

# IGBT Module

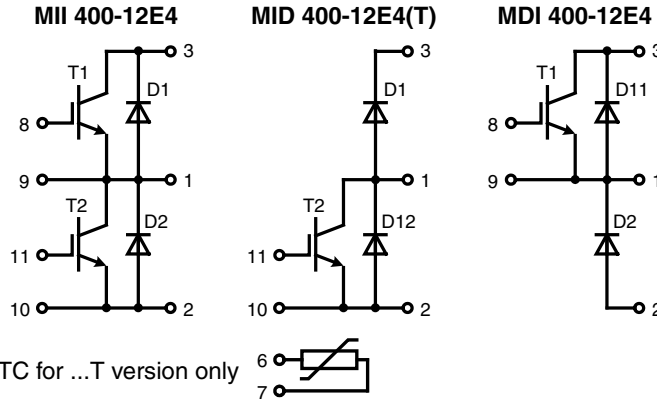
phaseleg and chopper topologies  
with optional temperature sensor

Preliminary Data

$$I_{C25} = 420 \text{ A}$$

$$V_{CES} = 1200 \text{ V}$$

$$V_{CE(sat) \text{ typ.}} = 2.2 \text{ V}$$



IGBTs T1 - T2		Maximum Ratings	
Symbol	Conditions		
$V_{CES}$	$T_{VJ} = 25^\circ\text{C to } 125^\circ\text{C}$	1200	V
$V_{GES}$		$\pm 20$	V
$I_{C25}$	$T_C = 25^\circ\text{C}$	420	A
$I_{C80}$	$T_C = 80^\circ\text{C}$	300	A
$I_{CM}$	$V_{GE} = \pm 15 \text{ V}; R_G = 4.7 \ \Omega; T_{VJ} = 125^\circ\text{C}$	450	A
$V_{CEK}$	<b>RBSOA</b> Clamped inductive load; $L = 100 \ \mu\text{H}$	$V_{CES}$	
$t_{SC}$ (SCSOA)	$V_{CE} = 900 \text{ V}; V_{GE} = \pm 15 \text{ V}; R_G = 4.7 \ \Omega$ $T_{VJ} = 125^\circ\text{C}; \text{non-repetitive}$	10	$\mu\text{s}$
$P_{tot}$	$T_C = 25^\circ\text{C}$	1700	W

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

## Features

- NPT<sup>3</sup> 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			
$I_{F25}$	$T_C = 25^\circ\text{C}$	450	A		
$I_{F80}$	$T_C = 80^\circ\text{C}$	290	A		
Symbol	Conditions	Characteristic Values			
		min.	typ.	max.	
$V_F$	$I_F = 300\text{ A}; V_{GE} = 0\text{ V};$ $T_{VJ} = 25^\circ\text{C}$ $T_{VJ} = 125^\circ\text{C}$		2.3 1.7	2.7	V V
$I_{RM}$ $t_{rr}$	$I_F = 225\text{ A}; di_F/dt = -2000\text{ A}/\mu\text{s};$ $V_R = 600\text{ V}; V_{GE} = 0\text{ V};$ $T_{VJ} = 125^\circ\text{C}$		200 220		A ns
$R_{thJC}$ $R_{thJH}$	(per IGBT) with heatsink compound		0.3	0.15	K/W K/W

### Chopper anti parallel diodes D11 - D12

Symbol	Conditions	Maximum Ratings			
$I_{F25}$	$T_C = 25^\circ\text{C}$	150	A		
$I_{F80}$	$T_C = 80^\circ\text{C}$	95	A		
Symbol	Conditions	Characteristic Values			
		min.	typ.	max.	
$V_F$	$I_F = 100\text{ A}; V_{GE} = 0\text{ V};$ $T_{VJ} = 25^\circ\text{C}$ $T_{VJ} = 125^\circ\text{C}$		2.3 1.7	2.7	V V
$I_{RM}$ $t_{rr}$	$I_F = 75\text{ A}; di_F/dt = -750\text{ A}/\mu\text{s};$ $V_R = 600\text{ V}; V_{GE} = 0\text{ V};$ $T_{VJ} = 125^\circ\text{C}$		80 220		A ns
$R_{thJC}$ $R_{thJH}$	(per IGBT) with heatsink compound		0.9	0.45	K/W K/W

### Temperature Sensor NTC (...T version only)

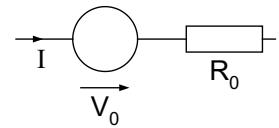
Symbol	Conditions	Characteristic Values			
		min.	typ.	max.	
$R_{25}$ $B_{25/100}$	$T = 25^\circ\text{C}$ $\left\{ R(T) = R_{25} \cdot e^{B_{25/100} \left( \frac{1}{T} - \frac{1}{298\text{K}} \right)} \right\}$		2200 3560		k $\Omega$ K

### Module

Symbol	Conditions	Maximum Ratings			
$T_{VJ}$ $T_{stg}$	operating	-40...+150		$^\circ\text{C}$	
		-40...+125		$^\circ\text{C}$	
$V_{ISO}$	$I_{ISOL} \leq 1\text{ mA}; 50/60\text{ Hz}$	4000		V~	
$M_d$	Mounting torque (module, M6) (terminal, M6)	2.25 - 2.75 4.5 - 5.5		Nm Nm	
Symbol	Conditions	Characteristic Values			
		min.	typ.	max.	
$d_s$ $d_A$	Creepage distance on surface Strike distance in air	2			mm mm
<b>Weight</b>			250		g

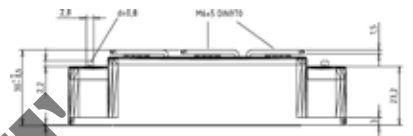
### Equivalent Circuits for Simulation

#### Conduction

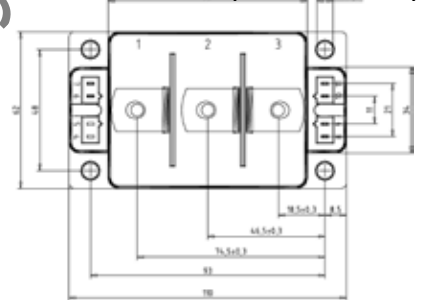


IGBT (typ. at  $V_{GE} = 15\text{ V}; T_J = 125^\circ\text{C}$ )  
 $V_0 = 1.0\text{ V}; R_0 = 5.3\text{ m}\Omega$

Free Wheeling Diode D1-D2 (typ. at  $T_J = 125^\circ\text{C}$ )  
 $V_0 = 1.3\text{ V}; R_0 = 1.3\text{ m}\Omega$



#### 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)