



**THE DATASHEET OF
MKI50-12E7**

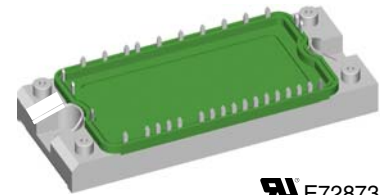
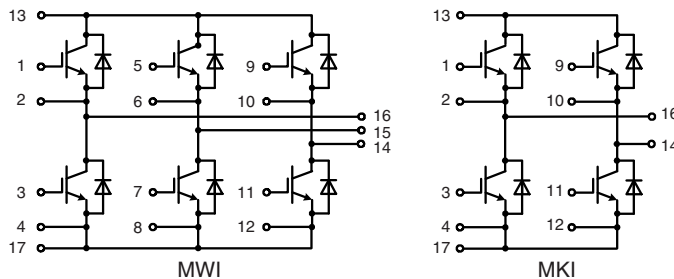


IGBT Modules

Sixpack, H Bridge

Short Circuit SOA Capability
 Square RBSOA

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



IXYS E72873

See outline drawing for pin arrangement

IGBTs

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

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	2.6	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		A
		200		ns
R_{thJC}	(per diode)			0.61 K/W

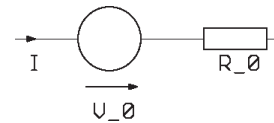
Module

Symbol	Conditions	Maximum Ratings	
T_{VJ}	operating	-40...+125	$^\circ\text{C}$
T_{VJM}		-40...+150	$^\circ\text{C}$
T_{stg}		-40...+125	$^\circ\text{C}$
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	m Ω
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

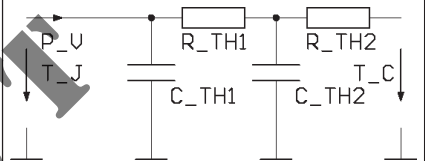
Conduction



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

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

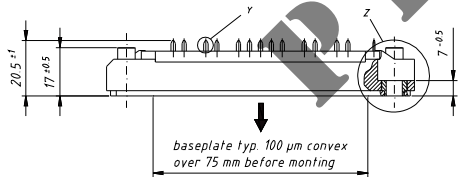


IGBT (typ.)

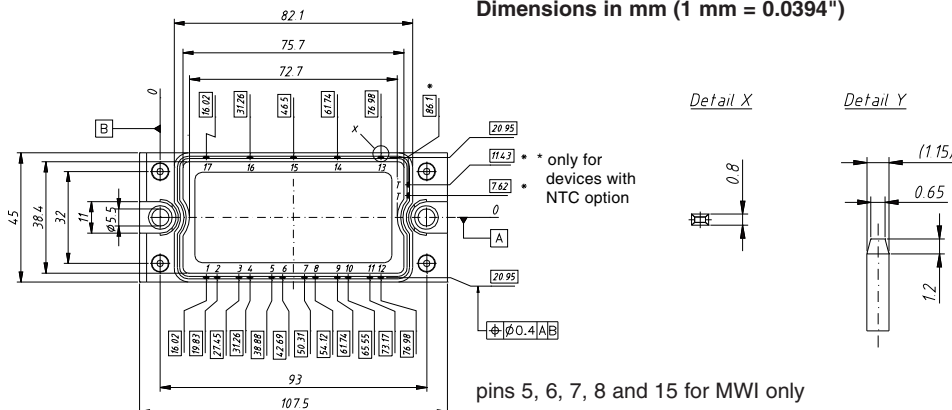
$C_{th1} = 0.22\text{ J/K}; R_{th1} = 0.26\text{ K/W}$
 $C_{th2} = 1.74\text{ J/K}; R_{th2} = 0.09\text{ K/W}$

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")



20070912a

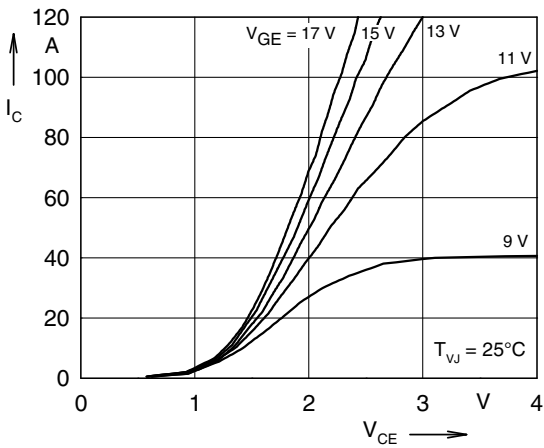


Fig. 1 Typ. output characteristics

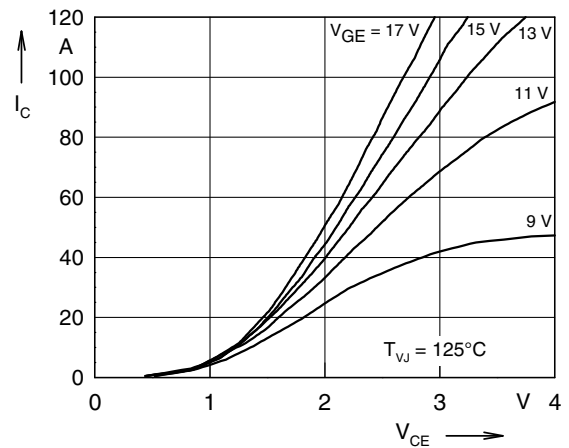


Fig. 2 Typ. output characteristics

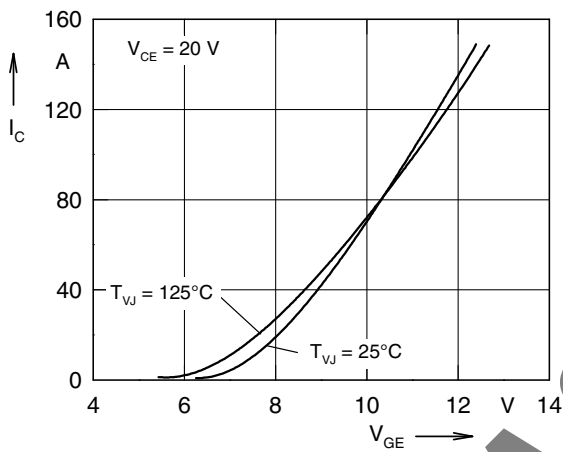


Fig. 3 Typ. transfer characteristics

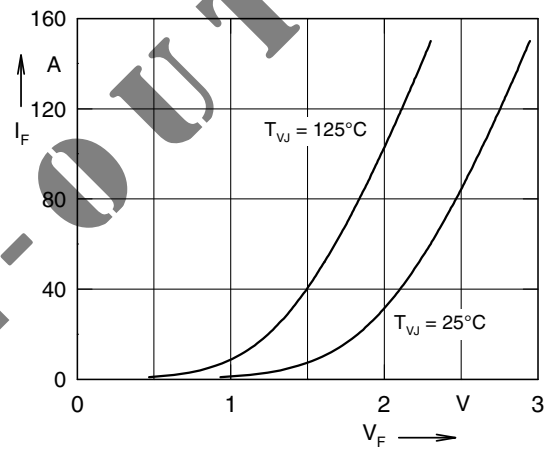


Fig. 4 Typ. forward characteristics of free wheeling diode

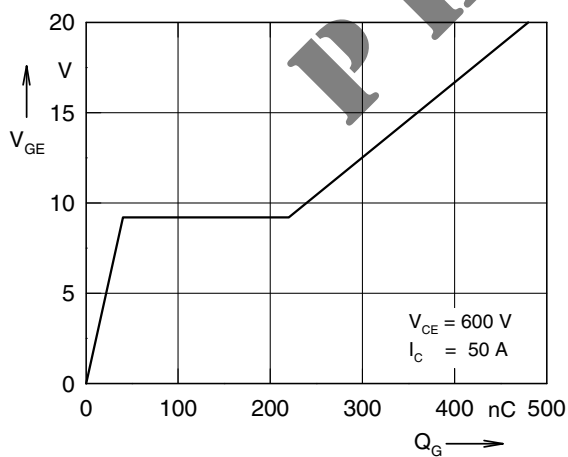


Fig. 5 Typ. turn on gate charge

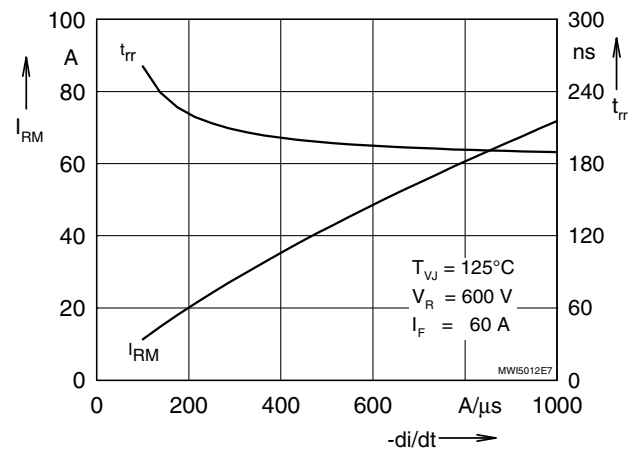


Fig. 6 Typ. turn off characteristics of free wheeling diode

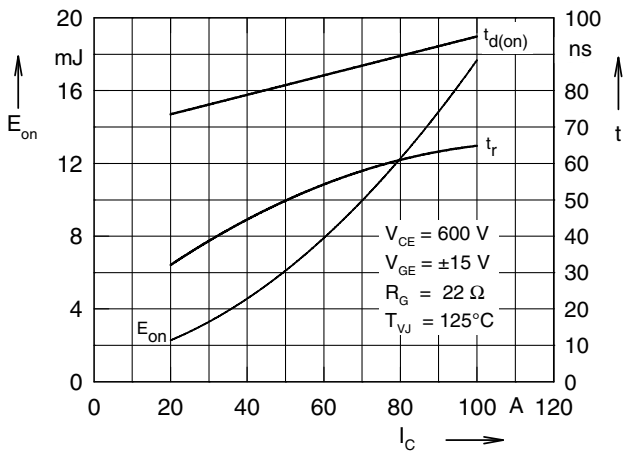


Fig. 7 Typ. turn on energy and switching times versus collector current

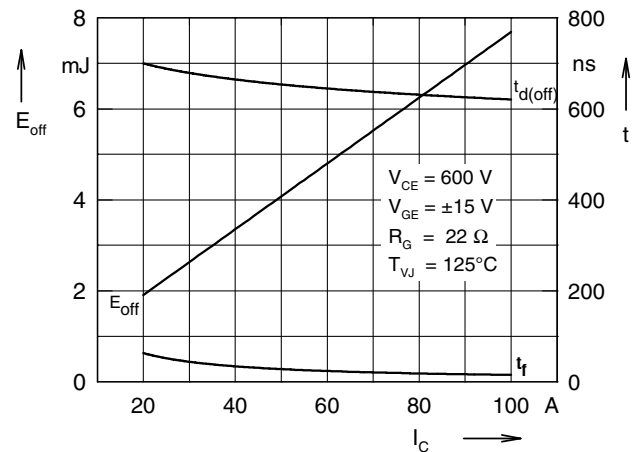


Fig. 8 Typ. turn off energy and switching times versus collector current

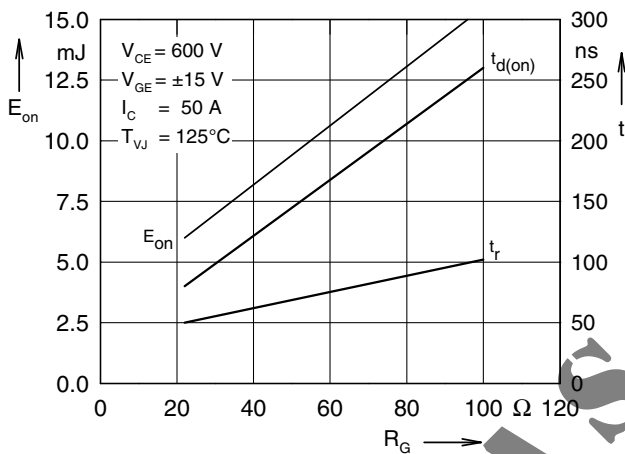


Fig. 9 Typ. turn on energy and switching times versus gate resistor

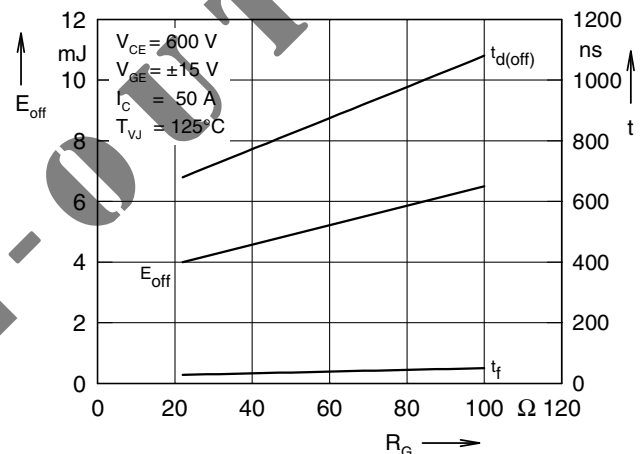


Fig. 10 Typ. turn off energy and switching times versus gate resistor

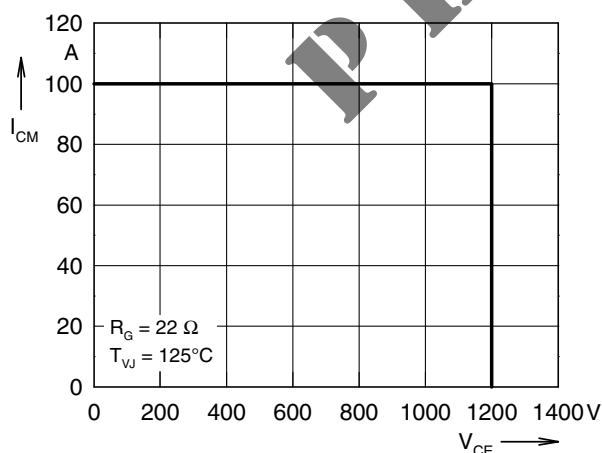


Fig. 11 Reverse biased safe operating area RBSOA

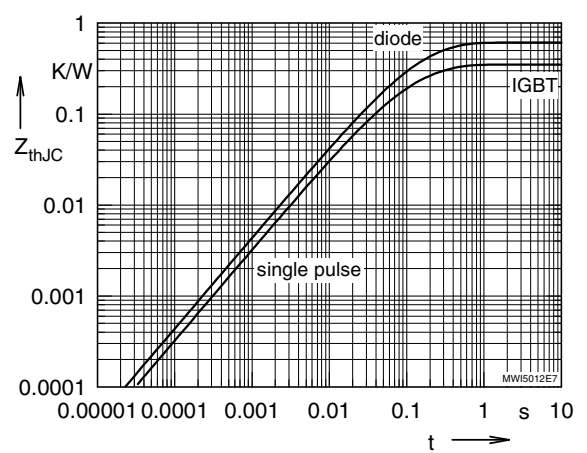


Fig. 12 Typ. transient thermal impedance

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