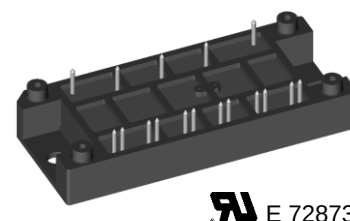
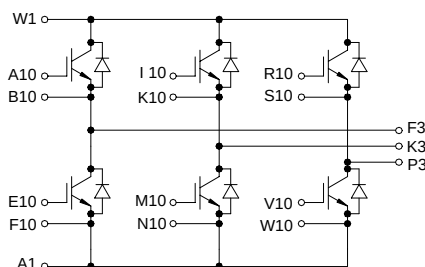


IGBT Modules

Sixpack

$$\begin{aligned} I_{C25} &= 90 \text{ A} \\ V_{CES} &= 1200 \text{ V} \\ V_{CE(sat) \text{ typ.}} &= 2.2 \text{ V} \end{aligned}$$

Short Circuit SOA Capability
Square RBSOA



Preliminary data

Symbol	Conditions	Maximum Ratings	
V_{CES}	$T_J = 25^\circ\text{C to } 150^\circ\text{C}$	1200	V
V_{CGR}	$T_J = 25^\circ\text{C to } 150^\circ\text{C}; R_{GE} = 20 \text{ k}\Omega$	1200	V
V_{GES}	Continuous	± 20	V
V_{GEM}	Transient	± 30	V
I_{C25}	$T_C = 25^\circ\text{C}$	90	A
I_{C80}	$T_C = 80^\circ\text{C}$	60	A
I_{CM}	$T_C = 80^\circ\text{C}, t_p = 1 \text{ ms}$	120	A
t_{SC} (SCSOA)	$V_{GE} = \pm 15 \text{ V}, V_{CE} = V_{CES}, T_J = 125^\circ\text{C}$ $R_G = 22 \Omega$, non repetitive	10	μs
RBSOA	$V_{GE} = \pm 15 \text{ V}, T_J = 125^\circ\text{C}, R_G = 22 \Omega$ Clamped inductive load, $L = 100 \mu\text{H}$	$I_{CM} = 100$ $V_{CEK} \leq V_{CES}$	A
P_{tot}	$T_C = 25^\circ\text{C}$	370	W
T_J		150	$^\circ\text{C}$
T_{stg}		-40 ... +150	$^\circ\text{C}$
V_{ISOL}	50/60 Hz, RMS $t = 1 \text{ min}$ $I_{ISOL} \leq 1 \text{ mA}$ $t = 1 \text{ s}$ Insulating material: Al_2O_3	4000 4800	V~ V~
M_d	Mounting torque (M5)	2.0 - 2.5 18 - 22	Nm lb.in.
d_s	Creepage distance on surface	9	mm
d_A	Strike distance through air	9	mm
a	Max. allowable acceleration	50	m/s^2
Weight	Typical	80 2.8	g oz.

Data according to a single IGBT/FRED unless otherwise stated.

Features

- NPT IGBT technology
- low saturation voltage
- low switching losses
- switching frequency up to 30 kHz
- square RBSOA, no latch up
- high short circuit capability
- positive temperature coefficient for easy paralleling
- MOS input, voltage controlled
- ultra fast free wheeling diodes
- solderable pins for PCB mounting
- package with DCB ceramic base plate
- isolation voltage 4800 V
- UL registered E72873

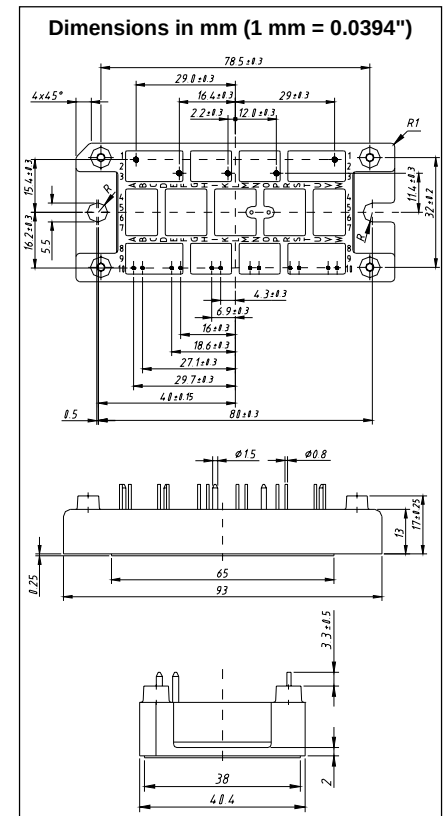
Advantages

- space and weight savings
- reduced protection circuits
- package designed for wave soldering

Typical Applications

- AC motor control
- AC servo and robot drives
- power supplies

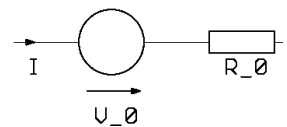
Symbol	Conditions	Characteristic Values ($T_J = 25^\circ\text{C}$, unless otherwise specified)		
		min.	typ.	max.
$V_{(BR)CES}$	$V_{GE} = 0\text{ V}$	1200		V
$V_{GE(th)}$	$I_C = 2\text{ mA}$, $V_{CE} = V_{GE}$	4.5		6.5 V
I_{CES}	$V_{CE} = V_{CES}$ $T_J = 25^\circ\text{C}$ $T_J = 125^\circ\text{C}$		6	4 mA mA
I_{GES}	$V_{CE} = 0\text{ V}$, $V_{GE} = \pm 20\text{ V}$			± 200 nA
$V_{CE(sat)}$	$I_C = 50\text{ A}$, $V_{GE} = 15\text{ V}$		2.2	2.7 V
C_{ies}	$V_{CE} = 25\text{ V}$, $V_{GE} = 0\text{ V}$, $f = 1\text{ MHz}$		3300	pF
C_{oes}			500	pF
C_{res}			220	pF
$t_{d(on)}$	Inductive load, $T_J = 125^\circ\text{C}$ $I_C = 50\text{ A}$, $V_{GE} = \pm 15\text{ V}$ $V_{CE} = 600\text{ V}$, $R_G = 22\ \Omega$		100	ns
t_r			70	ns
$t_{d(off)}$			500	ns
t_f			70	ns
E_{on}			7.6	mJ
E_{off}			5.6	mJ
R_{thJC}	with heatsink compound			0.33 K/W
R_{thJS}			0.66	K/W



Reverse Diode (FRED)		Characteristic Values		
		min.	typ.	max.
V_F	$I_F = 50\text{ A}$, $V_{GE} = 0\text{ V}$ $I_F = 50\text{ A}$, $V_{GE} = 0\text{ V}$, $T_J = 125^\circ\text{C}$		2.3 1.8	2.5 V 2.1 V
I_F	$T_C = 25^\circ\text{C}$ $T_C = 80^\circ\text{C}$			100 A 60 A
I_{RM}	$I_F = 50\text{ A}$, $V_{GE} = 0\text{ V}$, $-di_F/dt = 400\text{ A}/\mu\text{s}$		40	A
t_{rr}	$T_J = 125^\circ\text{C}$, $V_R = 600\text{ V}$		200	ns
R_{thJC}	with heatsink compound			0.66 K/W
R_{thJS}			1.32	K/W

Equivalent Circuits for Simulation

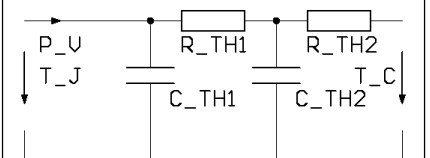
Conduction



IGBT (typ. at $V_{GE} = 15\text{ V}$; $T_J = 125^\circ\text{C}$)
 $V_0 = 1.5\text{ V}$; $R_0 = 20.7\text{ m}\Omega$

Free Wheeling Diode (typ. at $T_J = 125^\circ\text{C}$)
 $V_0 = 1.3\text{ V}$; $R_0 = 11.3\text{ m}\Omega$

Thermal Response



IGBT (typ.)
 $C_{th1} = 0.13\text{ J/K}$; $R_{th1} = 0.323\text{ K/W}$
 $C_{th2} = 0.32\text{ J/K}$; $R_{th2} = 0.008\text{ K/W}$

Free Wheeling Diode (typ.)
 $C_{th1} = 0.10\text{ J/K}$; $R_{th1} = 0.645\text{ K/W}$
 $C_{th2} = 0.18\text{ J/K}$; $R_{th2} = 0.013\text{ K/W}$

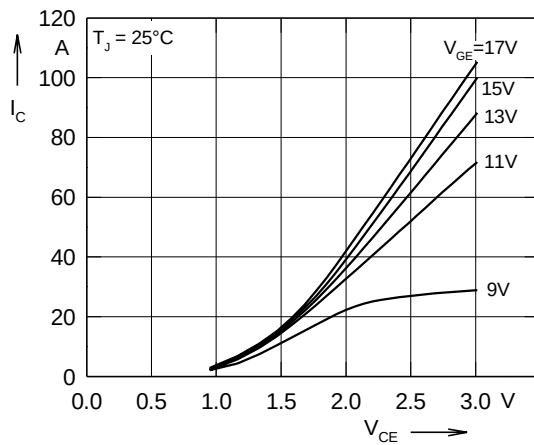


Fig. 1 Typ. output characteristics

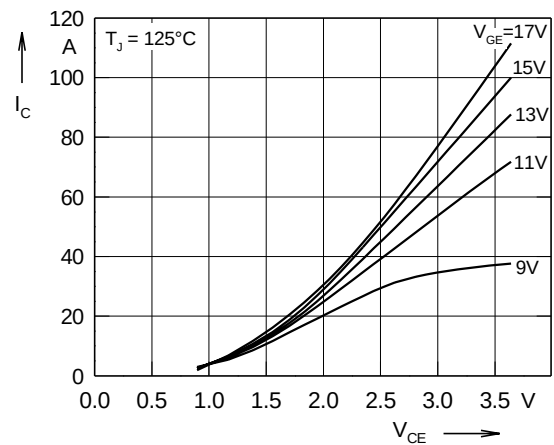


Fig. 2 Typ. output characteristics

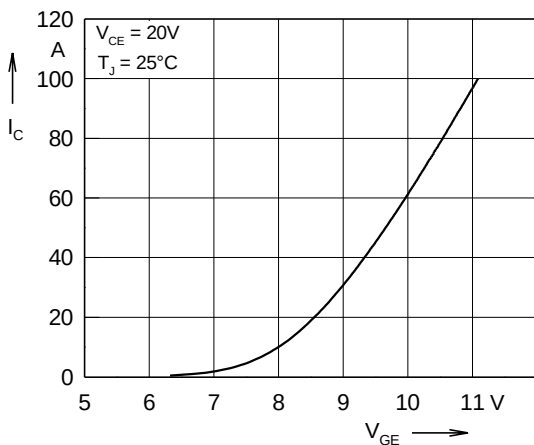


Fig. 3 Typ. transfer characteristics

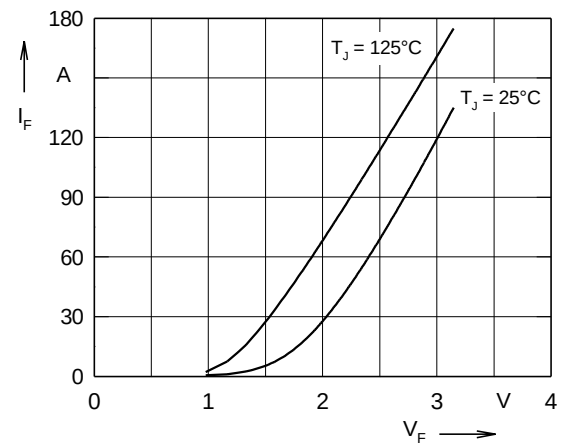


Fig. 4 Typ. forward characteristics of free wheeling diode

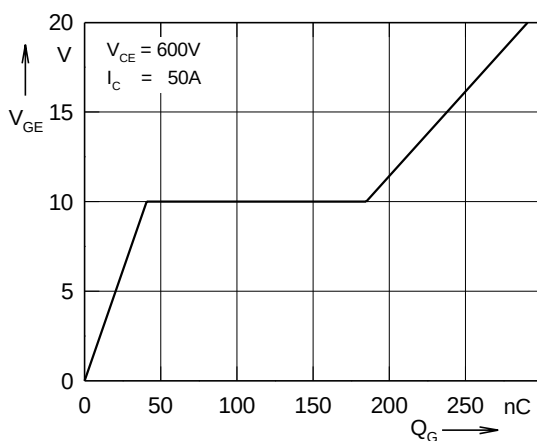


Fig. 5 Typ. turn on gate charge

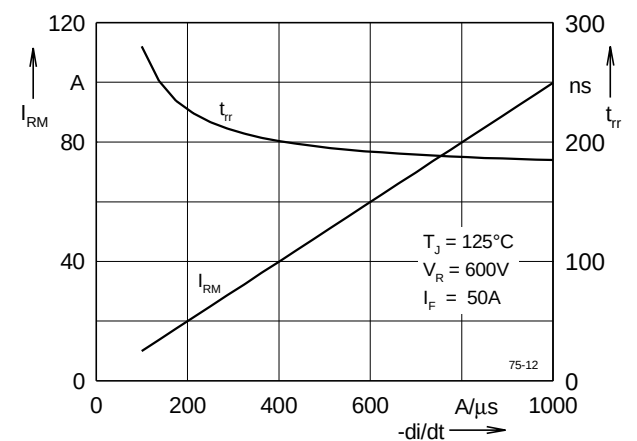


Fig. 6 Typ. turn off characteristics of free wheeling diode

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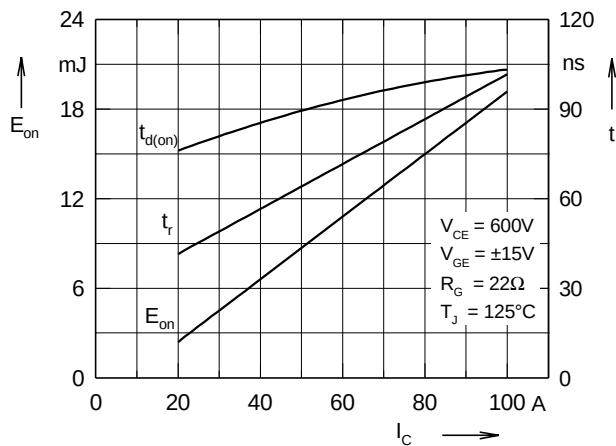


Fig. 7 Typ. turn on energy and switching times versus collector current

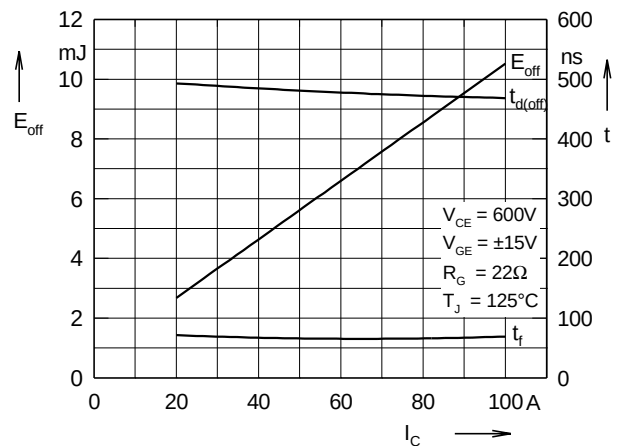


Fig. 8 Typ. turn off energy and switching times versus collector current

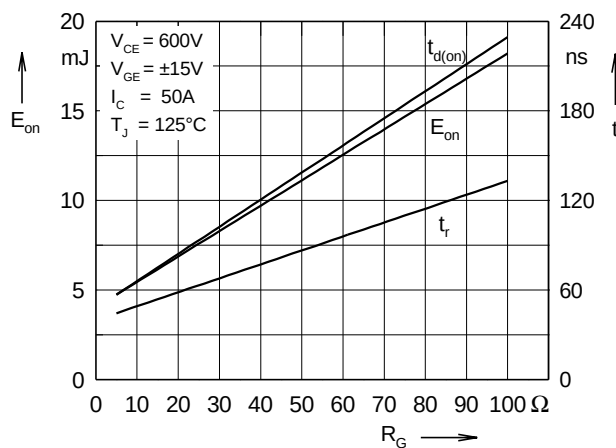


Fig. 9 Typ. turn on energy and switching times versus gate resistor

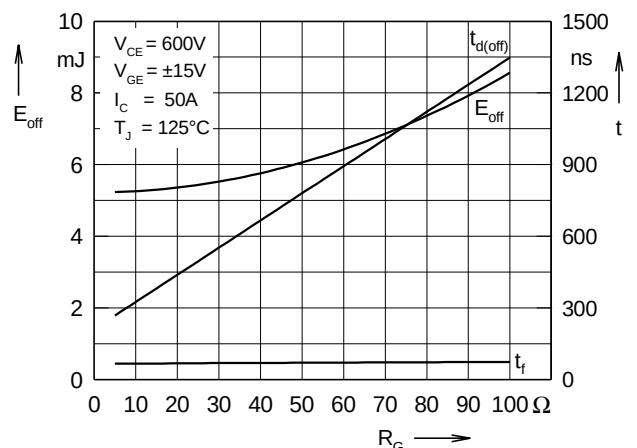


Fig. 10 Typ. turn off energy and switching times versus gate resistor

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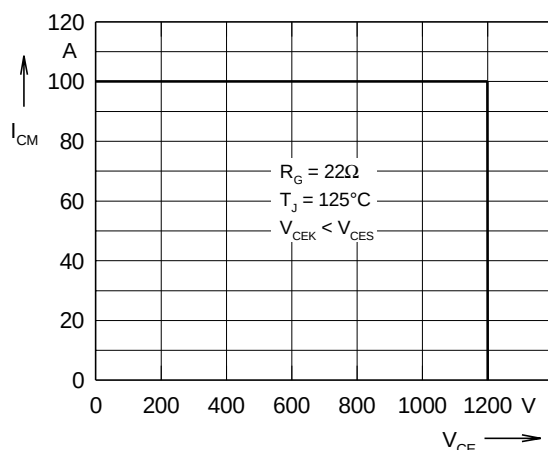


Fig. 11 Reverse biased safe operating area RBSOA

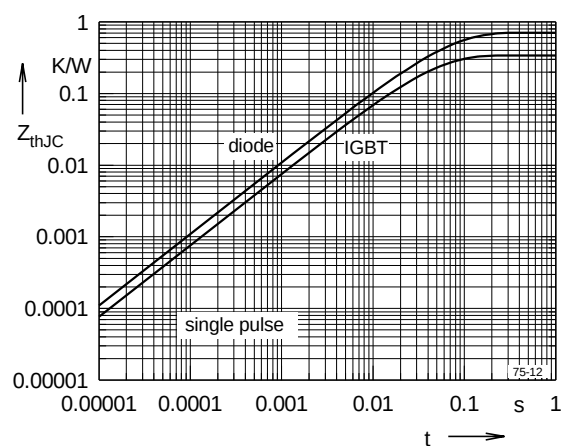


Fig. 12 Typ. transient thermal impedance