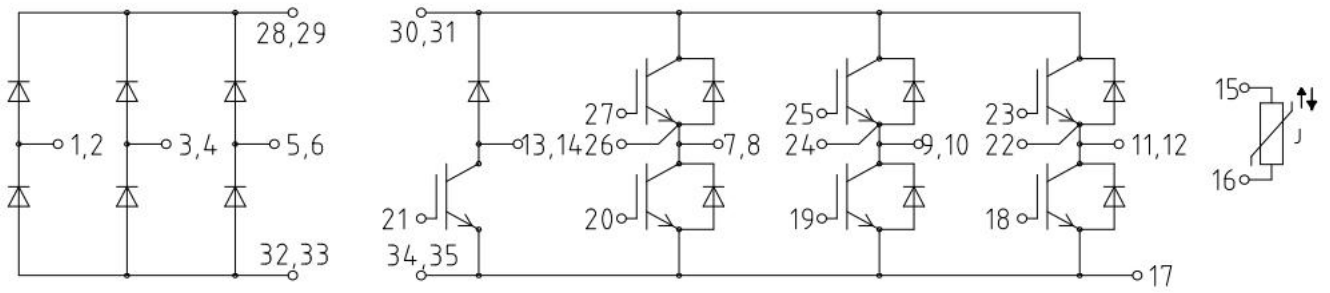
### NTC Thermistor Characteristics

Symbol	Item	Conditions	Values			Unit
			Min.	Typ.	Max.	
R <sub>25</sub>	Rated resistance	T <sub>C</sub> =25°C	-	5	-	kΩ
ΔR/R	Deviation of resistance	T <sub>C</sub> =100°C, R <sub>100</sub> =493Ω	-5	-	5	%
P <sub>25</sub>	Power dissipation	T <sub>C</sub> =25°C	-	-	20	mW
B <sub>25/50</sub>	B-constant	R <sub>2</sub> =R <sub>25</sub> exp[B <sub>25/50</sub> (1/T <sub>2</sub> -1/(298.15K))]	-	3375	-	K
B <sub>25/80</sub>	B-constant	R <sub>2</sub> =R <sub>25</sub> exp[B <sub>25/80</sub> (1/T <sub>2</sub> -1/(298.15K))]	-	3411	-	
B <sub>25/100</sub>	B-constant	R <sub>2</sub> =R <sub>25</sub> exp[B <sub>25/100</sub> (1/T <sub>2</sub> -1/(298.15K))]	-	3433	-	

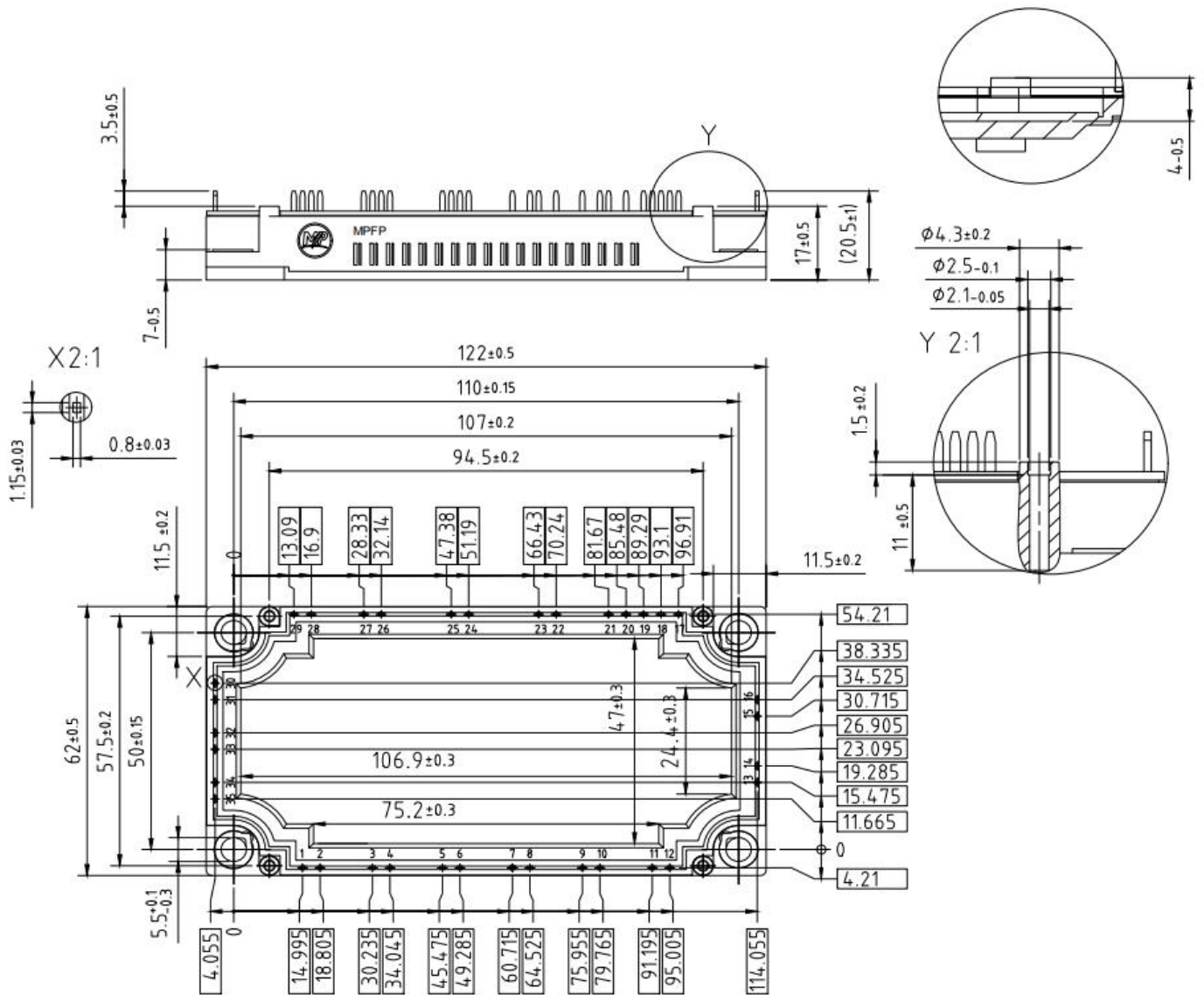
### Module

Symbol	Item	Conditions	Rating			Unit
V <sub>ISOL</sub>	Isolation voltage	Terminals to baseplate, RMS, f=50Hz, t=1min	2500			V
T <sub>vj max</sub>	Maximum junction temperature	-	175			°C
T <sub>vj op</sub>	Operating junction temperature	Continuous operation(underswitching)	-40~150			°C
T <sub>stg</sub>	Storage temperature	-	-40~125			°C
Symbol	Item	Conditions	Values			Unit
			Min.	Typ.	Max.	
M	Mounting torque for module mounting	-	3	-	6	Nm
ds	Creepage distance	Terminal to terminal	-	-	-	mm
		Terminal to base plate	-	10	-	
da	Clearance	Terminal to terminal	-	-	-	mm
		Terminal to base plate	-	7.5	-	
m	Weight	-	-	290	-	g

**Circuit Diagram**



**Package Outlines**



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