

Features

- Trench/Fieldstop IGBT
- Low Switching Losses
- Standard package
- Copper Base Plate
- Solder Contact Technology
- Integrated NTC temperature sensor



Typical Applications

- Motor Drives
- Servo Drives
- Auxiliary Inverters

IGBT, Inverter

Maximum Rated Values							
Symbol	Item	Conditions	Rating	Unit			
IGBT							
V_{CES}	Collector-emitter voltage	$T_{vj}=25^{\circ}\text{C}$	1200	V			
V_{GES}	Gate-emitter voltage	-	± 20	V			
I_C	Collector current,DC	$T_C=80^{\circ}\text{C}, T_{vj}=175^{\circ}\text{C}$	50	A			
I_{CRM}	Repetitive peak collector current	$t_p=1\text{ms}$	100	A			
P_{tot}	Total power dissipation	$T_C=25^{\circ}\text{C}, T_{vj}=175^{\circ}\text{C}$	278	W			
Characteristics Values							
Symbol	Item	Conditions	Values			Unit	
			Min.	Typ.	Max.		
I_{CES}	Collector-emitter cut-off current	$V_{CE}=1200\text{V}, V_{GE}=0\text{V}, T_{vj}=25^{\circ}\text{C}$	-	-	1	mA	
I_{GES}	Gate leakage current	$V_{CE}=0\text{V}, V_{GE}=20\text{V}, T_{vj}=25^{\circ}\text{C}$	-	-	100	nA	
$V_{GE(th)}$	Gate-emitter threshold voltage	$I_C=1.5\text{mA}, V_{CE}=V_{GE}, T_{vj}=25^{\circ}\text{C}$	5.2	5.7	6.6	V	
V_{CESat}	Collector-emitter saturation voltage	$I_C=50\text{A}$ $V_{GE}=15\text{V}$	$T_{vj}=25^{\circ}\text{C}$	-	2.25		-
			$T_{vj}=125^{\circ}\text{C}$	-	-		-
			$T_{vj}=150^{\circ}\text{C}$	-	-	-	
C_{ies}	Input capacitance	$V_{CE}=25\text{V}, V_{GE}=0\text{V}$ $f=1\text{MHz}, T_{vj}=25^{\circ}\text{C}$	-	3.535	-	nF	
C_{oes}	Output capacitance		-	0.231	-		
C_{res}	Reverse transfer capacitance		-	0.119	-		
Q_G	Gate charge	$V_{CC}=600\text{V}, I_C=50\text{A}$ $V_{GE}=-15\dots+15\text{V}, T_{vj}=25^{\circ}\text{C}$	-	0.201	-	μC	
R_g	Internal gate resistance	$T_{vj}=25^{\circ}\text{C}$	-	-	-	Ω	

$t_{d(on)}$	Turn-on delay time	$V_{CC}=600V$ $I_C=50A$ $V_{GE}=\pm 15V$ $R_{G(on)}=51\Omega$ $R_{G(off)}=51\Omega$	$T_{vj}=25^\circ C$	-	257.9	-	ns
			$T_{vj}=125^\circ C$	-	-	-	
			$T_{vj}=150^\circ C$	-	-	-	
t_r	Rise time		$T_{vj}=25^\circ C$	-	152.4	-	
			$T_{vj}=125^\circ C$	-	-	-	
			$T_{vj}=150^\circ C$	-	-	-	
$t_{d(off)}$	Turn-off delay time		$T_{vj}=25^\circ C$	-	528.5	-	
			$T_{vj}=125^\circ C$	-	-	-	
			$T_{vj}=150^\circ C$	-	-	-	
t_f	Fall time		$T_{vj}=25^\circ C$	-	359.9	-	
			$T_{vj}=125^\circ C$	-	-	-	
			$T_{vj}=150^\circ C$	-	-	-	
E_{on}	Turn-on energy (per pulse)	$T_{vj}=25^\circ C$	-	15.8	-	mJ	
		$T_{vj}=125^\circ C$	-	-	-		
		$T_{vj}=150^\circ C$	-	-	-		
E_{off}	Turn-off energy (per pulse)	$T_{vj}=25^\circ C$	-	3.49	-		
		$T_{vj}=125^\circ C$	-	-	-		
		$T_{vj}=150^\circ C$	-	-	-		
SC data	Short-circuit current	$V_{CC}=600V, V_{GE}\leq 15V, T_{vj}=125^\circ C$ $V_{CES}\leq 1200V, t_p\leq 10\mu s$	-	360	-	A	
R_{thJC}	Thermal resistance, junction to case	Per IGBT	-	-	0.54	K/W	
R_{thCH}	Thermal resistance, case to heatsink	Per IGBT $\lambda_{grease}=1W/(m\cdot K)$	-	0.295	-	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	$T_C=80^\circ C, T_{vj}=175^\circ C$	50	A
I_{FRM}	Repetitive peak forward current	$t_p=1ms$	100	A
I^2t	I^2t -value	$V_R=0V, t_p=10ms, T_{vj}=125^\circ C$	667	A^2s

Characteristic Values

			Min.	Typ.	Max.		
V_F	Continuous forward voltage	$I_F=50A$ $V_{GE}=0V$	$T_{vj}=25^\circ C$	-	2.31	-	V
			$T_{vj}=125^\circ C$	-	-	-	
			$T_{vj}=150^\circ C$	-	-	-	
I_{RM}	Peak reverse recovery current	$V_R=600V$ $I_F=50A$ $V_{GE}=-15V$	$T_{vj}=25^\circ C$	-	15.8	-	A
			$T_{vj}=125^\circ C$	-	-	-	
			$T_{vj}=150^\circ C$	-	-	-	
t_{rr}	Reverse recovery time		$T_{vj}=25^\circ C$	-	110.7	-	ns
			$T_{vj}=125^\circ C$	-	-	-	
			$T_{vj}=150^\circ C$	-	-	-	
Q_r	Recovered charge	$T_{vj}=25^\circ C$	-	1.61	-	μC	
		$T_{vj}=125^\circ C$	-	-	-		
		$T_{vj}=150^\circ C$	-	-	-		

E_{rec}	Reverse recovery energy		$T_{vj}=25^{\circ}C$	-	0.82	-	mJ
			$T_{vj}=125^{\circ}C$	-	-	-	
			$T_{vj}=150^{\circ}C$	-	-	-	
R_{thJC}	Thermal resistance, junction to case	per diode		-	-	0.94	K/W
T_{vjop}	Temperature under switching conditions			-40		150	$^{\circ}C$

Diode, Rectifier

Maximum Rated Values							
Symbol	Item	Conditions		Rating			Unit
V_{RRM}	Repetitive peak reverse voltage	$T_{vj}=25^{\circ}C$		1800			V
I_{FRMSM}	Maximum RMS forward current per chip	$T_C=80^{\circ}C$		50			A
I_{RMSM}	Maximum RMS current at rectifier output	$T_C=80^{\circ}C$		60			A
I_{FSM}	Surge forward current	$t_p = 10 \text{ ms}, T_{vj} = 150^{\circ} C$		420			A
I^2t	I^2t -value	$t_p=10\text{ms}, T_{vj}=150^{\circ}C$		882			A^2s
Characteristic Values							
Symbol	Item	Conditions	Values			Unit	
			Min.	Typ.	Max.		
V_F	Continuous forward voltage	$I_F=50A$ $V_{GE}=0V$	$T_{vj}=25^{\circ}C$	-	0.96	-	V
			$T_{vj}=125^{\circ}C$	-	-	-	
			$T_{vj}=150^{\circ}C$	-	-	-	
I_R	Reverse current	$V_R=1800V$	$T_{vj}=25^{\circ}C$	-	-	10	uA
			$T_{vj}=125^{\circ}C$	-	-	-	
			$T_{vj}=150^{\circ}C$	-	-	-	
T_{vjop}	Temperature under switching conditions			-40		150	$^{\circ}C$

IGBT, Brake-Chopper

Maximum Rated Values							
Symbol	Item	Conditions		Values			Unit
V_{CES}	Collector-emitter voltage	$T_{vj}=25^{\circ}C$		1200			V
V_{GES}	Gate-emitter voltage	-		± 20			V
I_C	Collector current,DC	$T_C=100^{\circ}C, T_{vj}=175^{\circ}C$		25			A
I_{CRM}	Repetitive peak collector current	$t_p=1\text{ms}$		50			A
P_{tot}	Total power dissipation	$T_C=25^{\circ}C, T_{vj}=175^{\circ}C$		151			W
Characteristic Values							
Symbol	Item	Conditions	Values			Unit	
			Min.	Typ.	Max.		
IGBT							
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	$V_{CE}=0V, V_{GE}=20V, T_{vj}=25^{\circ}C$		-	-	100	nA
$V_{GE(th)}$	Gate-emitter threshold voltage	$I_C=0.5\text{mA}, V_{CE}=V_{GE}, T_{vj}=25^{\circ}C$		5.5	5.9	6.6	V
V_{CESat}	Collector-emitter saturation voltage	$I_C=25A$ $V_{GE}=15V$	$T_{vj}=25^{\circ}C$	-	2.04	-	
			$T_{vj}=125^{\circ}C$	-	-	-	
			$T_{vj}=150^{\circ}C$	-	-	-	

C_{ies}	Input capacitance	$V_{CE}=25V, V_{GE}=0V$ $f=1MHz, T_{vj}=25^{\circ}C$	-	1.77	-	nF	
C_{oes}	Output capacitance		-	0.17	-		
C_{res}	Reverse transfer capacitance		-	0.06	-		
Q_G	Gate charge	$V_{CC}=600V, I_C=15A$ $V_{GE}=-15...+15V, T_{vj}=25^{\circ}C$	-	0.171	-	μC	
R_g	Internal gate resistance	$T_{vj}=25^{\circ}C$	-	-	-	Ω	
$t_{d(on)}$	Turn-on delay time	$V_{CC}=600V$ $I_C=25A$ $V_{GE}=\pm 15V$ $R_{G(on)}=51\Omega$ $R_{G(off)}=51\Omega$	$T_{vj}=25^{\circ}C$	-	109	-	ns
			$T_{vj}=125^{\circ}C$	-	-	-	
			$T_{vj}=150^{\circ}C$	-	-	-	
t_r	Rise time		$T_{vj}=25^{\circ}C$	-	165	-	
			$T_{vj}=125^{\circ}C$	-	-	-	
			$T_{vj}=150^{\circ}C$	-	-	-	
$t_{d(off)}$	Turn-off delay time		$T_{vj}=25^{\circ}C$	-	313	-	
			$T_{vj}=125^{\circ}C$	-	-	-	
			$T_{vj}=150^{\circ}C$	-	-	-	
t_f	Fall time		$T_{vj}=25^{\circ}C$	-	694	-	
			$T_{vj}=125^{\circ}C$	-	-	-	
			$T_{vj}=150^{\circ}C$	-	-	-	
E_{on}	Turn-on energy (per pulse)	$T_{vj}=25^{\circ}C$	-	6.2	-	mJ	
		$T_{vj}=125^{\circ}C$	-	-	-		
		$T_{vj}=150^{\circ}C$	-	-	-		
E_{off}	Turn-off energy (per pulse)	$T_{vj}=25^{\circ}C$	-	1.52	-		
		$T_{vj}=125^{\circ}C$	-	-	-		
		$T_{vj}=150^{\circ}C$	-	-	-		
SC data	Short-circuit current	$V_{CC}=600V, V_{GE}\leq 15V, T_{vj}=125^{\circ}C$ $V_{CES}\leq 1200V, t_p\leq 10\mu s$	-	90	-	A	
R_{thJC}	Thermal resistance, junction to case	Per IGBT	-	-	0.99	K/W	
T_{vjop}	Temperature under switching conditions		-40		150	$^{\circ}C$	

Diode, Brake-Chopper
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	$T_C=80^{\circ}C, T_{vj}=175^{\circ}C$	15	A
I_{FRM}	Repetitive peak forward current	$t_p=1ms$	30	A
I^2t	I^2t -value	$V_R=0V, t_p=10ms, T_{vj}=125^{\circ}C$	166	A^2s

Characteristic Values

			Min.	Typ.	Max.		
V_F	Continuous forward voltage	$I_F=15A$ $V_{GE}=0V$	$T_{vj}=25^{\circ}C$	-	2.23	-	V
			$T_{vj}=125^{\circ}C$	-	-	-	
			$T_{vj}=150^{\circ}C$	-	-	-	
I_{RM}	Peak reverse recovery current	$V_R=600V$ $I_F=25A$ $V_{GE}=-15V$	$T_{vj}=25^{\circ}C$	-	12.6	-	A
			$T_{vj}=125^{\circ}C$	-	-	-	
			$T_{vj}=150^{\circ}C$	-	-	-	
t_{rr}	Reverse recovery time		$T_{vj}=25^{\circ}C$	-	99.9	-	ns

			$T_{vj}=125^{\circ}\text{C}$	-	-	-	
Q_r	Recovered charge		$T_{vj}=25^{\circ}\text{C}$	-	0.85	-	μC
			$T_{vj}=125^{\circ}\text{C}$	-	-	-	
E_{rec}	Reverse recovery energy		$T_{vj}=25^{\circ}\text{C}$	-	0.45	-	mJ
			$T_{vj}=125^{\circ}\text{C}$	-	-	-	
R_{thJC}	Thermal resistance, junction to case	per diode		-	-	0.94	K/W
T_{vjop}	Temperature under switching conditions			-40		150	$^{\circ}\text{C}$

Note:

IGBT electrical characteristics according to IEC 60747 – 9

Diode electrical characteristics according to IEC 60747 – 2

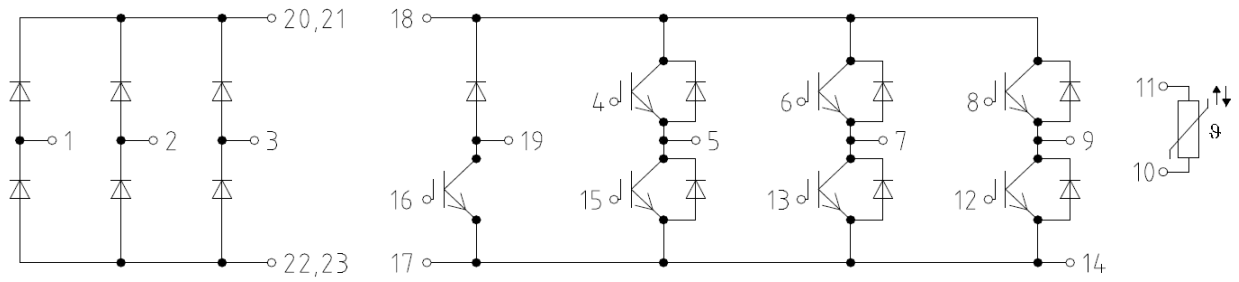
NTC Thermistor Characteristics

Symbol	Item	Conditions	Values			Unit
			Min.	Typ.	Max.	
R_{25}	Rated resistance	$T_C=25^{\circ}\text{C}$	-	5	-	$\text{k}\Omega$
$\Delta R/R$	Deviation of resistance	$T_C=100^{\circ}\text{C}, R_{100}=493\Omega$	-5	-	5	%
P_{25}	Power dissipation	$T_C=25^{\circ}\text{C}$	-	-	20	mW
$B_{25/50}$	B-constant	$R_2=R_{25}\exp[B_{25/50}(1/T_2-1/(298.15\text{K}))]$	-	3375	-	K
$B_{25/80}$	B-constant	$R_2=R_{25}\exp[B_{25/80}(1/T_2-1/(298.15\text{K}))]$	-	3411	-	
$B_{25/100}$	B-constant	$R_2=R_{25}\exp[B_{25/100}(1/T_2-1/(298.15\text{K}))]$	-	3433	-	

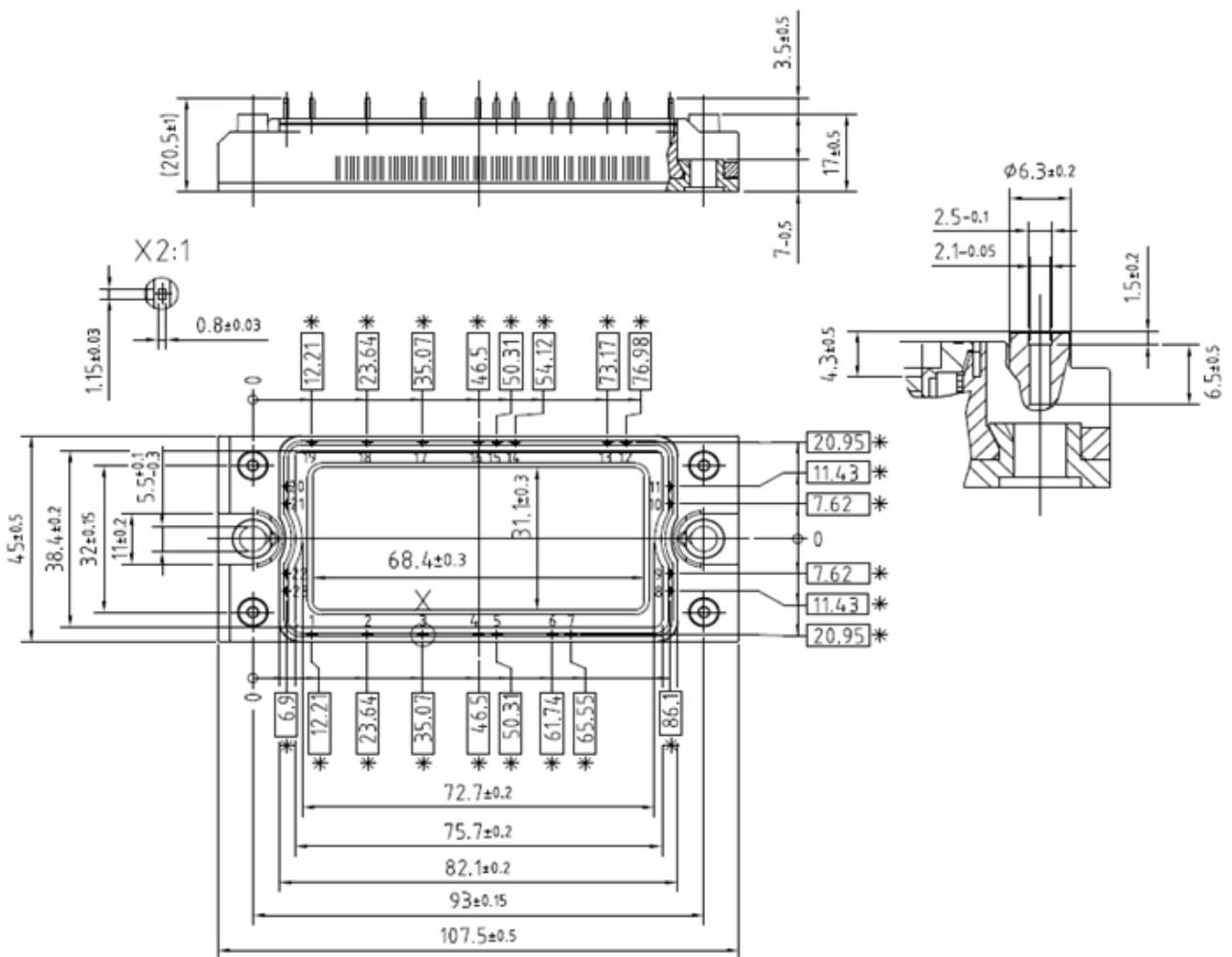
Module

Symbol	Item	Conditions	Rating			Unit
V_{ISOL}	Isolation voltage	Terminals to baseplate, RMS, $f=50\text{Hz}, t=1\text{min}$	2500			V
$T_{vj\max}$	Maximum junction temperature	-	175			$^{\circ}\text{C}$
T_{vjop}	Operating junction temperature	Continuous operation (under switching)	-40~150			$^{\circ}\text{C}$
T_{stg}	Storage temperature	-	-40~125			$^{\circ}\text{C}$
Symbol	Item	Conditions	Values			Unit
			Min.	Typ.	Max.	
M_s	Mounting torque	Mounting to heat sink, M5 screw	3	-	6	Nm
d_s	Creepage distance	Terminal to terminal	-	-	-	mm
		Terminal to base plate	-	10	-	
d_a	Clearance	Terminal to terminal	-	-	-	mm
		Terminal to base plate	-	7.5	-	
m	Weight	-	-	175	-	g

Circuit Diagram



Package Outlines



* = all dimensions with tolerance of $\text{⌀} 0.4$

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