IXYS

Preliminary data

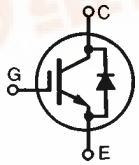
IGBT with Diode

IXSX50N60AU1
IXSX50N60AU1S

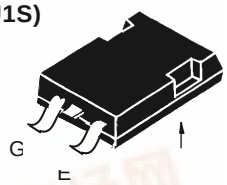
V_{CES} = 600 V
I_{C25} = 75 A
$V_{CE(sat)}$ = 2.7 V

Combi Pack

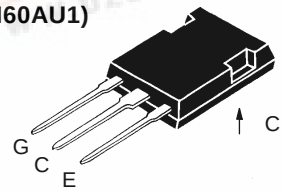
Short Circuit SOA Capability



TO-247 Hole-less SMD (50N60AU1S)



TO-247 Hole-less (50N60AU1)



G = Gate, C = Collector,
E = Emitter, TAB = Collector

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, limited by leads	75	A
I_{C90}	T_C = 90°C	50	A
I_{CM}	T_C = 25°C, 1 ms	200	A
SSOA (RBSOA)	V_{GE} = 15 V, T_{VJ} = 125°C, R_G = 22 Ω Clamped inductive load, L = 30 µH	I_{CM} = 100 @ 0.8 V_{CES}	A
t_{SC} **(SCSOA)**	V_{GE} = 15 V, V_{CE} = 360 V, T_J = 125°C R_G = 22 Ω, non repetitive	10	µs
P_C	T_C = 25°C	300	W
T_J		-55 ... +150	°C
T_{JM}		150	°C
T_{stg}		-55 ... +150	°C
Weight		6	g
Maximum lead temperature for soldering 1.6 mm (0.062 in.) from case for 10 s		300	°C

Symbol	Test Conditions		Characteristic Values (T_J = 25°C, unless otherwise specified) min.	typ.	max.	
BV_{CES}	I_C = 3 mA, V_{GE} = 0 V		600			V
$V_{GE(th)}$	I_C = 4 mA, V_{CE} = V_{GE}		4		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				±100	nA
$V_{CE(sat)}$	I_C = I_{C90}, V_{GE} = 15 V				2.7	V

Features

- Hole-less TO-247 package for clip mounting
- High current rating
- Guaranteed Short Circuit SOA capability
- High frequency IGBT and anti-parallel FRED in one package
- Low $V_{CE(sat)}$
  - for minimum on-state conduction losses
- MOS Gate turn-on
  - drive simplicity
- Fast Recovery Epitaxial Diode (FRED)
  - soft recovery with low I_{RM}

Applications

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

Advantages

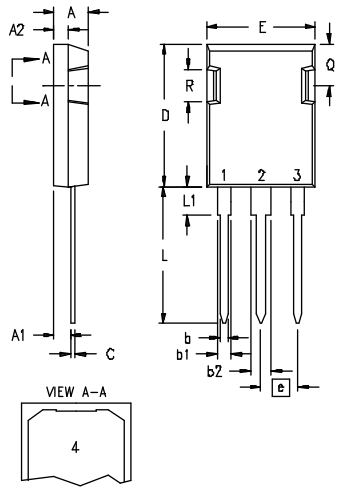
- Space savings (two devices in one package)
- High power density

Symbol	Test Conditions (T_J = 25°C, unless otherwise specified)	min.	typ.	max.	
g_{fs}	$I_C = I_{C90}$; V_{CE} = 10 V, Pulse test, t ≤ 300 µs, duty cycle ≤ 2 %	20	23		S
Q_g	$I_C = I_{C90}$, V_{GE} = 15 V, V_{CE} = 0.5 V_{CES}		190	250	nC
Q_{ge}			45	60	nC
Q_{gc}			88	120	nC
$t_{d(on)}$	**Inductive load, T_J = 25°C**		70		ns
t_{ri}	$I_C = I_{C90}$, V_{GE} = 15 V, L = 100 µH,		220		ns
$t_{d(off)}$	V_{CE} = 0.8 V_{CES}, R_G = 2.7 Ω		200		ns
t_{fi}	Remarks: Switching times may increase		400	600	ns
E_{off}	for V_{CE} (Clamp) > 0.8 • V_{CES}, higher T_J or increased R_G		6		mJ
$t_{d(on)}$	**Inductive load, T_J = 125°C**		70		ns
t_{ri}	$I_C = I_{C90}$, V_{GE} = 15 V, L = 100 µH		230		ns
E_{on}	V_{CE} = 0.8 V_{CES}, R_G = 2.7 Ω		4.5		mJ
$t_{d(off)}$	Remarks: Switching times may increase		340		ns
t_{fi}	for V_{CE} (Clamp) > 0.8 • V_{CES}, higher T_J or increased R_G		400		ns
E_{off}			7		mJ
R_{thJC}				0.42	K/W
R_{thCK}			0.15		K/W

Reverse Diode (FRED)

Symbol	Test Conditions (T_J = 25°C, unless otherwise specified)	min.	typ.	max.	
V_F	$I_F = I_{C90}$, V_{GE} = 0 V, Pulse test, t ≤ 300 µs, duty cycle d ≤ 2 %			1.8	V
I_{RM}	$I_F = I_{C90}$, V_{GE} = 0 V, -di_F/dt = 480 A/µs		19	33	A
t_{rr}	V_R = 360 V T_J = 125°C		175		ns
	I_F = 1 A; -di/dt = 200 A/µs; V_R = 30 V T_J = 25°C		35	50	ns
R_{thJC}				0.75	K/W

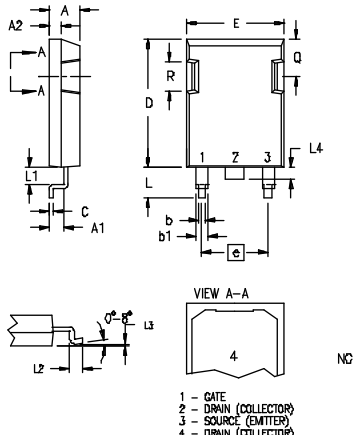
TO-247 HOLE-LESS



SYM	INCHES MIN	INCHES MAX	MILLIMETERS MIN	MILLIMETERS MAX
A	.190	.205	4.83	5.21
A1	.090	.100	2.29	2.54
A2	.075	.085	1.91	2.16
b	.045	.055	1.14	1.40
b1	.075	.084	1.91	2.13
b2	.115	.123	2.92	3.12
C	.024	.031	0.61	0.80
D	.819	.840	20.80	21.34
E	.620	.635	15.75	16.13
e	.215 BSC		5.45 BSC	
L	.780	.800	19.81	20.32
L1	.150	.170	3.81	4.32
Q	.220	.244	5.59	6.20
R	.170	.190	4.32	4.83

1 – GATE
2 – DRAIN (COLLECTOR)
3 – SOURCE (EMITTER)
4 – DRAIN (COLLECTOR)

TO-247 HOLE-LESS SMD



1 – GATE
2 – DRAIN (COLLECTOR)
3 – SOURCE (EMITTER)

SYM	INCHES MIN	INCHES MAX	MILLIMETERS MIN	MILLIMETERS MAX
A	.190	.205	4.83	5.21
A1	.090	.100	2.29	2.54
A2	.075	.085	1.91	2.16
b	.045	.055	1.14	1.40
b1	.075	.084	1.91	2.13
C	.024	.031	0.61	0.80
D	.819	.840	20.80	21.34
E	.620	.635	15.75	16.13
e	.430BSC		10.90BSC	
L	.193	.201	4.90	5.10
L1	.106	.114	2.70	2.90
L2	.083	.091	2.10	2.30
L3	.00	.004	0.00	0.10
L4	.075	.083	1.90	2.10
Q	.220	.244	5.59	6.20
R	.170	.190	4.32	4.83

NOTE: 1. This drawing meets all dimensions requirement of JEDEC outlines TO-247AD except L, L1, L2, L3, L4 and screw hole dia.
2. All metal surface are solder plated except trimmed area.

IXYS reserves the right to change limits, test conditions, and dimensions.

Fig.1 Saturation Characteristics

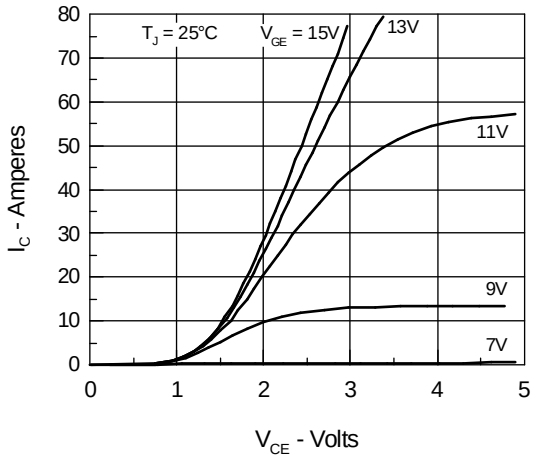


Fig. 3 Collector-Emitter Voltage vs. Gate-Emitter Voltage

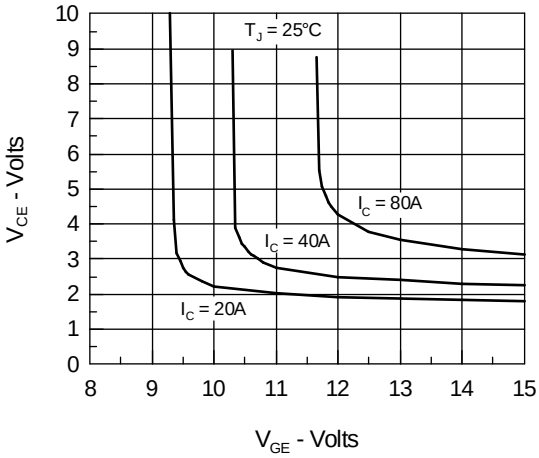


Fig.5 Input Admittance

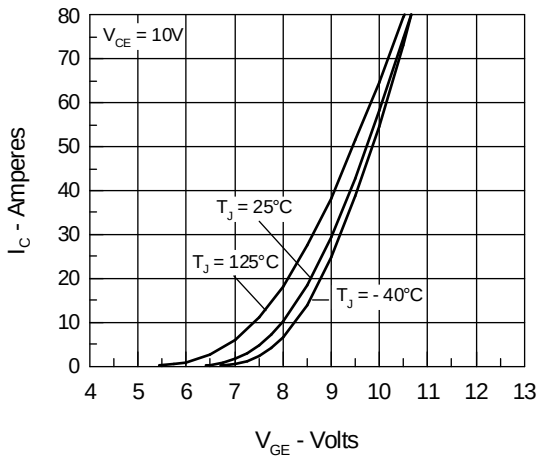


Fig.2 Output Characterstics

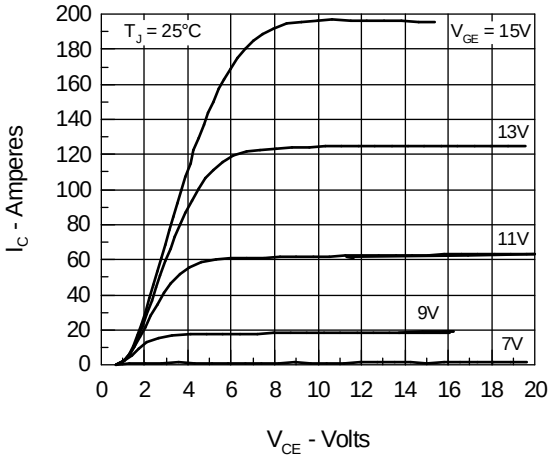


Fig. 4 Temperature Dependence of Output Saturation Voltage

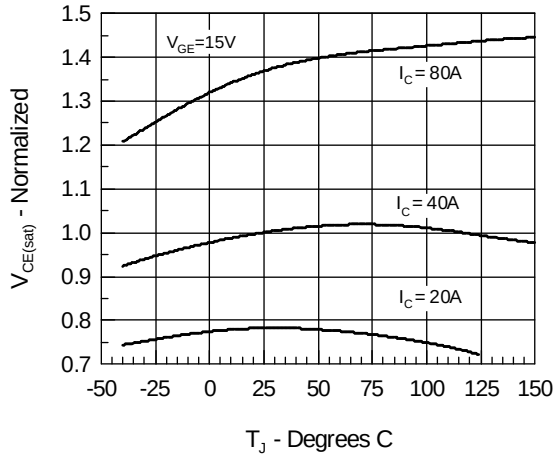


Fig.6 Temperature Dependence of Breakdown and Threshold Voltage

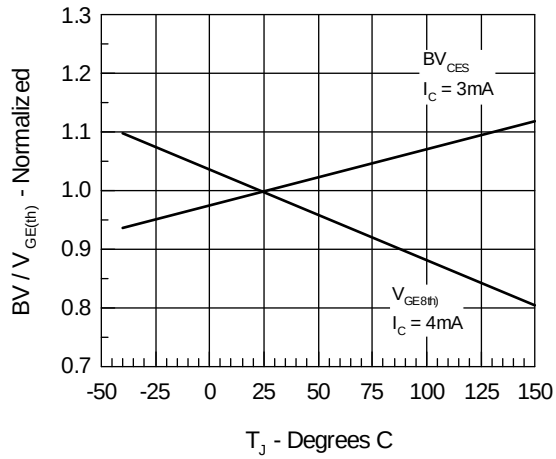


Fig.7 Turn-Off Energy per Pulse and Fall Time on Collector Current

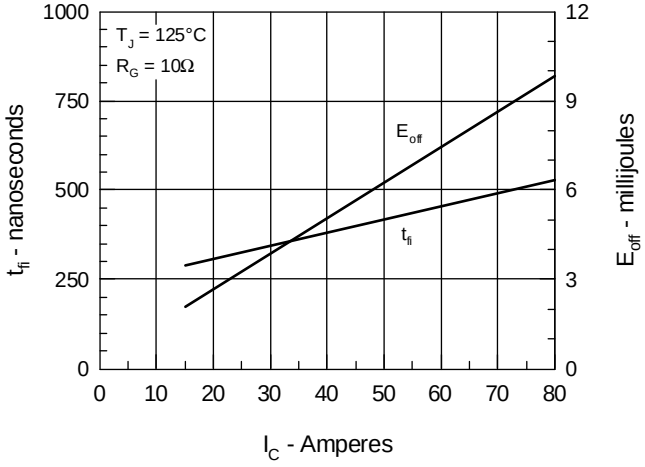


Fig.8 Dependence of Turn-Off Energy Per Pulse and Fall Time on R_G

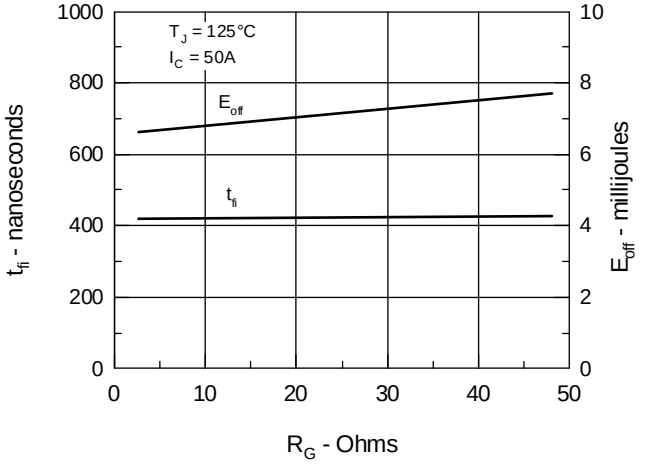


Fig.9 Gate Charge Characteristic Curve

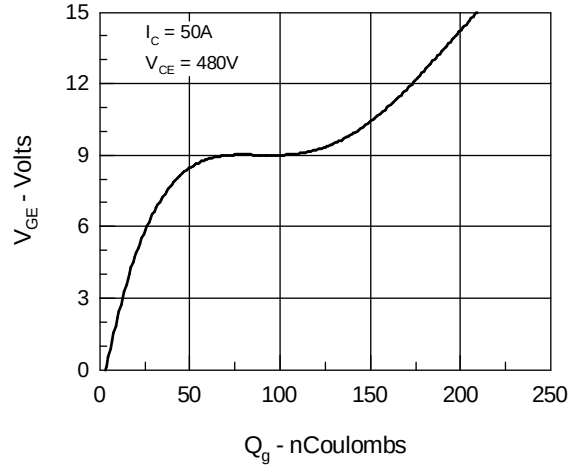


Fig.10 Turn-Off Safe Operating Area

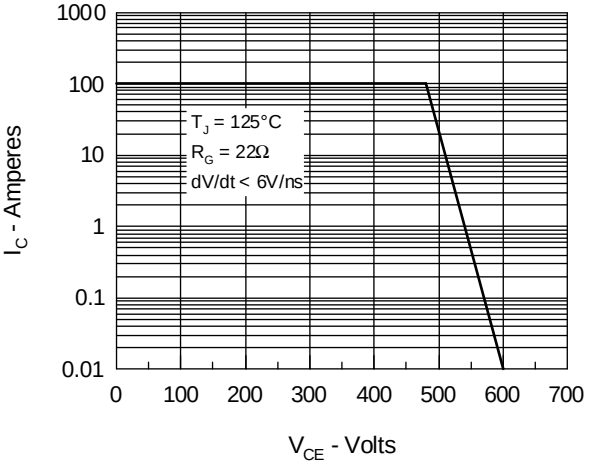


Fig.11 Transient Thermal Impedance

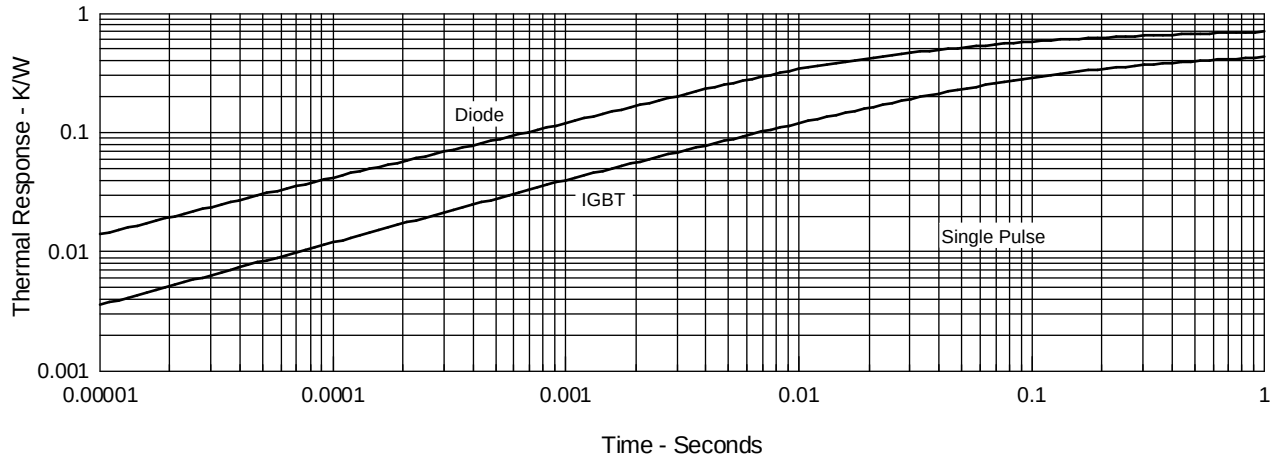


Fig.12 Typical Forward Voltage Drop

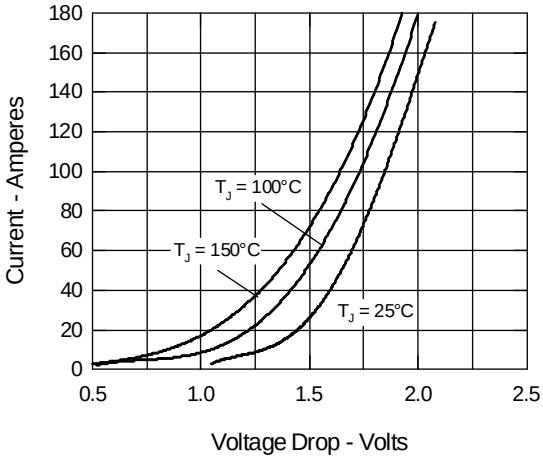


Fig.13 Peak Forward Voltage V_{FR} and Forward Recovery Time t_{fr}

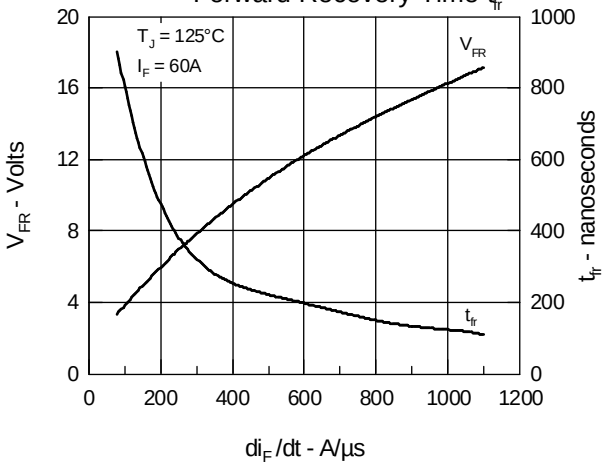


Fig.14 Junction Temperature Dependence off I_{RM} and Q_r

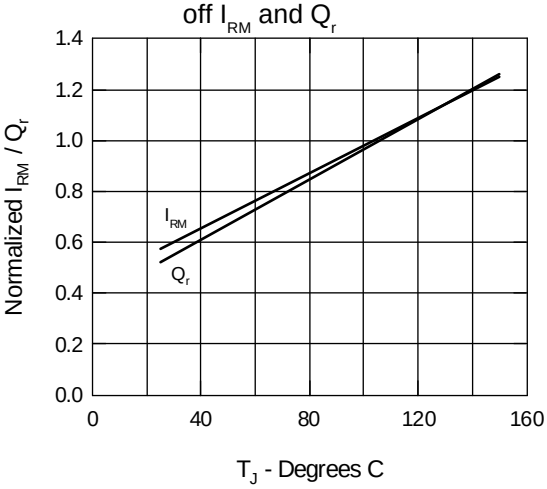


Fig.15 Reverse Recovery Chargee

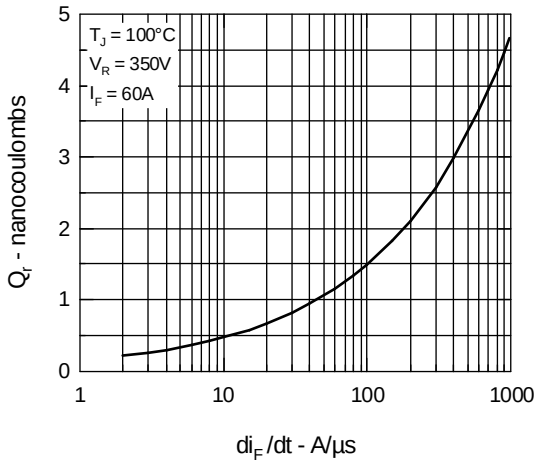


Fig.16 Peak Reverse Recovery Current

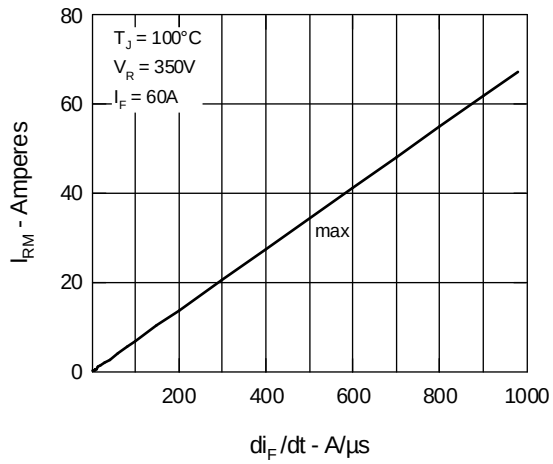


Fig.17 Reverse Recovery Time