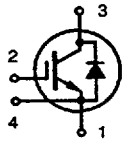
IXYS

IGBT with Diode

IXSN50N60U1

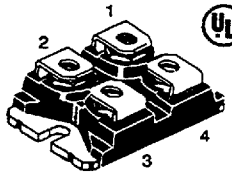
I_C = 53 A
V_{CES} = 600 V
$V_{CE(sat)}$ = 2.5 V

High Short Circuit SOA Capability



Symbol	Test Conditions	Maximum Ratings	
V_{CES}	T_J = 25°C to 150°C	600	V
V_{CGR}	T_J = 25°C to 150°C; R_{GE} = 1 MΩ	600	V
V_{GES}	Continuous	±20	V
V_{GEM}	Transient	±30	V
I_{C25}	T_C = 25°C	53	A
I_{C90}	T_C = 90°C	36	A
I_{CM}	T_C = 25°C, 1 ms	72	A
t_{SC} (SCSOA)	V_{GE} = 15 V, V_{CE} = 0.6 • V_{CES}, T_J = 125°C R_G = 22 Ω, non repetitive	10	µs
RBSOA	V_{GE} = 15 V, T_J = 125°C, R_G = 22 Ω Clamped inductive load, L = 30 µH	I_{CM} = 72 @ 0.8 V_{CES}	A
P_C	T_C = 25°C	205	W
T_J		-40 ... +150	°C
T_{JM}		150	°C
T_{stg}		-40 ... +150	°C
V_{ISOL}	50/60 Hz, t = 1 min I_{ISOL} = 1 mA, t = 1 s	2500 3000	V~ V~
M_d	Mounting torque (M4) Terminal connection torque (M4)	1.5/13 1.5/13	Nm/lb.in. Nm/lb.in.
Weight		30	g

miniBLOC, SOT-227 B



E72873 (M)

1 = Emitter, 2 = Gate
3 = Collector, 4 = Kelvin Emitter

Symbol	Test Conditions		Characteristic Values (T_J = 25°C, unless otherwise specified) min.	typ.	max.	
BV_{CES}	I_C = 6 mA, V_{GE} = 0 V		600			V
$V_{GE(th)}$	I_C = 10 mA, V_{CE} = V_{GE}		5		8	V
I_{CES}	V_{CE} = 0.8 • V_{CES} V_{GE} = 0 V	T_J = 25°C T_J = 125°C			750 15	µA mA
I_{GES}	V_{CE} = 0 V, V_{GE} = ±20 V				±500	nA

Features
- International standard package miniBLOC (ISOTOP compatible)
- Isolation voltage 2500 V (RMS)
- 2nd generation HDMOS™ process
  - for high short circuit SOA
- Low $V_{CE(sat)}$
  - for minimum on-state conduction losses
- MOS Gate turn-on
  - drive simplicity
- Fast Recovery Epitaxial Diode (FRED)
  - short t_{rr} and low I_{RM}
- Low collector-to-case capacitance (< 45 pF)
  - reduced RFI
- Low package inductance (< 5 nH)
  - easy to drive and to protect

Applications
- AC motor speed control
- DC servo and robot drives
- Uninterruptible power systems (UPS)
- Switched-mode and resonant-mode power supplies
- DC choppers

Advantages
- Easy to mount
- Space savings
- High power density

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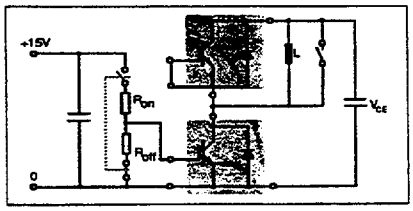
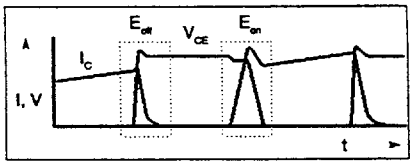
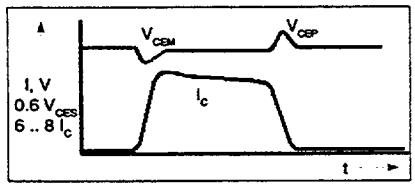
Symbol	Test Conditions (T$_J$ = 25°C, unless otherwise specified)	Characteristic Values min.	typ.	max.	
$V_{CE(sat)}$	$I_C = I_{C90}$, V_{GE} = 15 V			2.5	V
g_{fs}	$I_C = I_{C90}$, V_{CE} = 20 V, Pulse test, t ≤ 300 µs, duty cycle δ ≤ 2 %	10	20		S
$I_{C(on)}$	V_{GE} = 15 V		350		A
C_{ies}	V_{CE} = 25 V, V_{GE} = 0 V, f = 1 MHz		4.5		nF
C_{oes}			0.5		nF
C_{res}			0.09		nF
Q_g	$I_C = I_{C90}$, V_{GE} = 15 V, V_{CE} = 0.5 • V_{CES}		200		nC
Q_{ge}			45		nC
Q_{gc}			90		nC
$t_{d(on)}$	Inductive load, T$_J$ = 125°C		55		ns
t_{ri}	$I_C = I_{C90}$, V_{GE} = 15 V		170		ns
$t_{d(off)}$	V_{CE} = 0.6 • V_{CES}, R_{on} = 6.8 Ω, R_{off} = 22 Ω		800		ns
t_{fi}	Remarks: Switching times may increase for		600		ns
E_{on}	V_{CE} (Clamp) > 0.6 • V_{CES}, T$_J$ > 125°C or		4		mJ
E_{off}	increased R_G		6.5		mJ
R_{thJC}				0.61	K/W
R_{thCK}				0.05	K/W



Test circuit for E_{on}, E_{off}, SCSOA and RBSOA
R_{on} = 6.8 Ω L > 100 µH
R_{off} = 22 Ω for RBSOA, E_{off}



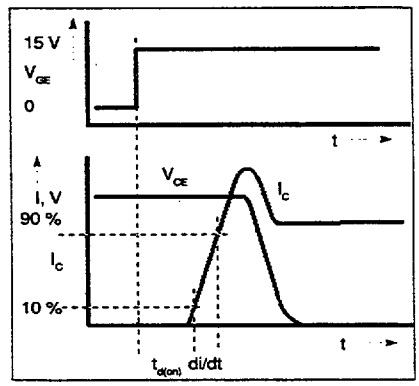
Typical V/I waveforms for inductive load



SCSOA conditions V_{CE} = 0.6 V_{CES},
V_{CEM} = 0.5 V_{CES}, V_{CEP} < V_{CES}, T$_J$ = 125°C

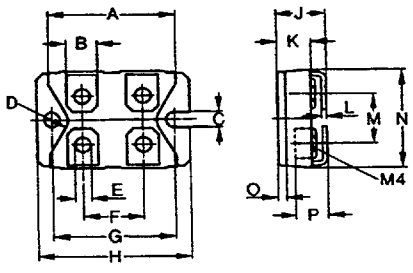
Reverse Diode (FRED)

	Test Conditions (T$_J$ = 25°C, unless otherwise specified)	Characteristic Values min.	typ.	max.	
V_F	$I_F = I_{C90}$, V_{GE} = 0 V Pulse test, t ≤ 300 µs, duty cycle δ ≤ 2 %			2.3	V
I_{RM}	$I_F = I_{C90}$, V_{GE} = 0 V, -di$_F$/dt = 480 A/µs			35	A
t_{rr}	T$_J$ = 125°C, V_R = 360 V		150		ns
R_{thJC}				0.7	K/W



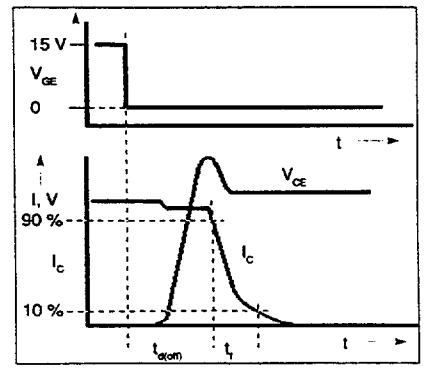
Turn-on waveforms E_{on}

Dimensions



M4 screws (4x) supplied

Dim.	Millimeter Min.	Max.	Inches Min.	Max.
A	31.5	31.7	1.241	1.249
B	7.8	8.2	0.307	0.323
C	4.0	-	0.158	-
D	4.1	4.3	0.162	0.169
E	4.1	4.3	0.162	0.169
F	14.9	15.1	0.587	0.595
G	30.1	30.3	1.186	1.193
H	38.0	38.2	1.497	1.505
J	11.8	12.2	0.465	0.481
K	8.9	9.1	0.351	0.359
L	0.75	0.85	0.030	0.033
M	12.6	12.8	0.496	0.504
N	25.2	25.4	0.993	1.001
O	1.95	2.05	0.077	0.081
P	-	5.0	-	0.197



Turn-off waveforms E_{off} RBSOA

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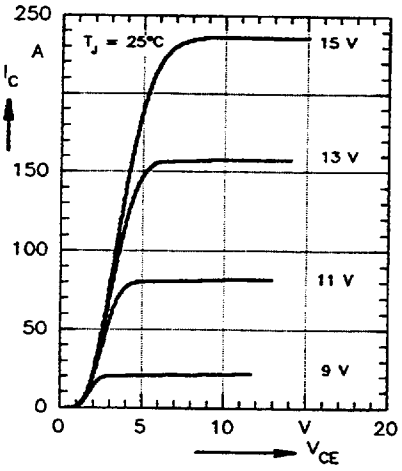

Fig. 1 Typ. output characteristics

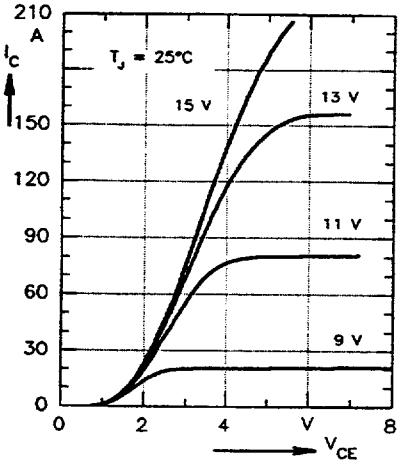

Fig. 2 Typ. output characteristics

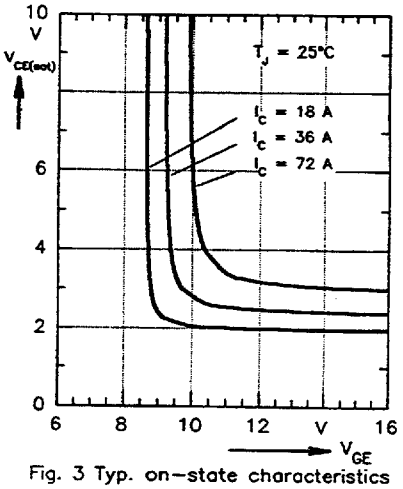

Fig. 3 Typ. on-state characteristics

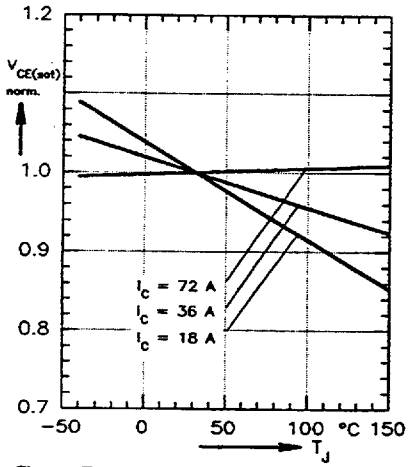

Fig. 4 Typ. temperature dependence of $V_{CE(sat)}$

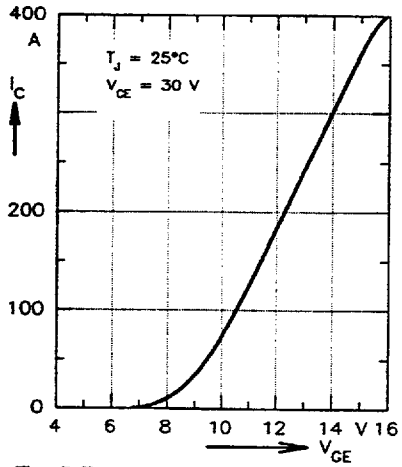

Fig. 5 Typ. transfer characteristics

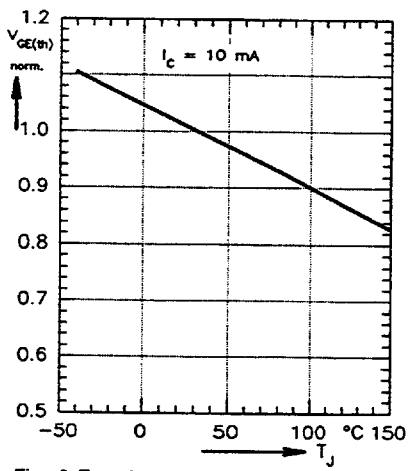

Fig. 6 Typ. temperature dependence of normalized $V_{GE(th)}$

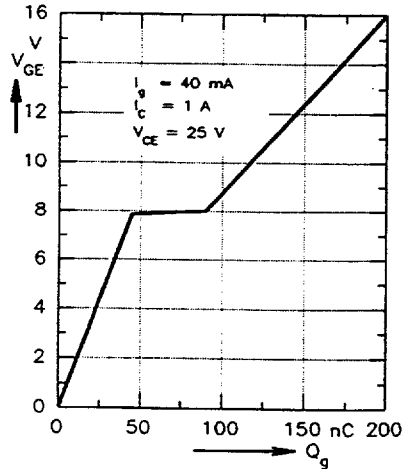

Fig. 7 Typ. turn-on gate charge characteristics, V_{GE} = f (Qg)

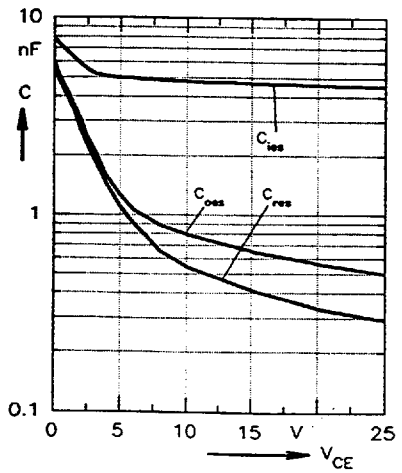

Fig. 8 Typ. capacitances

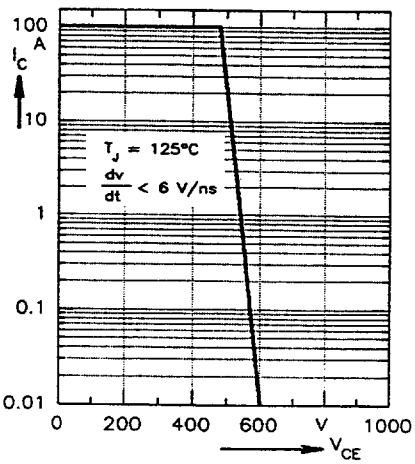

Fig. 9 Reverse biased safe operating area

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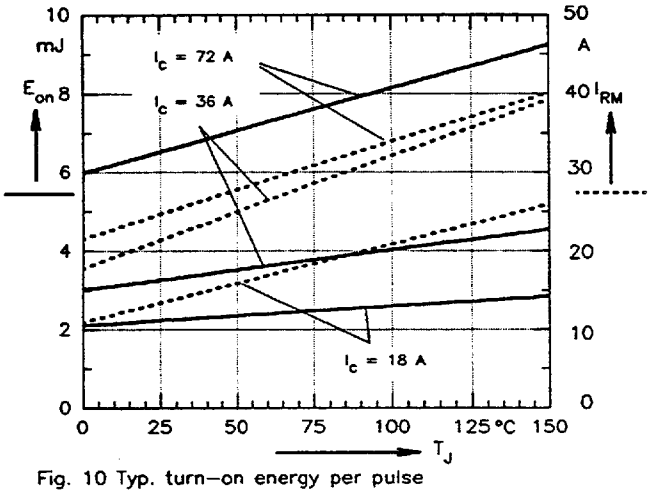

Fig. 10 Typ. turn–on energy per pulse

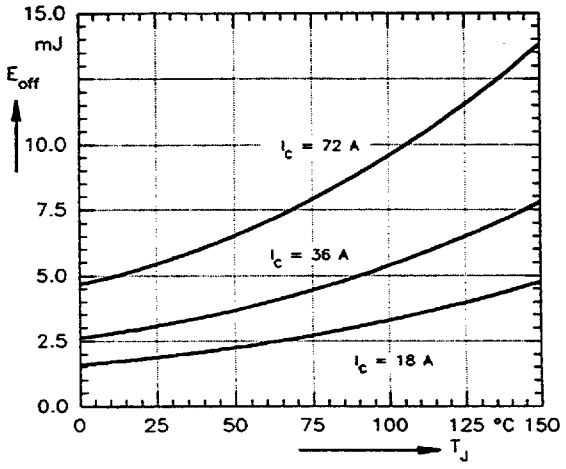

Fig. 11 Typ. turn–off energy per pulse

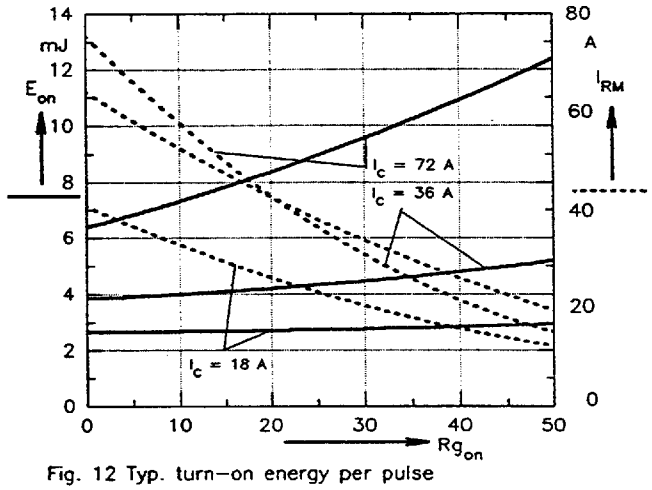

Fig. 12 Typ. turn–on energy per pulse

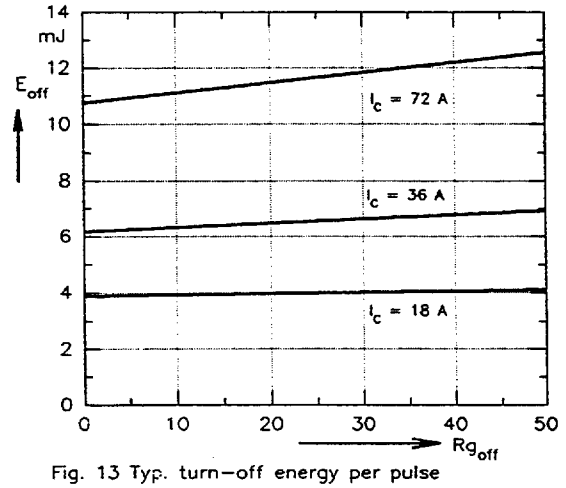

Fig. 13 Typ. turn–off energy per pulse

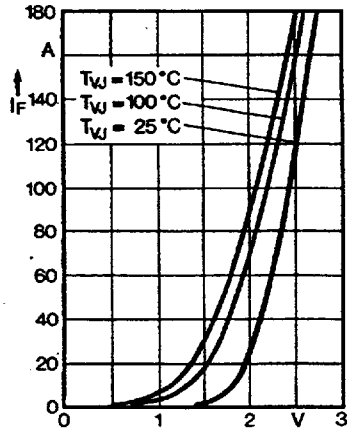

Fig. 15 Forward characteristic of reverse diode

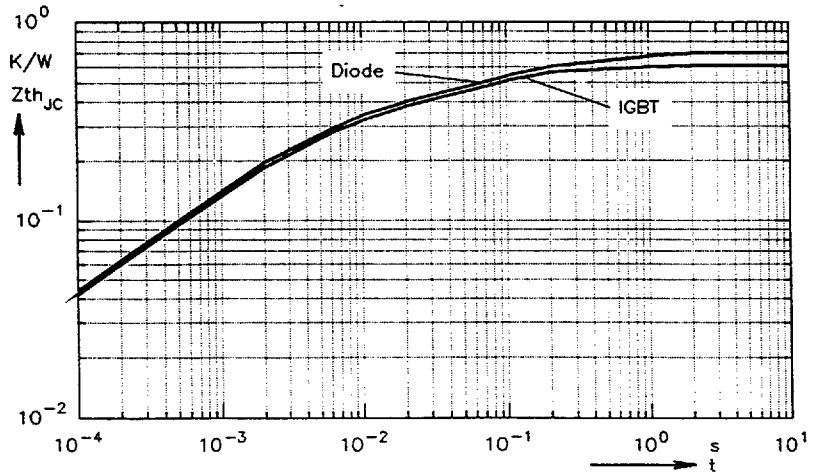

Fig. 16 Transient thermal resistance junction to case of IGBT and Diode

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