



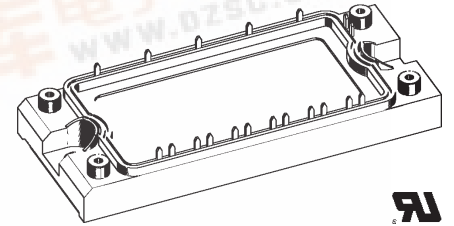
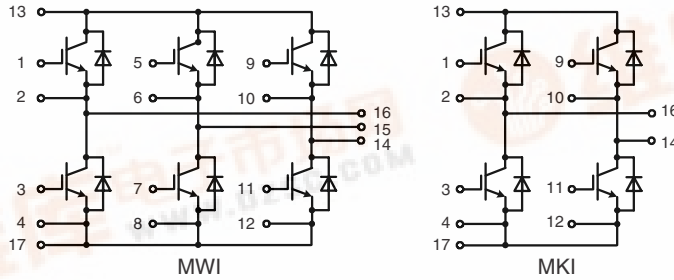
MWI 50-12 E7  
MKI 50-12 E7

# IGBT Modules

## Sixpack, H Bridge

Short Circuit SOA Capability  
Square RBSOA

$I_{C25} = 90 \text{ A}$   
 $V_{CES} = 1200 \text{ V}$   
 $V_{CE(sat) \text{ typ.}} = 1.9 \text{ V}$



### IGBTs

Symbol	Conditions	Maximum Ratings
$V_{CES}$	$T_{VJ} = 25^{\circ}\text{C to } 150^{\circ}\text{C}$	1200 V
$V_{GES}$		$\pm 20$ V
$I_{C25}$	$T_C = 25^{\circ}\text{C}$	90 A
$I_{C80}$	$T_C = 80^{\circ}\text{C}$	62 A
$I_{CM}$ $V_{CEK}$	$V_{GE} = \pm 15 \text{ V}; R_G = 22 \Omega; T_{VJ} = 125^{\circ}\text{C}$ RBSOA; clamped inductive load; $L = 100 \mu\text{H}$	100 V $V_{CES}$ A
$t_{SC}$	$V_{CE} = 900 \text{ V}; V_{GE} = \pm 15 \text{ V}; R_G = 22 \Omega; T_{VJ} = 125^{\circ}\text{C}$ SCSOA; non-repetitive	10 $\mu\text{s}$
$P_{tot}$	$T_C = 25^{\circ}\text{C}$	350 W

### Features

- NPT<sup>3</sup> IGBTs
  - low saturation voltage
  - positive temperature coefficient for easy paralleling
  - fast switching
  - short tail current for optimized performance also in resonant circuits
- HiPerFRED™ diode:
  - fast reverse recovery
  - low operating forward voltage
  - low leakage current
- Industry Standard Package
  - solderable pins for PCB mounting
  - isolated copper base plate
  - UL registered, E 72873

Symbol	Conditions	Characteristic Values ( $T_{VJ} = 25^{\circ}\text{C}$ , unless otherwise specified)			
		min.	typ.	max.	
$V_{CE(sat)}$	$I_C = 50 \text{ A}; V_{GE} = 15 \text{ V}; T_{VJ} = 25^{\circ}\text{C}$ $T_{VJ} = 125^{\circ}\text{C}$		1.9 2.1	V V	
$V_{GE(th)}$	$I_C = 2 \text{ mA}; V_{GE} = V_{CE}$	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	0.8 mA mA	
$I_{GES}$	$V_{CE} = 0 \text{ V}; V_{GE} = \pm 20 \text{ V}$			200 nA	
$t_{d(on)}$ $t_r$ $t_{d(off)}$ $t_f$ $E_{on}$ $E_{off}$	Inductive load, $T_{VJ} = 125^{\circ}\text{C}$ $V_{CE} = 600 \text{ V}; I_C = 50 \text{ A}$ $V_{GE} = \pm 15 \text{ V}; R_G = 22 \Omega$		80 50 680 30 6.0 4.0	ns ns ns ns mJ mJ	
$C_{ies}$		$V_{CE} = 25 \text{ V}; V_{GE} = 0 \text{ V}; f = 1 \text{ MHz}$		3.8	nF
$Q_{Gon}$		$V_{CE} = 600 \text{ V}; V_{GE} = 15 \text{ V}; I_C = 50 \text{ A}$		350	nC
$R_{thJC}$		(per IGBT)			0.35 K/W

### Typical Applications

- MWI
  - AC drives
  - power supplies with power factor correction
- MKI
  - motor control
    - . DC motor amature winding
    - . DC motor excitation winding
    - . synchronous motor excitation winding
  - supply of transformer primary winding
    - . power supplies
    - . welding
    - . X-ray
    - . battery charger

## Diodes

Symbol	Conditions	Maximum Ratings	
$I_{F25}$	$T_C = 25^\circ\text{C}$	110	A
$I_{F80}$	$T_C = 80^\circ\text{C}$	70	A

Symbol	Conditions	Characteristic Values		
		min.	typ.	max.
$V_F$	$I_F = 50\text{ A}; V_{GE} = 0\text{ V}; T_{VJ} = 25^\circ\text{C}$ $T_{VJ} = 125^\circ\text{C}$	2.2 1.6	2.6	V V
$I_{RM}$ $t_{rr}$	$I_F = 50\text{ A}; di_F/dt = -500\text{ A}/\mu\text{s}; T_{VJ} = 125^\circ\text{C}$ $V_R = 600\text{ V}; V_{GE} = 0\text{ V}$	40 200		A ns
$R_{thJC}$	(per diode)			0.61 K/W

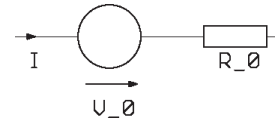
## Module

Symbol	Conditions	Maximum Ratings	
$T_{VJ}$	operating	-40...+125	°C
$T_{VJM}$		-40...+150	°C
$T_{stg}$		-40...+125	°C
$V_{ISOL}$	$I_{ISOL} \leq 1\text{ mA}; 50/60\text{ Hz}$	2500	V~
$M_d$	Mounting torque (M5)	2.7 - 3.3	Nm

Symbol	Conditions	Characteristic Values		
		min.	typ.	max.
$R_{pin-chip}$			5	mΩ
$d_S$	Creepage distance on surface	6		mm
$d_A$	Strike distance in air	6		mm
$R_{thCH}$	with heatsink compound		0.02	K/W
<b>Weight</b>			180	g

## Equivalent Circuits for Simulation

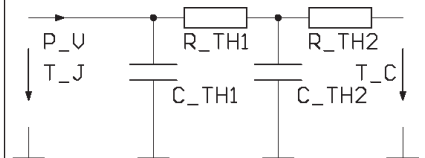
### Conduction



IGBT (typ. at  $V_{GE} = 15\text{ V}; T_J = 125^\circ\text{C}$ )  
 $V_0 = 0.95\text{ V}; R_0 = 24\text{ m}\Omega$

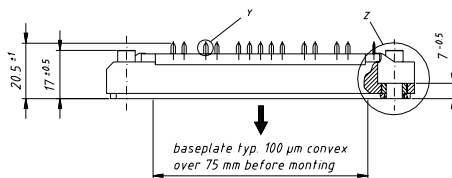
Free Wheeling Diode (typ. at  $T_J = 125^\circ\text{C}$ )  
 $V_0 = 1.3\text{ V}; R_0 = 6\text{ m}\Omega$

### Thermal Response

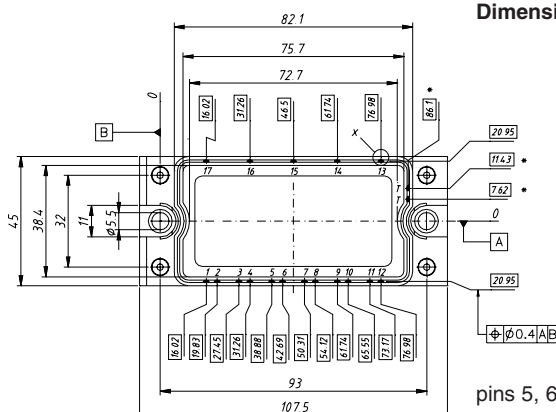


IGBT (typ.)  
 $C_{th1} = 0.22\text{ J/K}; R_{th1} = 0.26\text{ K/W}$   
 $C_{th2} = 1.74\text{ J/K}; R_{th2} = 0.09\text{ K/W}$

Free Wheeling Diode (typ.)  
 $C_{th1} = 0.151\text{ J/K}; R_{th1} = 0.483\text{ K/W}$   
 $C_{th2} = 1.003\text{ J/K}; R_{th2} = 0.127\text{ K/W}$

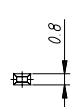


Dimensions in mm (1 mm = 0.0394")

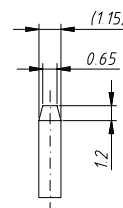


pins 5, 6, 7, 8 and 15 for MWI only

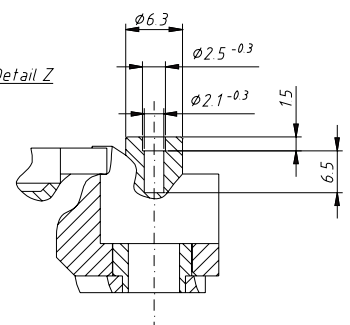
Detail X



Detail Y



Detail Z



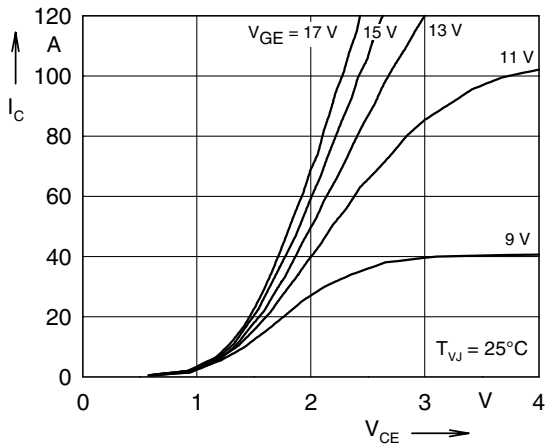


Fig. 1 Typ. output characteristics

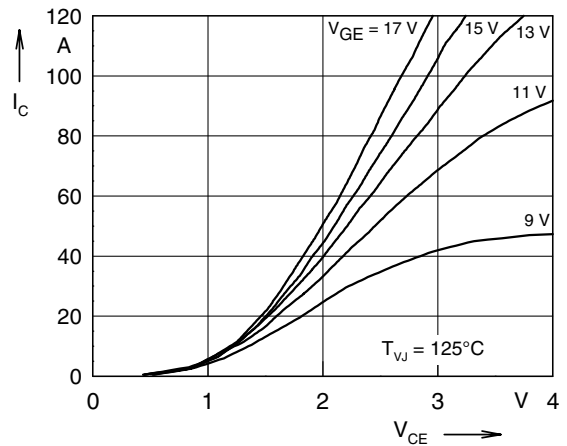


Fig. 2 Typ. output characteristics

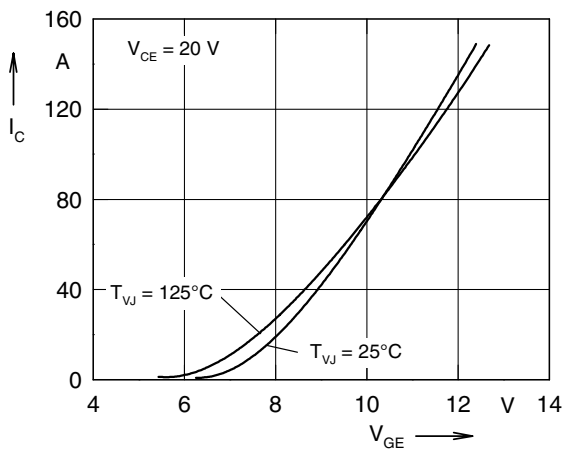


Fig. 3 Typ. transfer characteristics

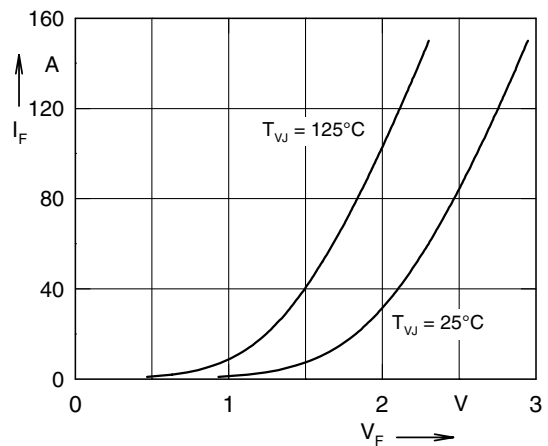


Fig. 4 Typ. forward characteristics of free wheeling diode

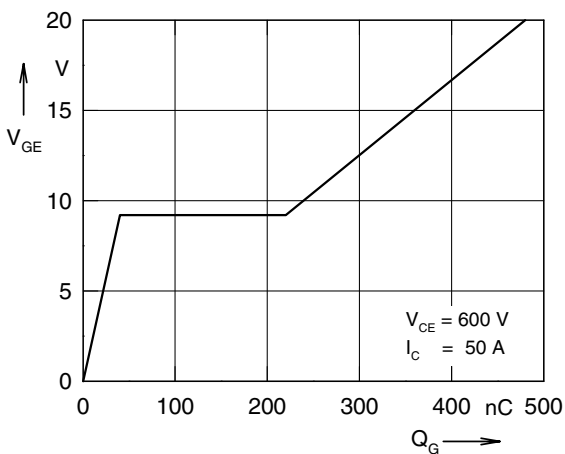


Fig. 5 Typ. turn on gate charge

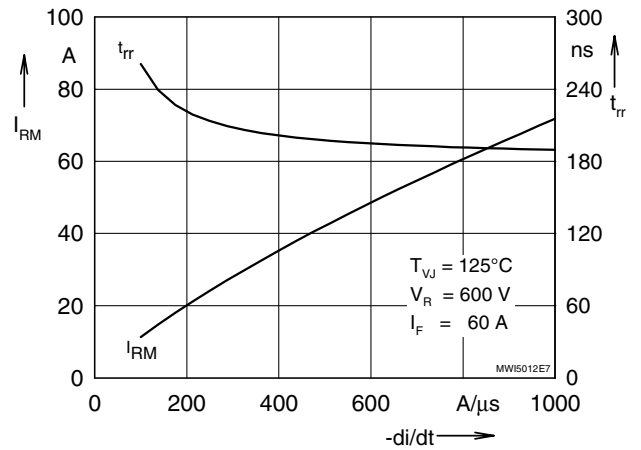


Fig. 6 Typ. turn off characteristics of free wheeling diode

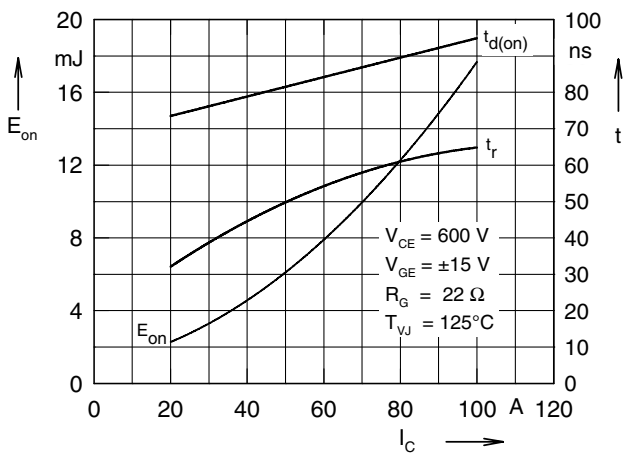


Fig. 7 Typ. turn on energy and switching times versus collector current

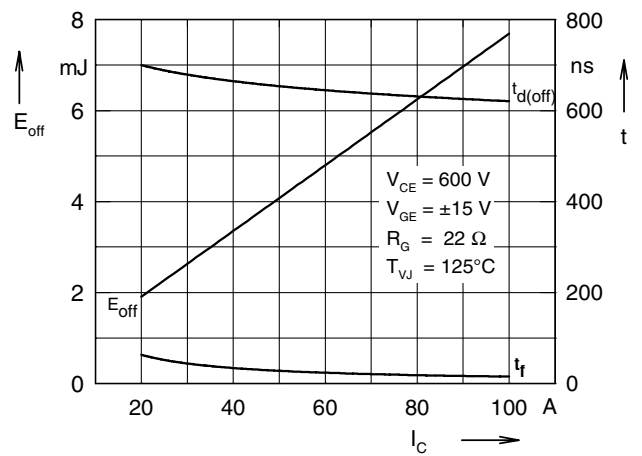


Fig. 8 Typ. turn off energy and switching times versus collector current

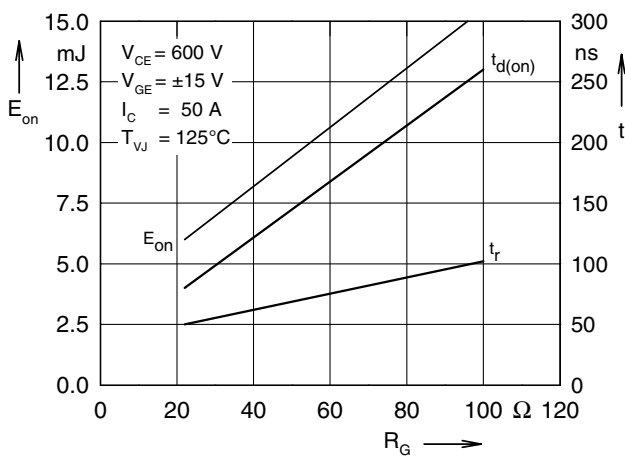


Fig. 9 Typ. turn on energy and switching times versus gate resistor

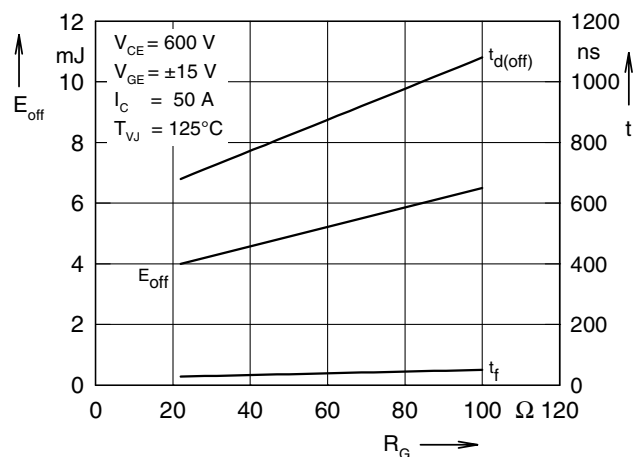


Fig. 10 Typ. turn off energy and switching times versus gate resistor

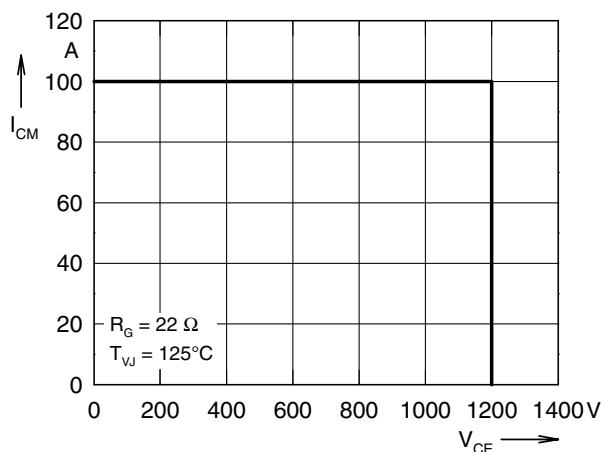


Fig. 11 Reverse biased safe operating area RBSOA

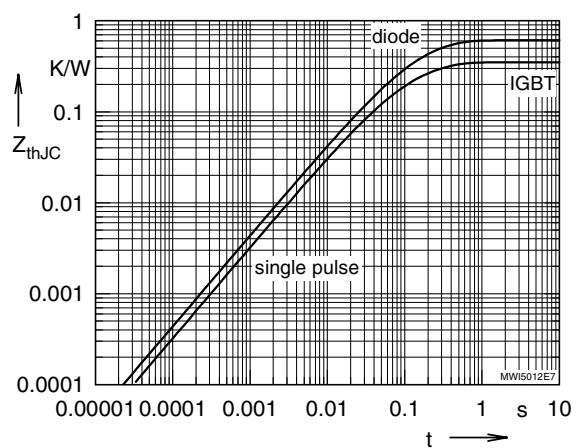


Fig. 12 Typ. transient thermal impedance