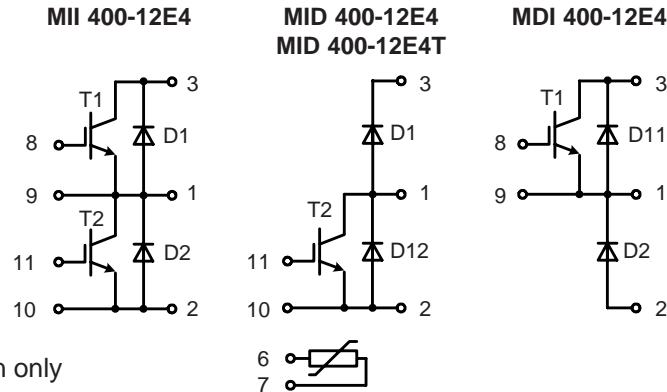


# IGBT Module

phaseleg and chopper topologies  
with optional temperature sensor

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



NTC for ...T version only



## IGBTs T1-T2

Symbol	Conditions	Maximum Ratings	
$V_{CES}$	$T_{VJ} = 25^\circ\text{C to } 150^\circ\text{C}$	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)	$V_{CE} = 900 \text{ V}; V_{GE} = \pm 15 \text{ V}; R_G = 4.7 \ \Omega; T_{VJ} = 125^\circ\text{C}$ non repetitive	10	$\mu\text{s}$
$P_{tot}$	$T_C = 25^\circ\text{C}$	1700	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<sup>TM</sup> 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

Symbol	Conditions	Characteristic Values ( $T_{VJ} = 25^\circ\text{C}$ , unless otherwise specified)			
		min.	typ.	max.	
$V_{CE(sat)}$	$I_C = 300 \text{ A}; V_{GE} = 15 \text{ V}; T_{VJ} = 25^\circ\text{C}$ $T_{VJ} = 125^\circ\text{C}$		2.2 2.6	2.8 V V	
$V_{GE(th)}$	$I_C = 10 \text{ mA}; V_{GE} = V_{CE}$	4.5		6.5 V	
$I_{CES}$	$V_{CE} = V_{CES}; V_{GE} = 0 \text{ V}; T_{VJ} = 25^\circ\text{C}$ $T_{VJ} = 125^\circ\text{C}$		0.8 3.5	3.3 mA mA	
$I_{GES}$	$V_{CE} = 0 \text{ V}; V_{GE} = \pm 20 \text{ V}$			600 nA	
$t_{d(on)}$ $t_r$ $t_{d(off)}$ $t_f$ $E_{on}$ $E_{off}$	Inductive load, $T_{VJ} = 125^\circ\text{C}$ $V_{CE} = 600 \text{ V}; I_C = 300 \text{ A}$ $V_{GE} = \pm 15 \text{ V}; R_G = 4.7 \ \Omega$		150 60 680 50 36 30	ns ns ns ns mJ mJ	
$C_{ies}$		$V_{CE} = 25 \text{ V}; V_{GE} = 0 \text{ V}; f = 1 \text{ MHz}$		17	nF
$Q_{Gon}$		$V_{CE} = 600 \text{ V}; V_{GE} = 15 \text{ V}; I_C = 300 \text{ A}$		2.25	$\mu\text{C}$
$R_{thJC}$ $R_{thJH}$		(per IGBT) with heatsink compound		0.15	0.08 K/W K/W

### Free wheeling diodes D1-D2

Symbol	Conditions	Maximum Ratings	
I <sub>F25</sub>	T <sub>C</sub> = 25°C	450	A
I <sub>F80</sub>	T <sub>C</sub> = 80°C	290	A

Symbol	Conditions	Characteristic Values		
		min.	typ.	max.
V <sub>F</sub>	I <sub>F</sub> = 300 A; V <sub>GE</sub> = 0 V; T <sub>VJ</sub> = 25°C T <sub>VJ</sub> = 125°C	2.3 1.7		V V
I <sub>RM</sub> t <sub>rr</sub>	I <sub>F</sub> = 225 A; di <sub>F</sub> /dt = -2000 A/μs; T <sub>VJ</sub> = 125°C V <sub>R</sub> = 600 V; V <sub>GE</sub> = 0 V	200		A ns
R <sub>thJC</sub> R <sub>thJH</sub>		(per diode) with heatsink compound	0.3	

### Chopper anti parallel diodes D11-D12

Symbol	Conditions	Maximum Ratings	
I <sub>F25</sub>	T <sub>C</sub> = 25°C	150	A
I <sub>F80</sub>	T <sub>C</sub> = 80°C	95	A

Symbol	Conditions	Characteristic Values		
		min.	typ.	max.
V <sub>F</sub>	I <sub>F</sub> = 100 A; V <sub>GE</sub> = 0 V; T <sub>VJ</sub> = 25°C T <sub>VJ</sub> = 125°C	2.3 1.7		V V
I <sub>RM</sub> t <sub>rr</sub>	I <sub>F</sub> = 75 A; di <sub>F</sub> /dt = -750 A/μs; T <sub>VJ</sub> = 125°C V <sub>R</sub> = 600 V; V <sub>GE</sub> = 0 V	80		A ns
R <sub>thJC</sub> R <sub>thJH</sub>		(per diode) with heatsink compound	0.9	

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

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

### Module

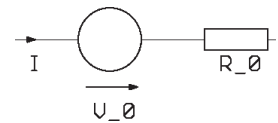
Symbol	Conditions	Maximum Ratings	
T <sub>VJ</sub> T <sub>stg</sub>		-40...+150 -40...+125	°C °C
V <sub>ISOL</sub>	I <sub>ISOL</sub> ≤ 1 mA; 50/60 Hz	4000	V~

M <sub>d</sub>	Mounting torque	(module, M6) (terminals, M6)	2.25 - 2.75 4.5 - 5.5	Nm Nm
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Symbol	Conditions	Characteristic Values		
		min.	typ.	max.
d <sub>s</sub>	Creepage distance on surface	2		mm
d <sub>A</sub>	Strike distance in air	2		mm
<b>Weight</b>		250		g

### Equivalent Circuits for Simulation

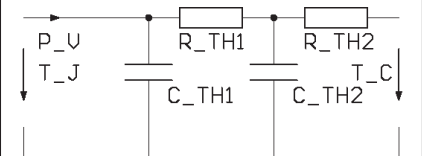
#### Conduction



IGBT (typ. at V<sub>GE</sub> = 15 V; T<sub>J</sub> = 125°C)  
V<sub>0</sub> = 1.0 V; R<sub>0</sub> = 5.3 mΩ

Free Wheeling Diode D1-D2 (typ. at T<sub>J</sub>=125°C)  
V<sub>0</sub> = 1.3 V; R<sub>0</sub> = 1.3 mΩ

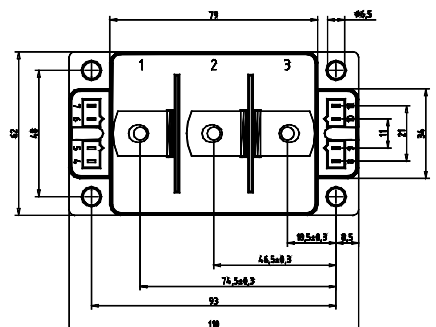
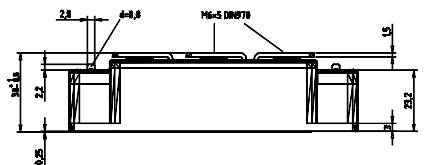
#### Thermal Response



IGBT (typ.)  
C<sub>th1</sub> = 0.52 J/K; R<sub>th1</sub> = 0.078 K/W  
C<sub>th2</sub> = 1.29 J/K; R<sub>th2</sub> = 0.002 K/W

Free Wheeling Diode D1-D2 (typ.)  
C<sub>th1</sub> = 0.43 J/K; R<sub>th1</sub> = 0.147 K/W  
C<sub>th2</sub> = 0.79 J/K; R<sub>th2</sub> = 0.003 K/W

### 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 4 (yellow wire) and 5 (red wire) – for pins 11 (yellow wire) and 10 (red wire)

- Type ZY180R with wire length 350mm – for pins 7 (yellow wire) and 6 (red wire) – for pins 8 (yellow wire) and 9 (red wire)

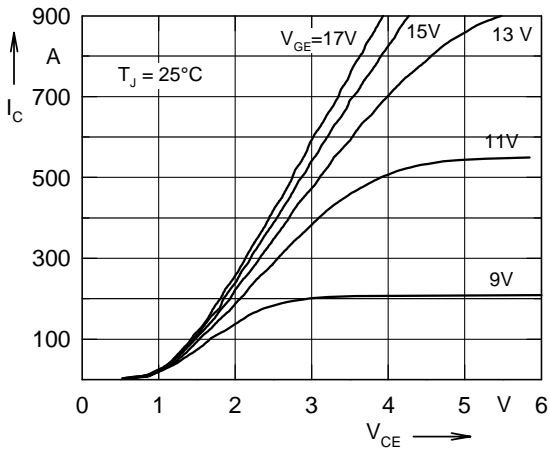


Fig. 1 Typ. output characteristics

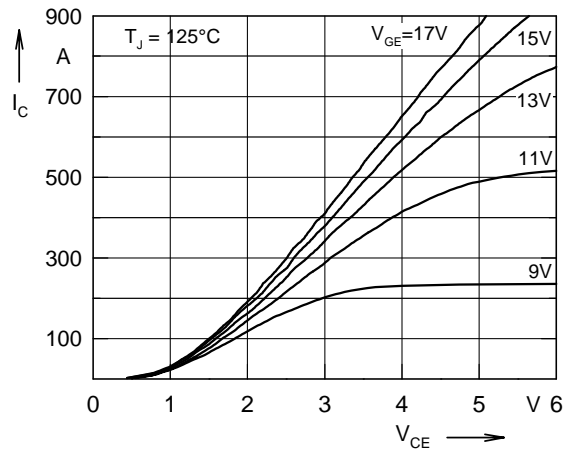


Fig. 2 Typ. output characteristics

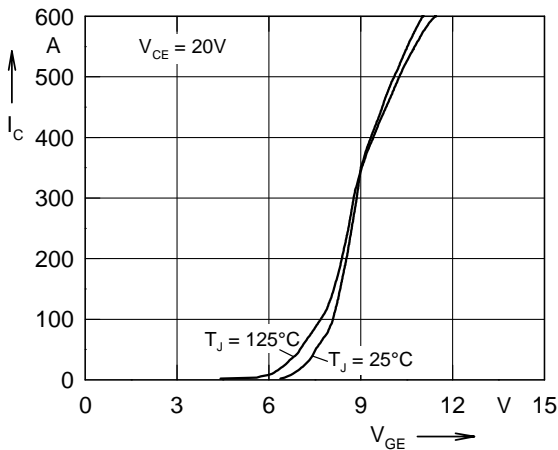


Fig. 3 Typ. transfer characteristics

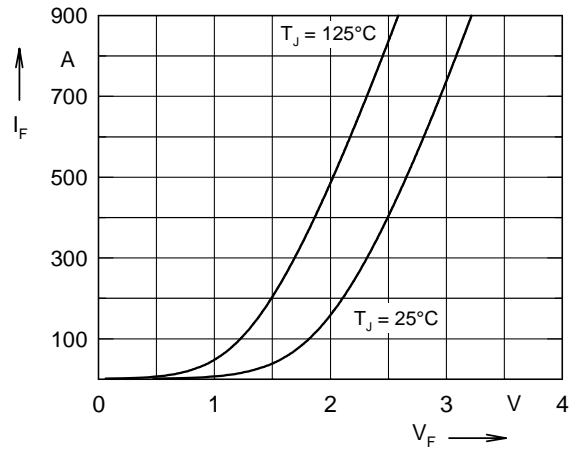


Fig. 4 Typ. forward characteristics of free wheeling diode D1-D2

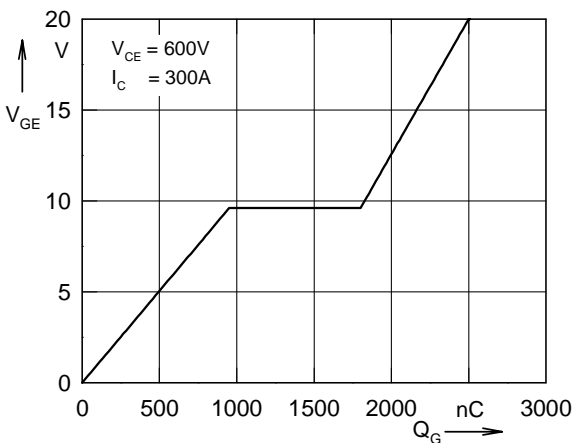


Fig. 5 Typ. turn on gate charge

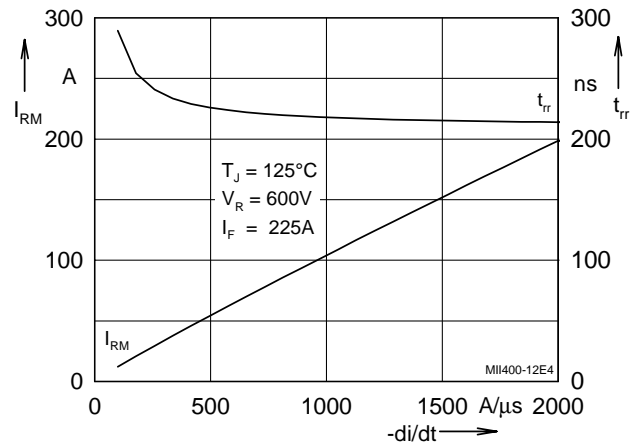


Fig. 6 Typ. turn off characteristics of free wheeling diode D1-D2

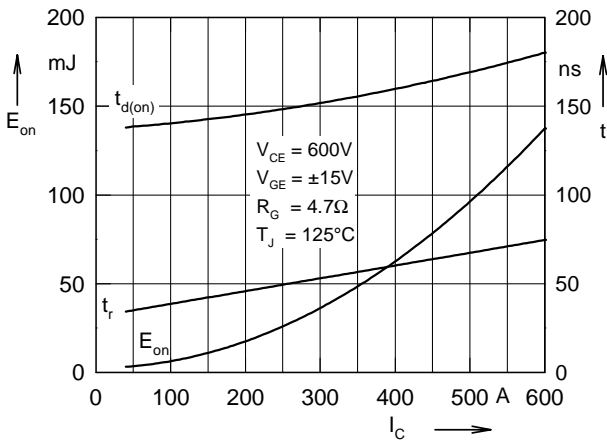


Fig. 7 Typ. turn on energy and switching times versus collector current

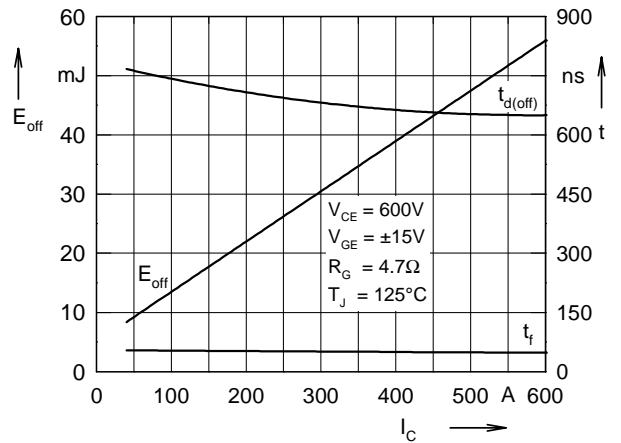


Fig. 8 Typ. turn off energy and switching times versus collector current

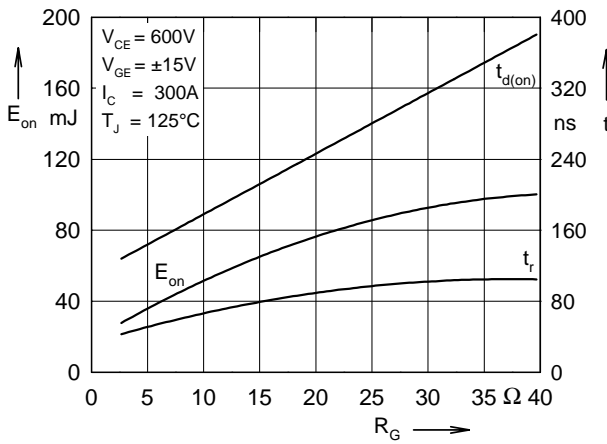


Fig. 9 Typ. turn on energy and switching times versus gate resistor

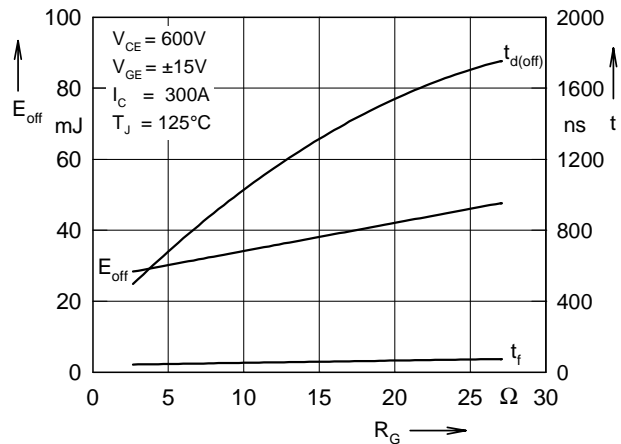


Fig.10 Typ. turn off energy and switching times versus gate resistor

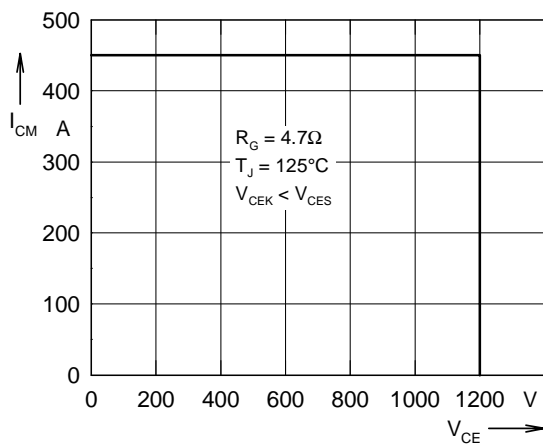


Fig. 11 Reverse biased safe operating area RBSOA

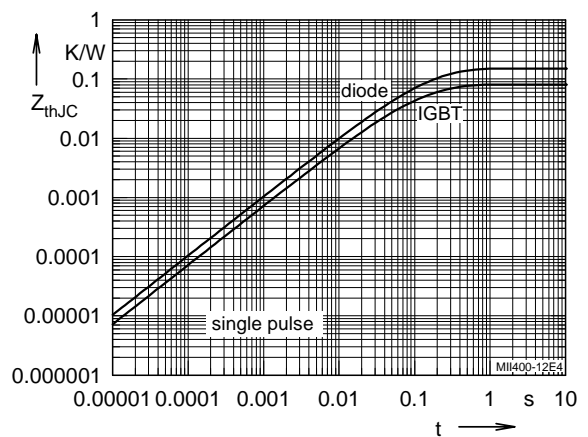


Fig. 12 Typ. transient thermal impedance