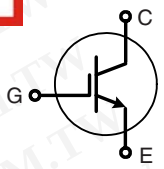
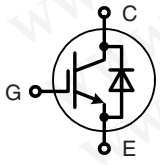
NPT³ IGBT

I_{C25} = 60 A
V_{CES} = 1200 V
$V_{CE(sat)\,typ.}$ = 2.4 V

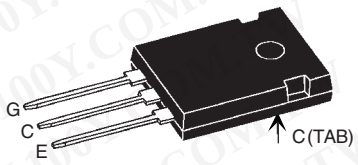


IXEH 40N120



IXEH 40N120D1

TO-247 AD



IGBT

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	60	A
I_{C90}	T_C = 90°C	40	A
I_{CM}	V_{GE} = ±15 V; R_G = 39 Ω; T_{VJ} = 125°C	50	A
V_{CEK}	RBSOA, Clamped inductive load; L = 100 µH	V_{CES}	
t_{SC} (SCSOA)	V_{CE} = 900V; V_{GE} = ±15 V; R_G = 39 Ω; T_{VJ} = 125°C non-repetitive	10	µs
P_{tot}	T_C = 25°C	300	W

Symbol	Conditions	Characteristic Values (T_{VJ} = 25°C, unless otherwise specified) min.	typ.	max.	
$V_{CE(sat)}$	I_C = 40 A; V_{GE} = 15 V; T_{VJ} = 25°C		2.4	3.0	V
	T_{VJ} = 125°C		2.8		V
$V_{GE(th)}$	I_C = 1 mA; V_{GE} = V_{CE}	4.5		6.5	V
I_{CES}	V_{CE} = V_{CES}; V_{GE} = 0 V; T_{VJ} = 25°C			0.4	mA
	T_{VJ} = 125°C		0.4		mA
I_{GES}	V_{CE} = 0 V; V_{GE} = ± 20 V			200	nA
$t_{d(on)}$	Inductive load, T_{VJ} = 125°C		85		ns
t_r	V_{CE} = 600 V; I_C = 40 A		50		ns
$t_{d(off)}$	V_{GE} = ±15 V; R_G = 39 Ω		440		ns
t_f			50		ns
E_{on}			6.1		mJ
E_{off}			3.0		mJ
C_{ies}	V_{CE} = 25 V; V_{GE} = 0 V; f = 1 MHz		2		nF
Q_{Gon}	V_{CE} = 600 V; V_{GE} = 15 V; I_C = 35 A		150		nC
R_{thJC}				0.42	K/W

Features

- NPT³ IGBT
  - low saturation voltage
  - positive temperature coefficient for easy paralleling
  - fast switching
  - short tail current for optimized performance in resonant circuits
- optional HiPerFRED™ diode
  - fast reverse recovery
  - low operating forward voltage
  - low leakage current
- TO-247 package
  - industry standard outline
  - epoxy meets UL 94V-0

Applications

- AC drives
- DC drives and choppers
- Uninteruptible power supplies (UPS)
- switched-mode and resonant-mode power supplies
- inductive heating, cookers

340

IXYS Semiconductor GmbH
Edisonstr. 15, D-68623 Lampertheim
Phone: +49-6206-503-0, Fax: +49-6206-503627

IXYS Corporation
3540 Bassett Street, Santa Clara CA 95054
Phone: (408) 982-0700, Fax: 408-496-0670

Diode [D1 version only]

Symbol	Conditions	Maximum Ratings	
I_{F25}	T_C = 25°C	60	A
I_{F90}	T_C = 90°C	35	A

Symbol	Conditions	Characteristic Values min.	typ.	max.	
V_F	I_F = 40 A; T_{VJ} = 25°C		2.6	3.0	V
	T_{VJ} = 125°C		2.0		V
I_{RM}	I_F = 30 A; di_F/dt = -500 A/µs; T_{VJ} = 125°C		51		A
t_{rr}	V_R = 600 V; V_{GE} = 0 V		180		ns
$E_{rec(off)}$			1.8		mJ
R_{thJC}				1.0	K/W

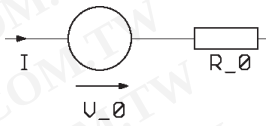
Component

Symbol	Conditions	Maximum Ratings	
T_{VJ}		-55...+150	°C
T_{stg}		-55...+150	°C
M_d	mounting torque	0.8...1.2	Nm

Symbol	Conditions	Characteristic Values min.	typ.	max.	
R_{thCH}	with heatsink compound		0.25		K/W
Weight			6		g

Equivalent Circuits for Simulation

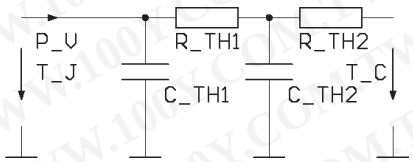
Conduction



IGBT (typ. at V_{GE} = 15 V; T_J = 125°C)
V_0 = 0.95 V; R_0 = 45 mΩ

Diode (typ. at T_J = 125°C)
V_0 = 1.26V; R_0 = 15 mΩ

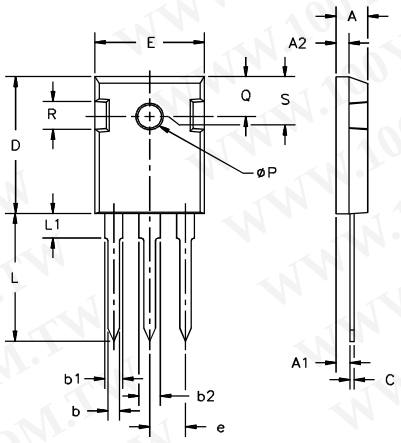
Thermal Response



IGBT
C_{th1} = 0.007 J/K; R_{th1} = 0.215 K/W
C_{th2} = 0.187 J/K; R_{th2} = 0.205 K/W

Diode
C_{th1} = 0.006 J/K; R_{th1} = 0.649 K/W
C_{th2} = 0.113 J/K; R_{th2} = 0.351 K/W

TO-247 AD Outline



Dim.	Millimeter Min.	Max.	Inches Min.	Max.
A	4.7	5.3	.185	.209
A_1	2.2	2.54	.087	.102
A_2	2.2	2.6	.059	.098
b	1.0	1.4	.040	.055
b_1	1.65	2.13	.065	.084
b_2	2.87	3.12	.113	.123
C	.4	.8	.016	.031
D	20.80	21.46	.819	.845
E	15.75	16.26	.610	.640
e	5.20	5.72	0.205	0.225
L	19.81	20.32	.780	.800
L1		4.50		.177
∅P	3.55	3.65	.140	.144
Q	5.89	6.40	0.232	0.252
R	4.32	5.49	.170	.216
S	6.15 BSC		242 BSC	

340

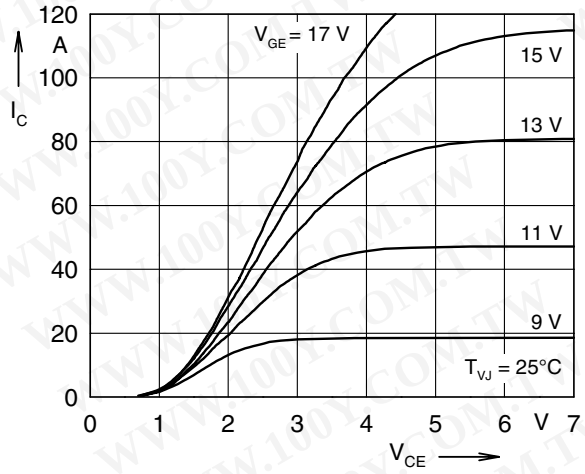


Fig. 1 Typ. output characteristics

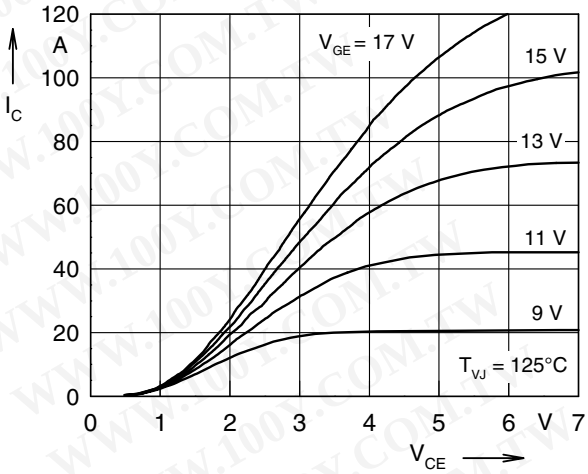


Fig. 2 Typ. output characteristics

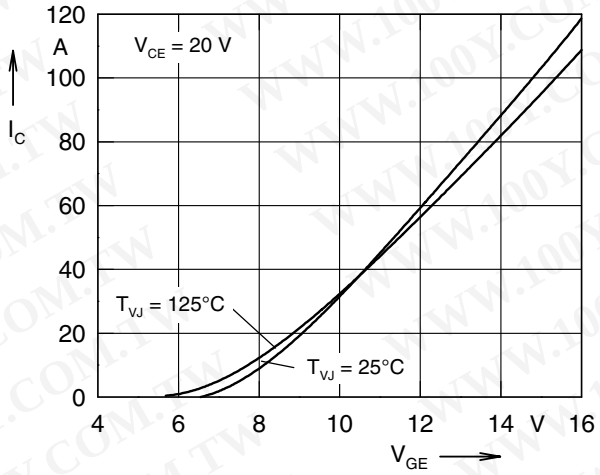


Fig. 3 Typ. transfer characteristics

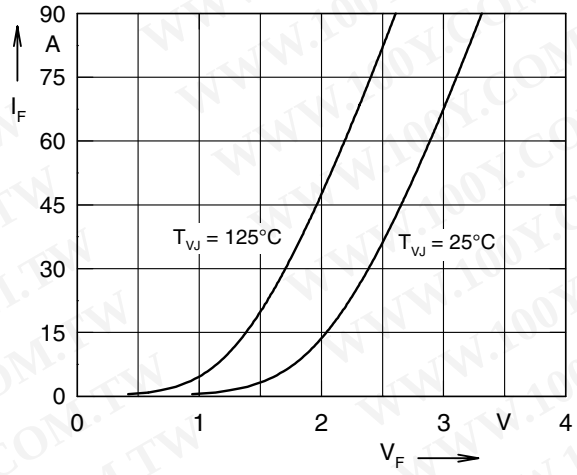


Fig. 4 Typ. forward characteristics of free wheeling diode

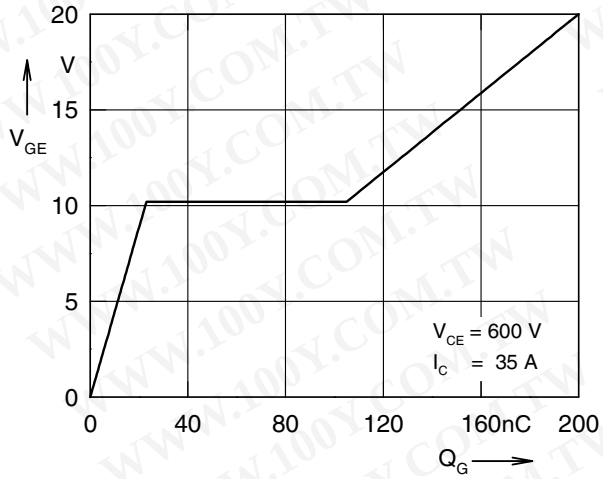


Fig. 5 Typ. turn on gate charge

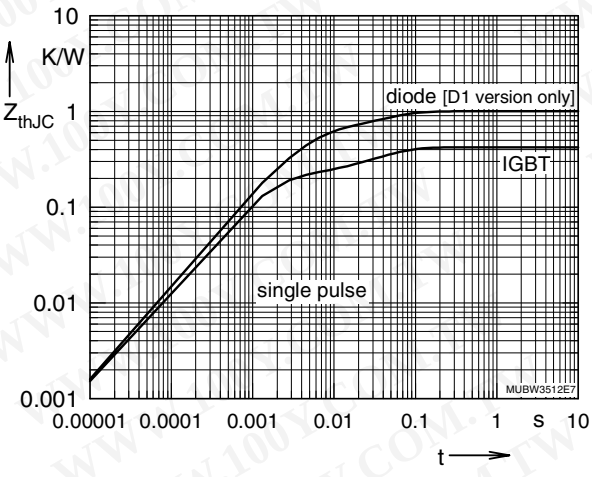


Fig. 6 Typ. transient thermal impedance

340

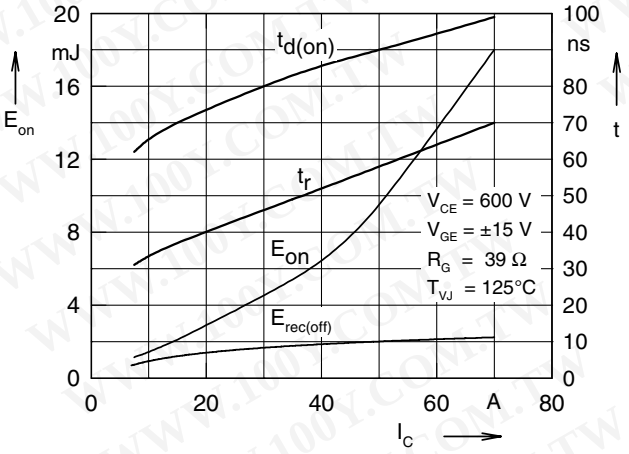


Fig. 7 Typ. turn on energy and switching times versus collector current

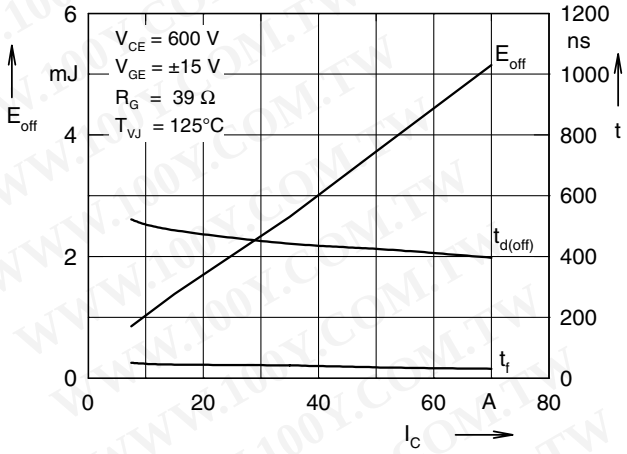


Fig. 8 Typ. turn off energy and switching times versus collector current

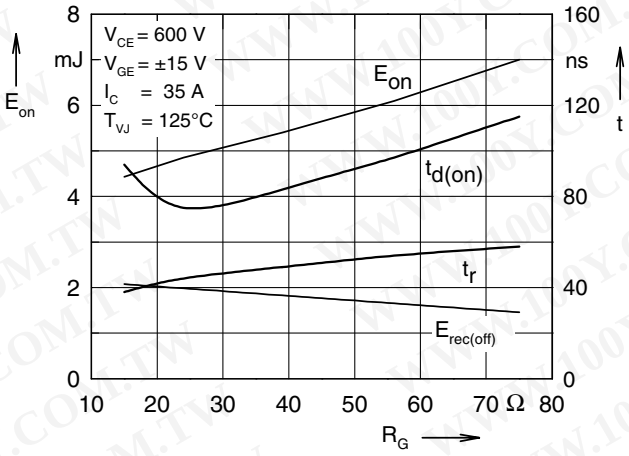


Fig. 9 Typ. turn on energy and switching times versus gate resistor

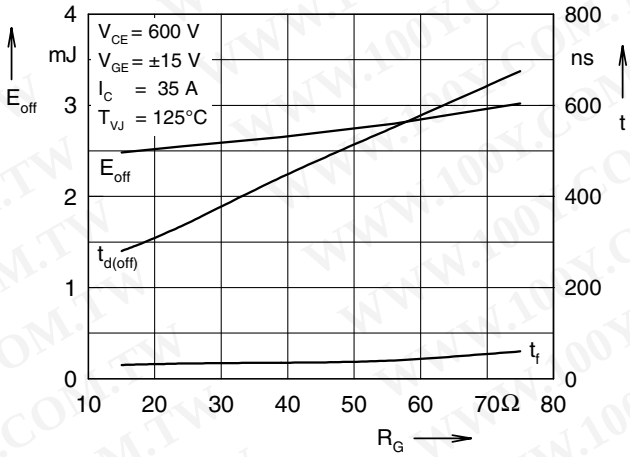


Fig.10 Typ. turn off energy and switching times versus gate resistor

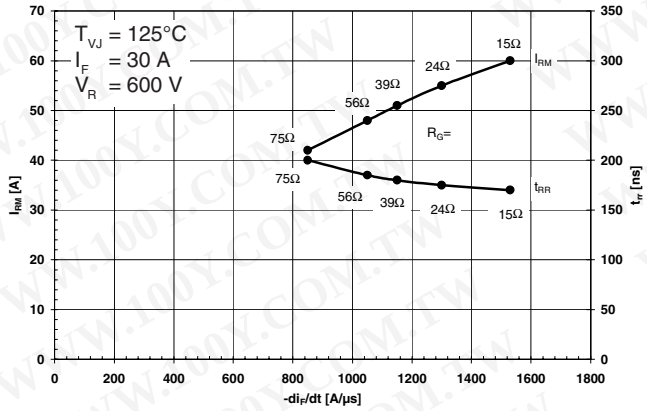


Fig. 11 Typ. turn off characteristics of free wheeling diode

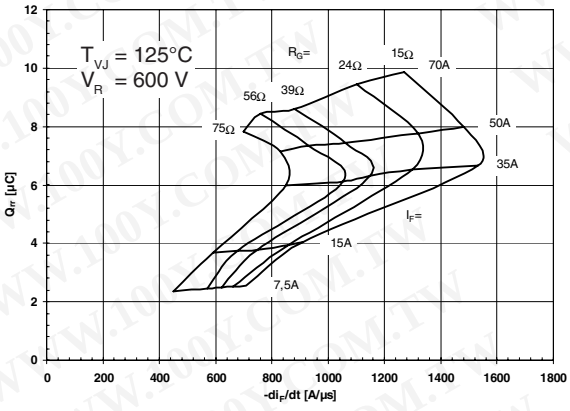


Fig. 12 Typ. turn off characteristics of free wheeling diode

340