

Electrical Features

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

Typical Applications

- Auxiliary Inverters
- Air Conditioning
- Motor Drives



Mechanical Features

- Al_2O_3 Substrate with Low Thermal Resistance
- Compact design
- Solder Contact Technology
- Rugged mounting due to integrated mounting clamps

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	-	± 20	V			
I_C	Collector current,DC	$T_C=100^{\circ}C, T_{vj}=175^{\circ}C$	40	A			
I_{CRM}	Repetitive peak collector current	$t_p=1ms$	80	A			
P_{tot}	Total power dissipation	$T_C=25^{\circ}C, T_{vj}=175^{\circ}C$	214	W			
Characteristics Values							
Symbol	Item	Conditions	Values			Unit	
IGBT			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	$V_{CE}=0V, V_{GE}=20V, T_{vj}=25^{\circ}C$	-	-	500	nA	
$V_{GE(th)}$	Gate-emitter threshold voltage	$I_C=1.5mA, V_{CE}=V_{GE}, T_{vj}=25^{\circ}C$	5.2	6.08	6.5	V	
V_{CEsat}	Collector-emitter saturation voltage	$I_C=40A$ $V_{GE}=15V$	$T_{vj}=25^{\circ}C$	-	1.9	-	V
			$T_{vj}=125^{\circ}C$	-	-	-	
			$T_{vj}=150^{\circ}C$	-	-	-	
C_{ies}	Input capacitance	$V_{CE}=25V, V_{GE}=0V$ $f=1MHz, T_{vj}=25^{\circ}C$	-	3.13	-	nF	
C_{oes}	Output capacitance		-	0.17	-		
C_{res}	Reverse transfer capacitance		-	0.09	-		
Q_G	Gate charge	$V_{CC}=600V, I_C=40A$ $V_{GE}=-15...+15V, T_{vj}=25^{\circ}C$	-	240	-	nC	
R_g	Internal gate resistance	$T_{vj}=25^{\circ}C$	-	-	-	Ω	

$t_{d(on)}$	Turn-on delay time	$V_{CC}=600V$ $I_C=40A$ $V_{GE}=\pm 15V$ $R_{G(on)}=12\Omega$ $R_{G(off)}=12\Omega$	$T_{vj}=25^\circ C$	-	10	-	ns
			$T_{vj}=125^\circ C$	-	-	-	
			$T_{vj}=150^\circ C$	-	-	-	
t_r	Rise time		$T_{vj}=25^\circ C$	-	25	-	
			$T_{vj}=125^\circ C$	-	-	-	
			$T_{vj}=150^\circ C$	-	-	-	
$t_{d(off)}$	Turn-off delay time		$T_{vj}=25^\circ C$	-	204	-	
			$T_{vj}=125^\circ C$	-	-	-	
			$T_{vj}=150^\circ C$	-	-	-	
t_f	Fall time		$T_{vj}=25^\circ C$	-	230	-	
			$T_{vj}=125^\circ C$	-	-	-	
			$T_{vj}=150^\circ C$	-	-	-	
E_{on}	Turn-on energy (per pulse)	$T_{vj}=25^\circ C$	-	2.41	-	mJ	
		$T_{vj}=125^\circ C$	-	-	-		
		$T_{vj}=150^\circ C$	-	-	-		
E_{off}	Turn-off energy (per pulse)	$T_{vj}=25^\circ C$	-	2.45	-		
		$T_{vj}=125^\circ C$	-	-	-		
		$T_{vj}=150^\circ C$	-	-	-		
SC data	Short-circuit current	$V_{CC}=600V, V_{GE}\leq 15V, T_{vj}=125^\circ C$ $V_{CES}\leq 1200V, t_p\leq 10\mu s$	-	243	-	A	
R_{thJC}	Thermal resistance, junction to case	Per IGBT	-	-	0.7	K/W	
R_{thCH}	Thermal resistance, case to heatsink	Per IGBT $\lambda_{grease}=1W/(m\cdot K)$	-	0.6	-	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		35	A
I_{FRM}	Repetitive peak forward current	$t_p=1ms$	70	A
I^2t	I^2t -value	$V_R=0V, t_p=10ms, T_{vj}=150^\circ C$	220	A^2s

Characteristic Values

V_F	Continuous forward voltage	$I_F=35A$ $V_{GE}=0V$	$T_{vj}=25^\circ C$	-	2.24	-	V
			$T_{vj}=125^\circ C$	-	-	-	
			$T_{vj}=150^\circ C$	-	-	-	
I_{RM}	Peak reverse recovery current		$T_{vj}=25^\circ C$	-	70	-	A
			$T_{vj}=125^\circ C$	-	-	-	
			$T_{vj}=150^\circ C$	-	-	-	
t_{rr}	Reverse recovery time	$V_R=600V$ $I_F=40A$ $V_{GE}=-15V$	$T_{vj}=25^\circ C$	-	57.4	-	ns
			$T_{vj}=125^\circ C$	-	-	-	
			$T_{vj}=150^\circ C$	-	-	-	
Q_r	Recovered charge		$T_{vj}=25^\circ C$	-	2.47	-	μC
			$T_{vj}=125^\circ C$	-	-	-	
			$T_{vj}=150^\circ C$	-	-	-	

E _{rec}	Reverse recovery energy		T _{vj} =25°C	-	1.47	-	mJ
			T _{vj} =125°C	-	-	-	
			T _{vj} =150°C	-	-	-	
R _{thJC}	Thermal resistance, junction to case	per diode	-	-	0.90	-	K/W
R _{thCH}	Thermal resistance, case to heatsink	per diode, λ _{grease} =1 W/(m • K)	-	0.75	-	-	K/W
T _{vjop}	Temperature under switching conditions		-40		150		°C

Diode, Rectifier

Maximum Rated Values							
Symbol	Item	Conditions		Rating			Unit
V _{RRM}	Repetitive peak reverse voltage	T _{vj} =25°C		1600			V
I _{FRMSM}	Maximum RMS forward current per chip	T _C =80°C, T _{vj} =175°C		60			A
I _{RMSM}	Maximum RMS current at rectifier output	T _C = 80°C		60			A
I _{FSM}	Surge forward current	t _p = 10 ms, T _{vj} = 150° C		370			A
I ² t	I ² t-value	V _R =0V, t _p =10ms, T _{vj} =150°C		685			A ² s
Characteristic Values							
Symbol	Item	Conditions	Values			Unit	
			Min.	Typ.	Max.		
V _F	Continuous forward voltage	I _F =35A V _{GE} =0V	T _{vj} =25°C	-	1.57	-	V
			T _{vj} =125°C	-	-	-	
			T _{vj} =150°C	-	-	-	
I _R	Reverse current	V _R =1600V	T _{vj} =25°C	-	-	10	uA
			T _{vj} =125°C	-	-	-	
			T _{vj} =150°C	-	-	-	
R _{thJC}	Thermal resistance, junction to case	per diode	-	1.05	1.15	-	K/W
R _{thCH}	Thermal resistance, case to heatsink	per diode, λ _{grease} =1 W/(m • K)	-	0.95	-	-	K/W
T _{vjop}	Temperature under switching conditions		-40		150		°C

IGBT, Brake-Chopper

Maximum Rated Values							
Symbol	Item	Conditions		Values			Unit
V _{CES}	Collector-emitter voltage	T _{vj} =25°C		1200			V
V _{GES}	Gate-emitter voltage	-		±20			V
I _C	Collector current,DC	T _C =100°C, T _{vj} =175°C		35			A
I _{CRM}	Repetitive peak collector current	t _p =1ms		70			A
P _{tot}	Total power dissipation	T _C =25°C, T _{vj} =175°C		214			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°C		-	-	1	mA
I _{GES}	Gate leakage current	V _{CE} =0V, V _{GE} =20V, T _{vj} =25°C		-	-	500	nA

$V_{GE(th)}$	Gate-emitter threshold voltage	$I_C=0.8mA, V_{CE}=V_{GE}, T_{vj}=25^\circ C$		5.2	5.7	6.5	
V_{CEsat}	Collector-emitter saturation voltage	$I_C=35A$ $V_{GE}=15V$	$T_{vj}=25^\circ C$	-	2.47	-	V
			$T_{vj}=125^\circ C$	-	-	-	
			$T_{vj}=150^\circ C$	-	-	-	
C_{ies}	Input capacitance	$V_{CE}=25V, V_{GE}=0V$ $f=1MHz, T_{vj}=25^\circ C$		-	1767	-	pF
C_{oes}	Output capacitance			-	116	-	
C_{res}	Reverse transfer capacitance			-	62	-	
Q_G	Gate charge	$V_{CC}=600V, I_C=35A$ $V_{GE}=-15\dots+15V, T_{vj}=25^\circ C$		-	220	-	nC
R_g	Internal gate resistance	$T_{vj}=25^\circ C$		-	-	-	Ω
$t_{d(on)}$	Turn-on delay time			$T_{vj}=25^\circ C$	-	109	-
				$T_{vj}=125^\circ C$	-	-	-
				$T_{vj}=150^\circ C$	-	-	-
t_r	Rise time			$T_{vj}=25^\circ C$	-	10.4	-
				$T_{vj}=125^\circ C$	-	-	-
				$T_{vj}=150^\circ C$	-	-	-
$t_{d(off)}$	Turn-off delay time	$V_{CC}=600V$ $I_C=35A$ $V_{GE}=\pm 15V$		$T_{vj}=25^\circ C$	-	166	-
				$T_{vj}=125^\circ C$	-	-	-
				$T_{vj}=150^\circ C$	-	-	-
t_f	Fall time	$R_{G(on)}=12\Omega$ $R_{G(off)}=12\Omega$		$T_{vj}=25^\circ C$	-	239	-
				$T_{vj}=125^\circ C$	-	-	-
				$T_{vj}=150^\circ C$	-	-	-
E_{on}	Turn-on energy (per pulse)			$T_{vj}=25^\circ C$	-	1.57	-
				$T_{vj}=125^\circ C$	-	-	-
				$T_{vj}=150^\circ C$	-	-	-
E_{off}	Turn-off energy (per pulse)			$T_{vj}=25^\circ C$	-	1.28	-
				$T_{vj}=125^\circ C$	-	-	-
				$T_{vj}=150^\circ C$	-	-	-
SC data	Short-circuit current	$V_{CC}=600V, V_{GE}\leq 15V, T_{vj}=125^\circ C$ $V_{CES}\leq 1200V, t_p\leq 10\mu s$		-	160	-	A
R_{thJC}	Thermal resistance, junction to case	Per IGBT		-	0.6	0.7	K/W
R_{thCH}	Thermal resistance, case to heatsink	Per IGBT $\lambda_{grease}=1W/(m\cdot K)$		-	0.6	-	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			10		A	
I_{FRM}	Repetitive peak forward current	$t_p=1ms$		20		A	
I^2t	I^2t -value	$V_R=0V, t_p=10ms, T_{vj}=150^\circ C$		14		A^2s	
Characteristic Values							
V_F	Continuous forward voltage	$I_F=10A$ $V_{GE}=0V$		$T_{vj}=25^\circ C$	-	1.98	-
				$T_{vj}=125^\circ C$	-	-	-

			$T_{vj}=150^{\circ}\text{C}$	-	-	-	
I_{RM}	Peak reverse recovery current	$V_R=600\text{V}$ $I_F=10\text{A}$ $V_{GE}=-15\text{V}$	$T_{vj}=25^{\circ}\text{C}$	-	45	-	A
			$T_{vj}=125^{\circ}\text{C}$	-	-	-	
			$T_{vj}=150^{\circ}\text{C}$	-	-	-	
t_{rr}	Reverse recovery time		$T_{vj}=25^{\circ}\text{C}$	-	45.2	-	ns
			$T_{vj}=125^{\circ}\text{C}$	-	-	-	
Q_r	Recovered charge		$T_{vj}=25^{\circ}\text{C}$	-	1.06	-	μC
		$T_{vj}=125^{\circ}\text{C}$	-	-	-		
E_{rec}	Reverse recovery energy	$T_{vj}=25^{\circ}\text{C}$	-	0.73	-	mJ	
		$T_{vj}=125^{\circ}\text{C}$	-	-	-		
R_{thJC}	Thermal resistance, junction to case	per diode		-	1.75	1.90	K/W
R_{thCH}	Thermal resistance, case to heatsink	per diode, $\lambda_{grease}=1\text{ W}/(\text{m}\cdot\text{K})$		-	1.30	-	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

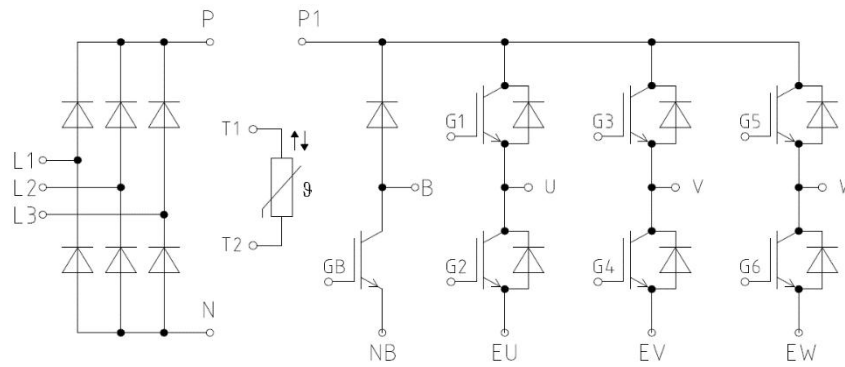
NTC Thermistor Characteristics

Symbol	Item	Conditions	Values			Unit
			Min.	Typ.	Max.	
R_{25}	Rated resistance	$T_C=25^{\circ}\text{C}$	-	5	-	k Ω
$\Delta R/R$	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	-	

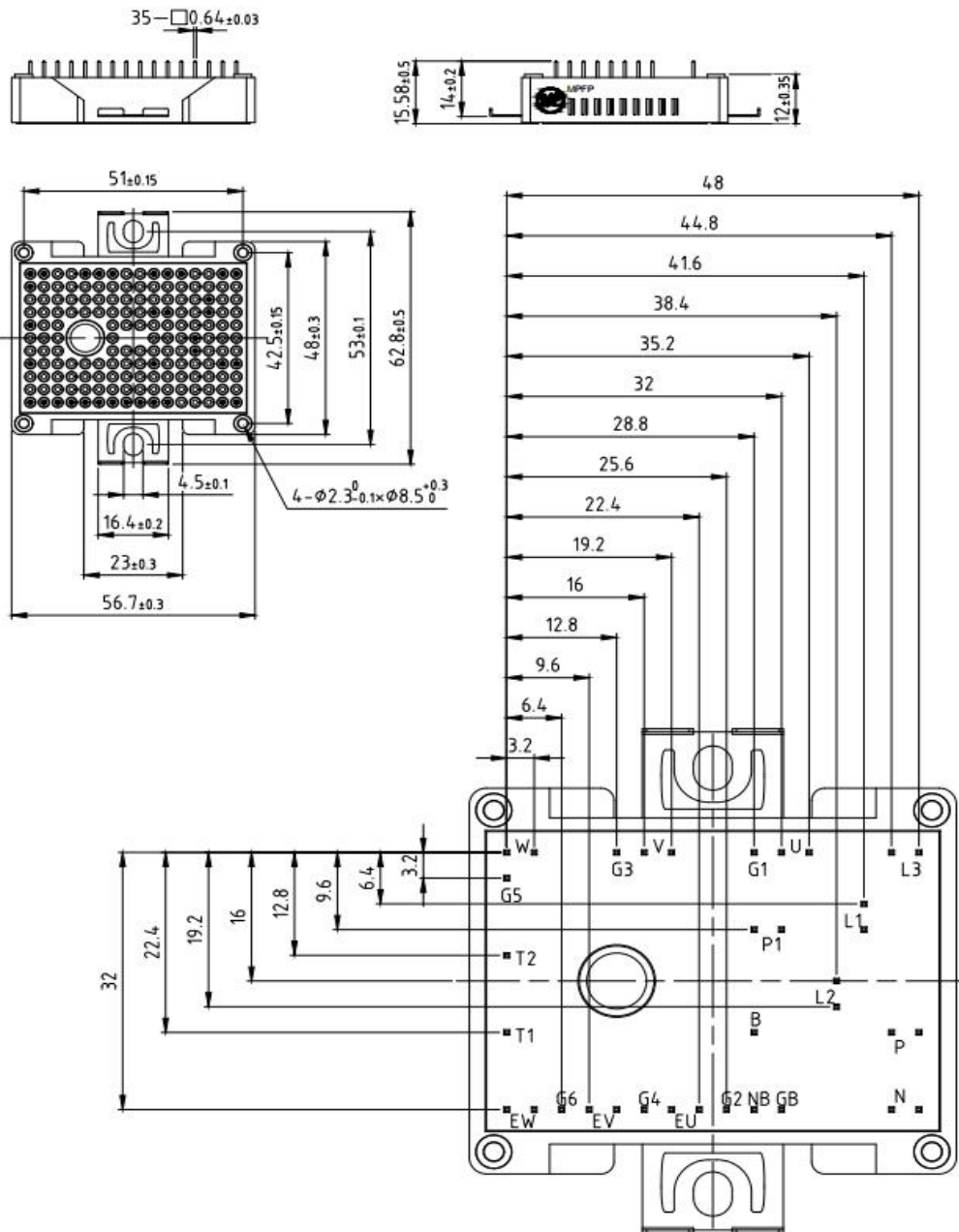
Module

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			$^{\circ}\text{C}$
$T_{vj\ op}$	Operating junction temperature	Continuous operation(underswitching)	-40~150			$^{\circ}\text{C}$
T_{stg}	Storage temperature	-	-40~125			$^{\circ}\text{C}$
Symbol	Item	Conditions	Values			Unit
			Min.	Typ.	Max.	
F	mounting force per clamp	-	40	-	80	N
d_s	Creepage distance	Terminal to terminal	-	6.3	-	mm
		Terminal to base plate	-	11.5	-	
d_a	Clearance	Terminal to terminal	-	5	-	mm
		Terminal to base plate	-	10	-	
m	Weight	-	-	41	-	g

Circuit Diagram



Package Outlines



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