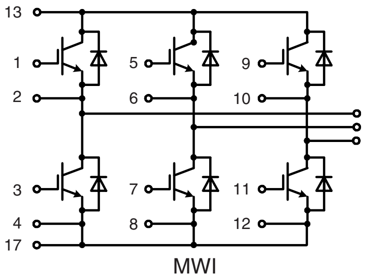
IGBT Modules

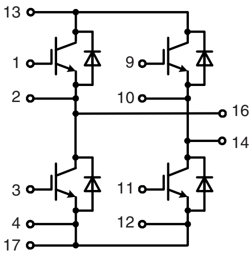
Sixpack, H Bridge

Short Circuit SOA Capability
Square RBSOA

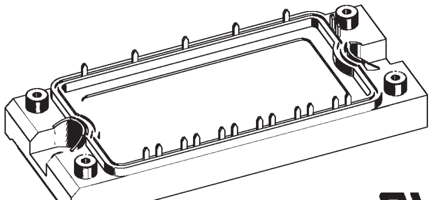
I_{C25} = 90 A
V_{CES} = 1200 V
$V_{CE(sat)\ typ.}$ = 1.9 V



MWI



MKI



IGBTs

Symbol	Conditions	Maximum Ratings	
V_{CES}	T_{VJ} = 25°C to 150°C	1200	V
V_{GES}		± 20	V
I_{C25}	T_C = 25°C	90	A
I_{C80}	T_C = 80°C	62	A
I_{CM}	V_{GE} = ±15 V; R_G = 22 Ω; T_{VJ} = 125°C	100	A
V_{CEK}	RBSOA; clamped inductive load; L = 100 µH	V_{CES}	
t_{SC}	V_{CE} = 900 V; V_{GE} = ±15 V; R_G = 22 Ω; T_{VJ} = 125°C SCSOA; non-repetitive	10	µs
P_{tot}	T_C = 25°C	350	W

Symbol	Conditions Characteristic Values (T_{VJ} = 25°C, unless otherwise specified)	min.	typ.	max.	
$V_{CE(sat)}$	I_C = 50 A; V_{GE} = 15 V; T_{VJ} = 25°C		1.9	2.4	V
	T_{VJ} = 125°C		2.1		V
$V_{GE(th)}$	I_C = 2 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	mA
	T_{VJ} = 125°C		0.8		mA
I_{GES}	V_{CE} = 0 V; V_{GE} = ± 20 V			200	nA
$t_{d(on)}$	Inductive load, T_{VJ} = 125°C V_{CE} = 600 V; I_C = 50 A V_{GE} = ±15 V; R_G = 22 Ω		80		ns
t_r			50		ns
$t_{d(off)}$			680		ns
t_f			30		ns
E_{on}			6.0		mJ
E_{off}			4.0		mJ
C_{ies}	V_{CE} = 25 V; V_{GE} = 0 V; f = 1 MHz		3.8		nF
Q_{Gon}	V_{CE} = 600 V; V_{GE} = 15 V; I_C = 50 A		350		nC
R_{thJC}	(per IGBT)			0.35	K/W

Features

- NPT³ 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

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

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Diodes

Symbol	Conditions	Maximum Ratings	
I_{F25}	T_C = 25°C	110	A
I_{F80}	T_C = 80°C	70	A

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

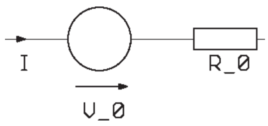
Module

Symbol	Conditions	Maximum Ratings	
T_{VJ}	operating	-40...+125	°C
T_{VJM}		-40...+150	°C
T_{stg}		-40...+125	°C
V_{ISOL}	I_{ISOL} ≤ 1 mA; 50/60 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
Weight			180		g

Equivalent Circuits for Simulation

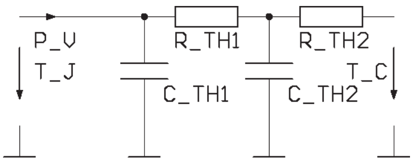
Conduction



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

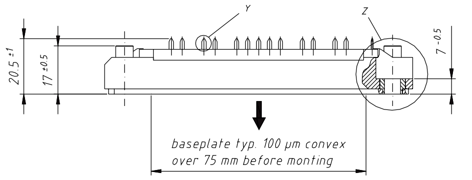
Free Wheeling Diode (typ. at T_J = 125°C)
$V_0 = 1.3\ V;\ R_0 = 6\ m\Omega$

Thermal Response

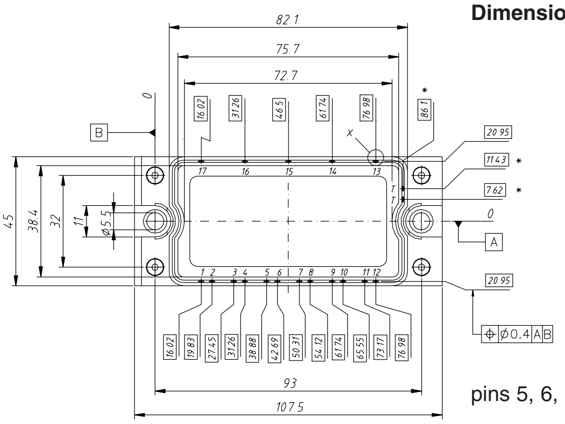


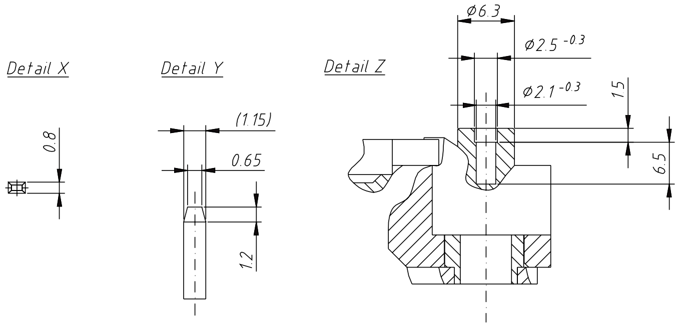
IGBT (typ.)
$C_{th1} = 0.22\ J/K;\ R_{th1} = 0.26\ K/W$
$C_{th2} = 1.74\ J/K;\ R_{th2} = 0.09\ K/W$

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



Dimensions in mm (1 mm = 0.0394")





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

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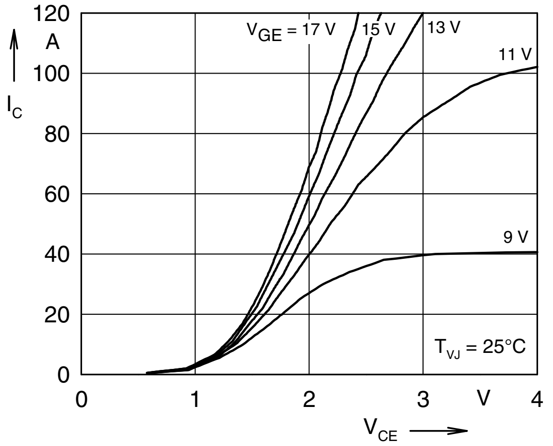

Fig. 1 Typ. output characteristics

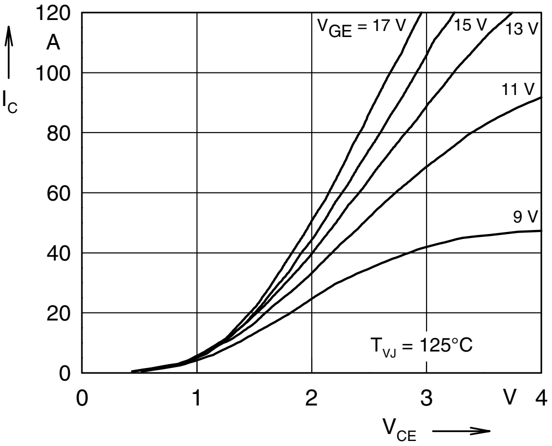

Fig. 2 Typ. output characteristics

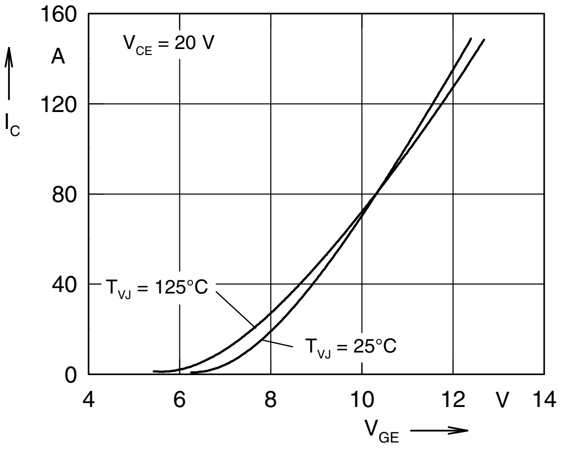

Fig. 3 Typ. transfer characteristics

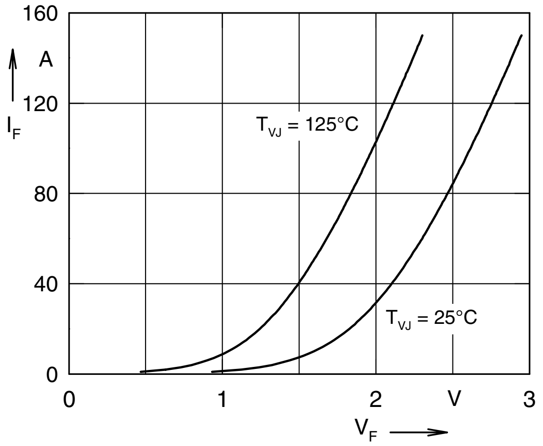

Fig. 4 Typ. forward characteristics of free wheeling diode

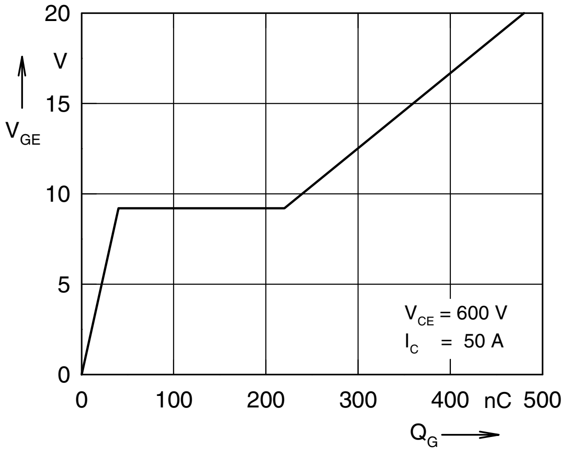

Fig. 5 Typ. turn on gate charge

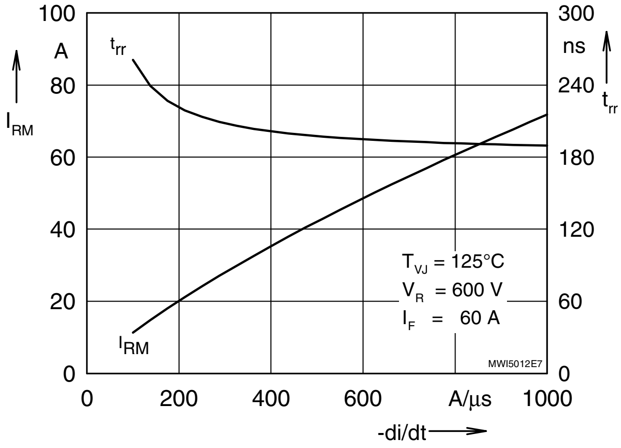

Fig. 6 Typ. turn off characteristics of free wheeling diode

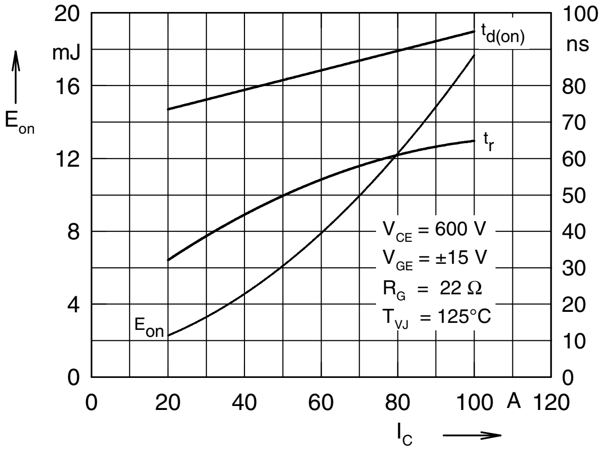

Fig. 7 Typ. turn on energy and switching times versus collector current

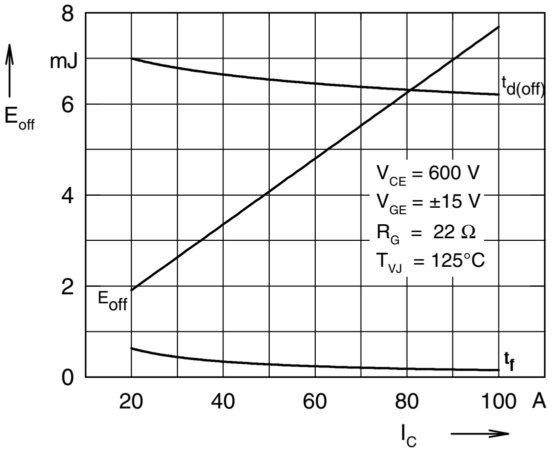

Fig. 8 Typ. turn off energy and switching times versus collector current

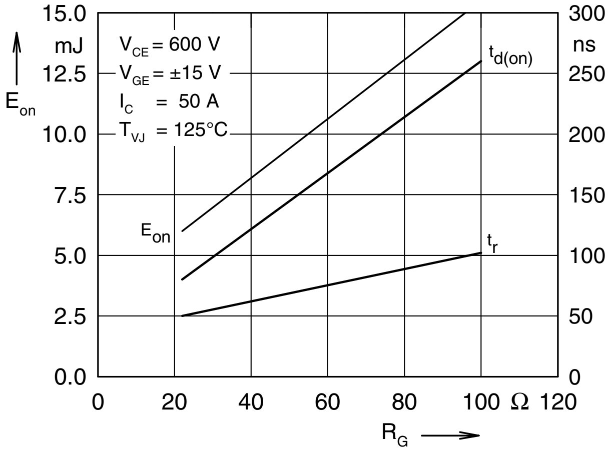

Fig. 9 Typ. turn on energy and switching times versus gate resistor

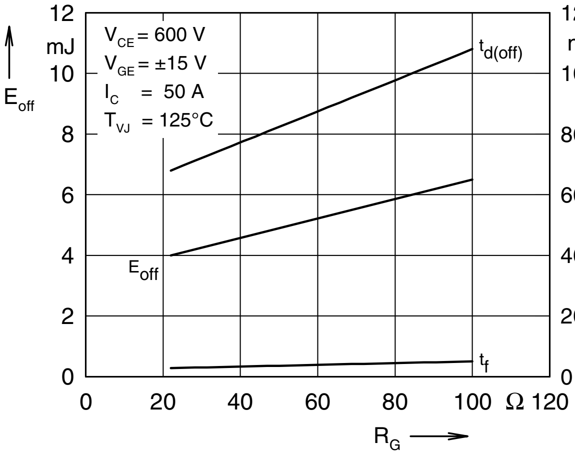

Fig.10 Typ. turn off energy and switching times versus gate resistor

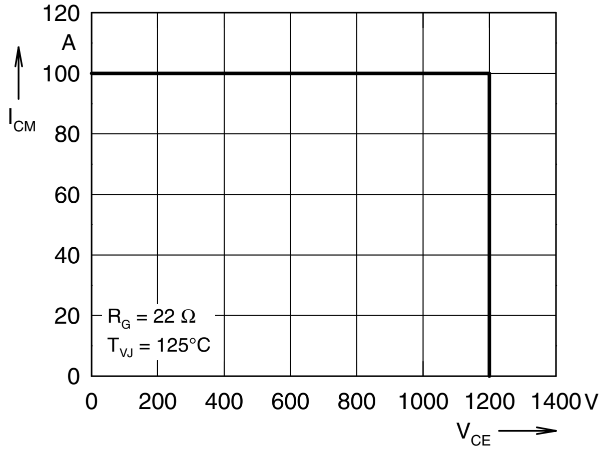

Fig. 11 Reverse biased safe operating area RBSOA

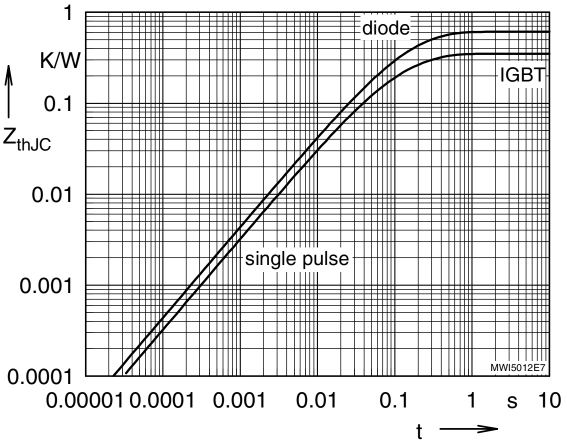

Fig. 12 Typ. transient thermal impedance

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