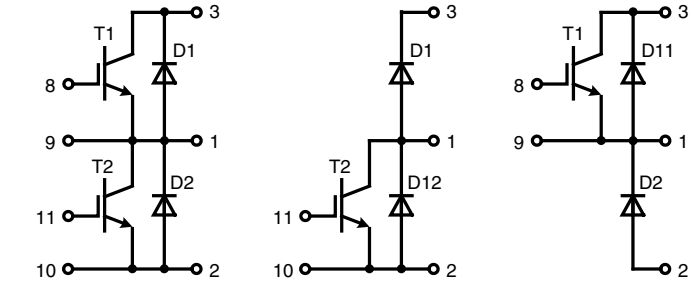
IGBT Module

phaseleg and chopper topolgies
with optional temperature sensor

Preliminary Data

I_{C25} = 420 A
V_{CES} = 1200 V
$V_{CE(sat)\ typ.}$ = 2.2 V

MII 400-12E4 MID 400-12E4(T) MDI 400-12E4



IGBTs T1 - T2

Symbol	Conditions	Maximum Ratings	
V_{CES}	T_{VJ} = 25°C to 125°C	1200	V
V_{GES}		± 20	V
I_{C25}	T_C = 25°C	420	A
I_{C80}	T_C = 80°C	300	A
I_{CM}	V_{GE} = ±15 V; R_G = 4.7 Ω; T_{VJ} = 125°C	450	A
V_{CEK}	**RBSOA** Clamped inductive load; L = 100 µH	V_{CES}	
t_{SC} (SCSOA)	V_{CE} = 900 V; V_{GE} = ±15 V; R_G = 4.7 Ω; T_{VJ} = 125°C; non-repetitive	10	µs
P_{tot}	T_C = 25°C	1700	W

Symbol	Conditions		Characteristic Values (T_{VJ} = 25°C, unless otherwise specified) min.	typ.	max.	
$V_{CE(sat)}$	I_C = 300 A; V_{GE} = 15 V;	T_{VJ} = 25°C		2.2	2.8	V
		T_{VJ} = 125°C		2.6		V
$V_{GE(th)}$	I_C = 10 mA; V_{GE} = V_{CE}		4.5		6.5	V
I_{CES}	V_{CE} = V_{CES}; V_{GE} = 0 V;	T_{VJ} = 25°C		0.8	3.3	mA
		T_{VJ} = 125°C		3.5		mA
I_{GES}	V_{CE} = 0 V; V_{GE} = ± 20 V				600	nA
$t_{d(on)}$	Inductive load, T_{VJ} = 125°C			170		ns
t_r	V_{CE} = 600 V; I_C = 300 A			60		ns
$t_{d(off)}$	V_{GE} = ±15 V; R_G = 4.7 Ω			680		ns
t_f				50		ns
E_{on}				44		mJ
E_{off}				30		mJ
C_{ies}	V_{CE} = 25 V; V_{GE} = 0 V; f = 1 MHz			17		nF
Q_{Gon}	V_{CE} = 600 V; V_{GE} = 15 V; I_C = 300 A			1.74		µC
R_{thJC}	(per IGBT)				0.08	K/W
R_{thJH}	with heatsink compound			0.15		K/W

Features

- NPT³ IGBT
  - low saturation voltage
  - positive temperature coefficient
  - fast switching
  - short tail current for optimized performance in resonant circuits
- HiPerFRED™ diodes
  - fast and soft reverse recovery
  - low operating forward voltage
  - low leakage current
- NTC sensor for measurement of case temperature
- Package
  - low inductive current path
  - screw connection to high current main terminals
  - use of non interchangeable connectors for auxiliary terminals possible
  - Kelvin emitter terminal for easy drive
  - isolated ceramic base plate

Applications

- drives
  - AC
  - DC
- power supplies
  - rectifiers with power factor correction and recuperation capability
  - UPS

Free wheeling diodes D1 - D2

Symbol	Conditions	Maximum Ratings	
I_{F25}	T_C = 25°C	450	A
I_{F80}	T_C = 80°C	290	A

Symbol	Conditions		Characteristic Values min.	typ.	max.	
V_F	I_F = 300 A; V_{GE} = 0 V;	T_{VJ} = 25°C		2.3	2.7	V
		T_{VJ} = 125°C		1.7		V
I_{RM}	I_F = 225 A; di_F/dt = -2000 A/µs;			200		A
t_{rr}	V_R = 600 V; V_{GE} = 0 V;	T_{VJ} = 125°C		220		ns
R_{thJC}	(per IGBT)				0.15	K/W
R_{thJH}	with heatsink compound			0.3		K/W

Chopper anti parallel diodes D11 - D12

Symbol	Conditions	Maximum Ratings	
I_{F25}	T_C = 25°C	150	A
I_{F80}	T_C = 80°C	95	A

Symbol	Conditions		Characteristic Values min.	typ.	max.	
V_F	I_F = 100 A; V_{GE} = 0 V;	T_{VJ} = 25°C		2.3	2.7	V
		T_{VJ} = 125°C		1.7		V
I_{RM}	I_F = 75 A; di_F/dt = -750 A/µs;			80		A
t_{rr}	V_R = 600 V; V_{GE} = 0 V;	T_{VJ} = 125°C		220		ns
R_{thJC}	(per IGBT)				0.45	K/W
R_{thJH}	with heatsink compound			0.9		K/W

Temperature Sensor NTC (...T version only)

Symbol	Conditions	Characteristic Values min.	typ.	max.	
R_{25}	T = 25°C $\left\{R(T) = R_{25} \cdot e^{B_{25/100}\left(\frac{1}{T} - \frac{1}{298K}\right)}\right\}$		2200		kΩ
$B_{25/100}$			3560		K

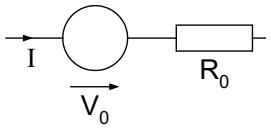
Module

Symbol	Conditions	Maximum Ratings	
T_{VJ}	operating	-40...+150	°C
T_{stg}		-40...+125	°C
V_{ISO}	I_{ISOL} ≤ 1 mA; 50/60 Hz	4000	V~
M_d	Mounting torque (module, M6)	2.25 - 2.75	Nm
	(terminal, M6)	4.5 - 5.5	Nm

Symbol	Conditions	Characteristic Values min.	typ.	max.	
d_S	Creepage distance on surface	2			mm
d_A	Strike distance in air	2			mm
Weight			250		g

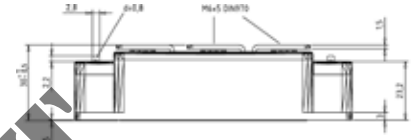
Equivalent Circuits for Simulation

Conduction

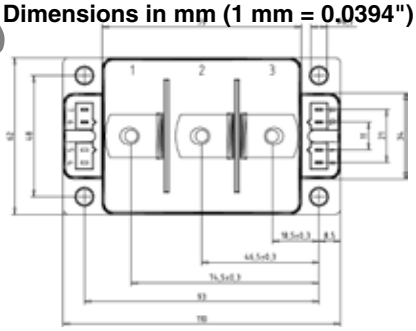


IGBT (typ. at V_{GE} = 15 V; T_J = 125°C)
V_0 = 1.0 V; R_0 = 5.3 mΩ

Free Wheeling Diode D1-D2 (typ. at T_J = 125°C)
V_0 = 1.3 V; R_0 = 1.3 mΩ



Dimensions in mm (1 mm = 0.0394")



Optional accessories for modules

keyed twin plugs
(UL758, style 1385, CSA class 5851, guide 460-1-1)

- Type ZY180L with wire length 350mm
  – for pins 11 (yellow wire) and 10 (red wire)
- Type ZY180R with wire length 350mm
  – for pins 8 (yellow wire) and 9 (red wire)