THE DATASHEET OF

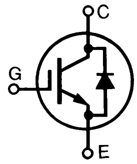
IXSH30N60U1

IXYS

	V_{CES}	I_{C25}	$V_{CE(sat)}$
Low $V_{CE(sat)}$ IGBT with Diode **IXSH 30 N60U1**	**600 V**	**50 A**	**2.5 V**
High Speed IGBT with Diode **IXSH 30 N60AU1**	**600 V**	**50 A**	**3.0 V**

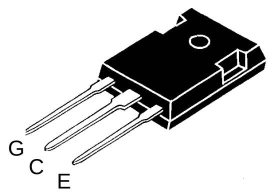
Combi Packs

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	50	A
I_{C90}	T_C = 90°C	30	A
I_{CM}	T_C = 25°C, 1 ms	100	A
SSOA (RBSOA)	V_{GE}= 15 V, T_J = 125°C, R_G = 33 Ω Clamped inductive load, L = 100 µH	I_{CM} = 60 @ 0.8 V_{CES}	A
t_{SC} **(SCSOA)**	V_{GE}= 15 V, V_{CE} = 360 V, T_J = 125°C R_G = 33 Ω, non repetitive	10	µs
P_C	T_C = 25°C	200	W
T_J		-55 ... +150	°C
T_{JM}		150	°C
T_{stg}		-55 ... +150	°C
M_d	Mounting torque	1.13/10	Nm/lb.in.
Weight		6	g
Maximum lead temperature for soldering 1.6 mm (0.062 in.) from case for 10 s		300	°C

TO-247 AD



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

Features

- International standard package JEDEC TO-247 AD
- High frequency IGBT with guaranteed Short Circuit SOA capability
- IGBT and anti-parallel FRED in one package
- 2nd generation HDMOS™ process
- Low $V_{CE(sat)}$
  - for low on-state conduction losses
- MOS Gate turn-on
  - drive simplicity

Applications

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

Advantages

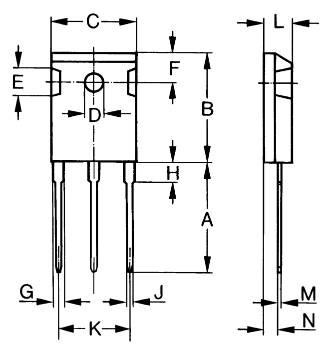
- Space savings (two devices in one package)
- Easy to mount with 1 screw (isolated mounting screw hole)
- Reduces assembly time and cost
- High power density

Symbol	Test Conditions		Characteristic Values (T_J = 25°C, unless otherwise specified) min.	typ.	max.	
BV_{CES}	I_C = 750 µA, V_{GE} = 0 V		600			V
$V_{GE(th)}$	I_C = 2.5 mA, V_{CE} = V_{GE}		5		8	V
I_{CES}	V_{CE} = 0.8 • V_{CES}	T_J = 25°C			500	µA
	V_{GE} = 0 V	T_J = 125°C			8	mA
I_{GES}	V_{CE} = 0 V, V_{GE} = ±20 V				±100	nA
$V_{CE(sat)}$	I_C = I_{C90}, V_{GE} = 15 V	30N60U1			2.5	V
		30N60AU1			3.0	V

IXYS reserves the right to change limits, test conditions, and dimensions. 92714F (12/96)

Symbol	Test Conditions		Characteristic Values (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 %		7	13		S
$I_{C(on)}$	V_{GE} = 15 V, V_{CE} = 10 V			100		A
C_{ies}	V_{CE} = 25 V, V_{GE} = 0 V, f = 1 MHz			2760		pF
C_{oes}				240		pF
C_{res}				51		pF
Q_g	$I_C = I_{C90}$, V_{GE} = 15 V, V_{CE} = 0.5 V_{CES}			110	150	nC
Q_{ge}				34	45	nC
Q_{gc}				47	63	nC
$t_{d(on)}$	**Inductive load, T_J = 25°C**			60		ns
t_{ri}	$I_C = I_{C90}$, V_{GE} = 15 V, L = 100 µH,			130		ns
$t_{d(off)}$	V_{CE} = 0.8 V_{CES}, R_G = 4.7 Ω			400		ns
t_{fi}	Remarks: Switching times may increase for	30N60U1		400		ns
	V_{CE} (Clamp) > 0.8 • V_{CES},	30N60AU1		200		ns
E_{off}	higher T_J or increased R_G	30N60AU1		2.5		mJ
$t_{d(on)}$	**Inductive load, T_J = 125°C**			60		ns
t_{ri}				130		ns
E_{on}	$I_C = I_{C90}$, V_{GE} = 15 V, L = 100 µH			4.2		mJ
$t_{d(off)}$	V_{CE} = 0.8 V_{CES}, R_G = 4.7 Ω	30N60U1		540	1000	ns
		30N60AU1		340	525	ns
t_{fi}	Remarks: Switching times may increase for	30N60U1		600	1500	ns
		30N60AU1		340	700	ns
E_{off}	V_{CE} (Clamp) > 0.8 • V_{CES}, higher T_J or increased R_G	30N60U1		12		mJ
		30N60AU1		6		mJ
R_{thJC}					0.63	K/W
R_{thCK}				0.25		K/W

TO-247 AD (IXSH) Outline



Dim.	Millimeter Min.	Max.	Inches Min.	Max.
A	19.81	20.32	0.780	0.800
B	20.80	21.46	0.819	0.845
C	15.75	16.26	0.610	0.640
D	3.55	3.65	0.140	0.144
E	4.32	5.49	0.170	0.216
F	5.4	6.2	0.212	0.244
G	1.65	2.13	0.065	0.084
H	-	4.5	-	0.177
J	1.0	1.4	0.040	0.055
K	10.8	11.0	0.426	0.433
L	4.7	5.3	0.185	0.209
M	0.4	0.8	0.016	0.031
N	1.5	2.49	0.087	0.102

Reverse Diode (FRED)

Symbol	Test Conditions		Characteristic Values (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 %				1.6	V
I_{RM}	$I_F = I_{C90}$, V_{GE} = 0 V, -di_F/dt = 240 A/µs			10	15	A
t_{rr}	V_R = 360 V	T_J = 125°C		150		ns
	I_F = 1 A; -di/dt = 100 A/µs; V_R = 30 V	T_J = 25°C		35	50	ns
R_{thJC}					1	K/W

IXYS MOSFETS and IGBTs are covered by one or more of the following U.S. patents:
4,835,592 4,881,106 5,017,508 5,049,961 5,187,117 5,486,715
4,850,072 4,931,844 5,034,796 5,063,307 5,237,481 5,381,025

Fig.1 Saturation Characteristics

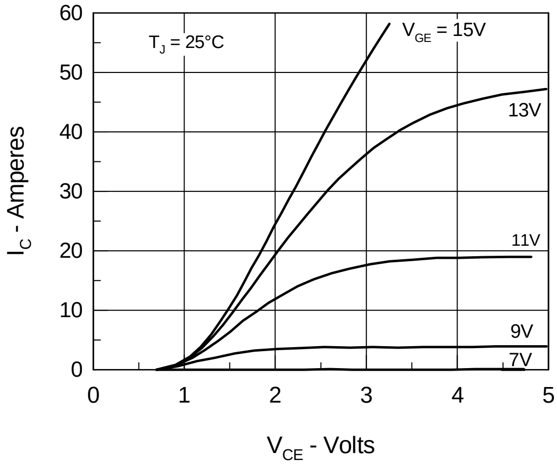


Fig.2 Output Characterstics

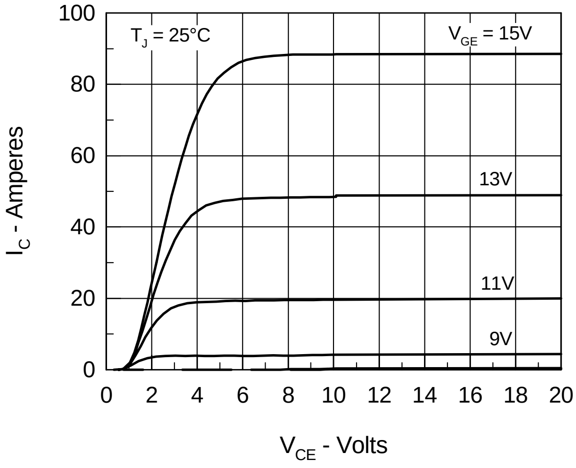


Fig.3 Collector-Emitter Voltage vs. Gate-Emitter Voltage

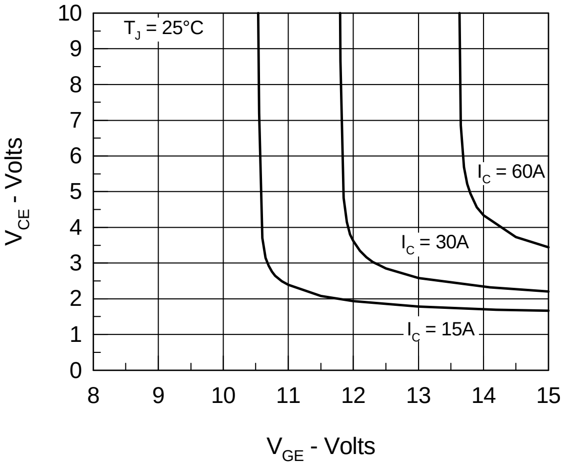


Fig.4 Temperature Dependence of Output Saturation Voltage

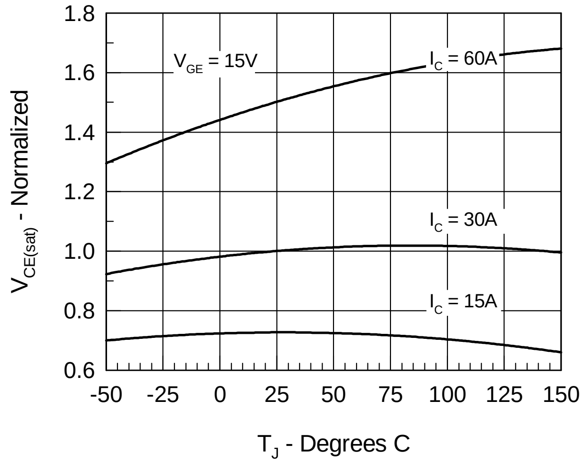


Fig.5 Input Admittance

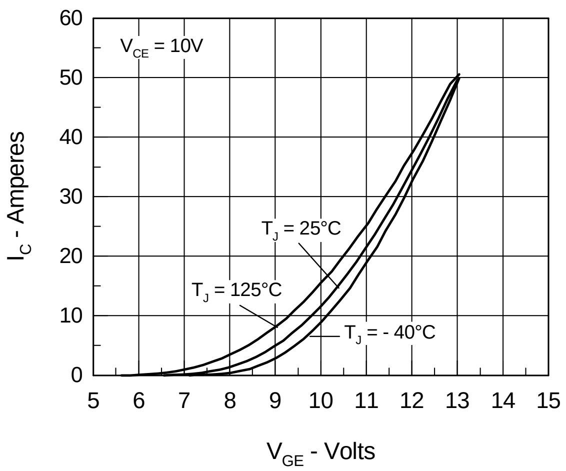


Fig.6 Temperature Dependence of Breakdown and Threshold Voltage

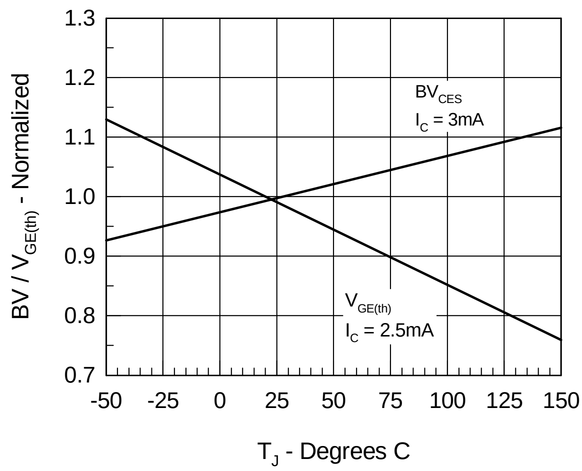


Fig.7 Turn-Off Energy per Pulse and Fall Time on Collector Current

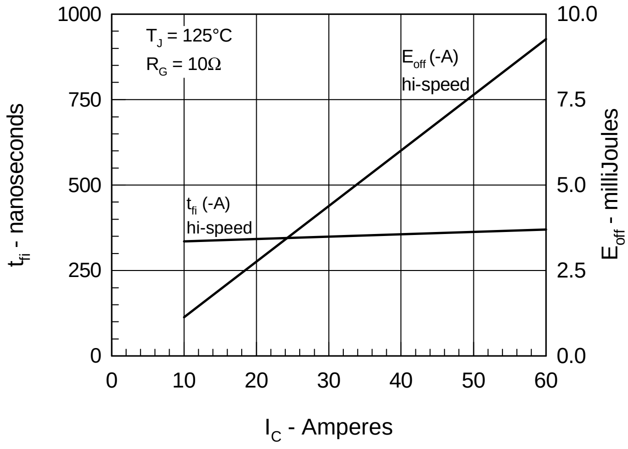


Fig.8 Dependence of Turn-Off Energy Per Pulse and Fall Time on R_G

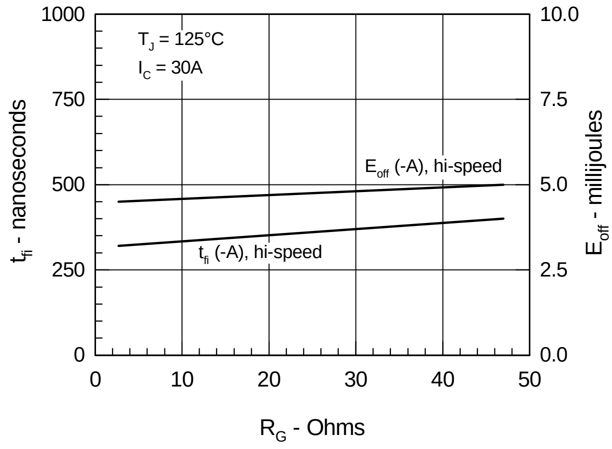


Fig.9 Gate Charge Characteristic Curve

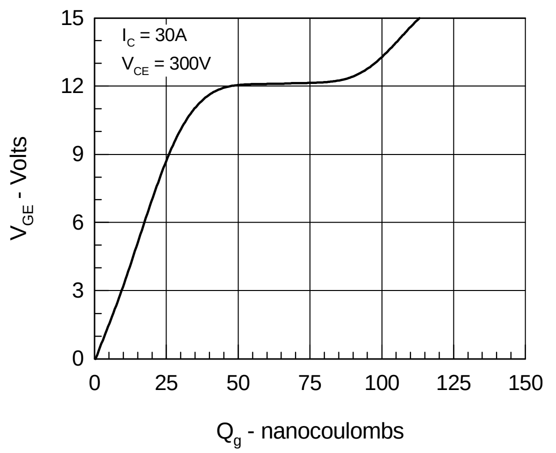


Fig.10 Turn-Off Safe Operating Area

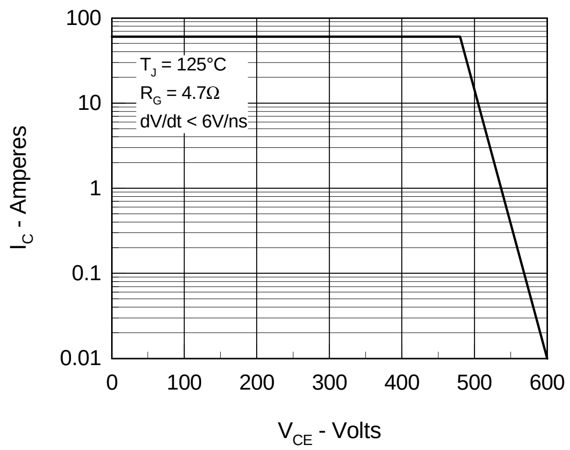


Fig.11 Transient Thermal Impedance

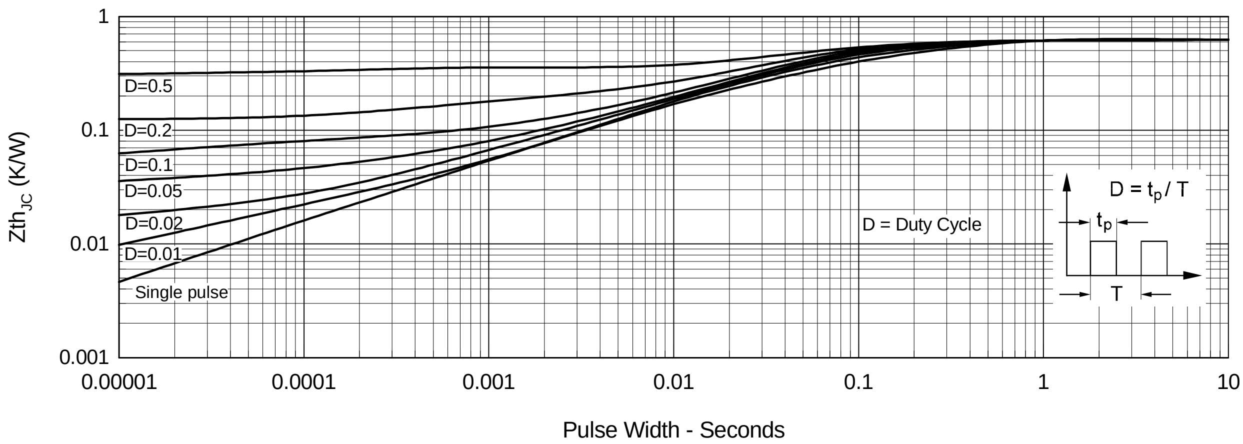


Fig.12 Maximum Forward Voltage Drop

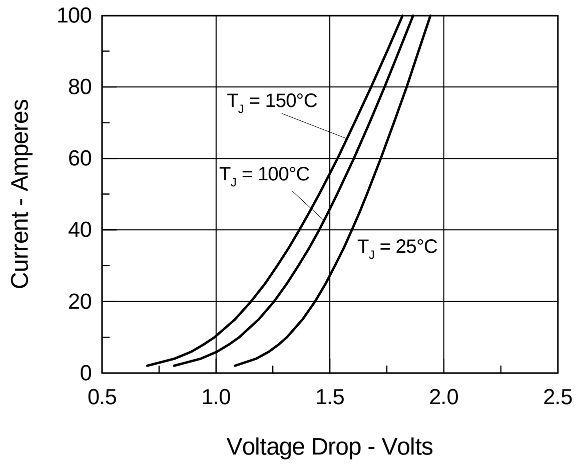


Fig.13 Peak Forward Voltage V_{FR} and Forward Recovery Time t_{fr}

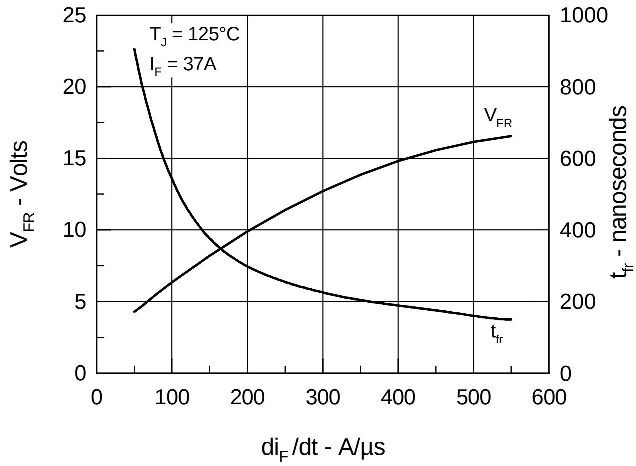


Fig.14 Junction Temperature Dependence off I_{RM} and Q_r

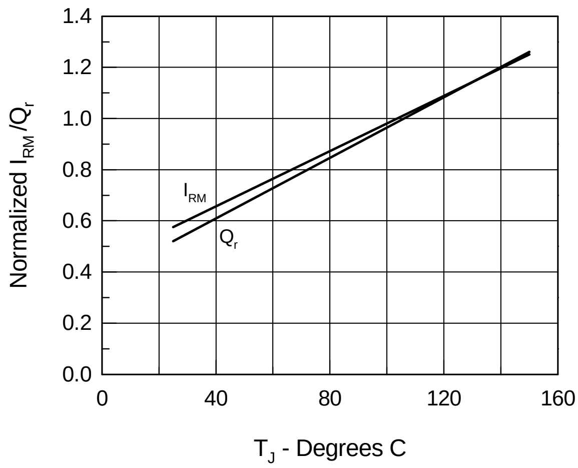


Fig.15 Reverse Recovery Chargee

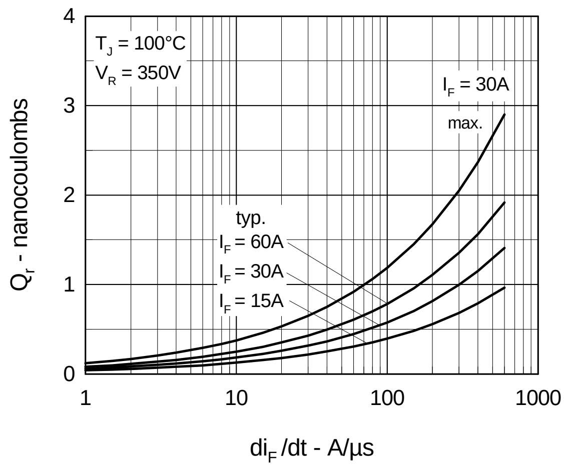


Fig.16 Peak Reverse Recovery Current

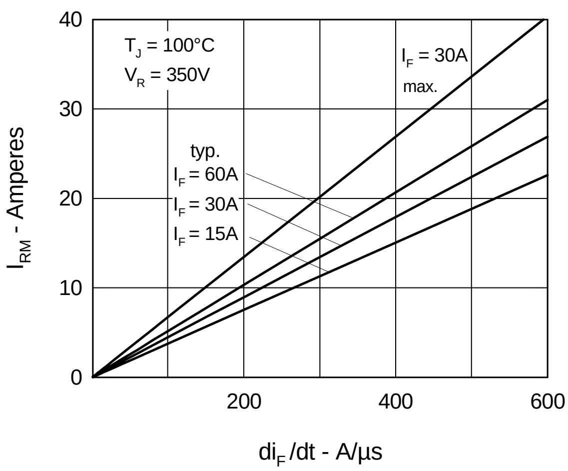


Fig.17 Reverse Recovery Time

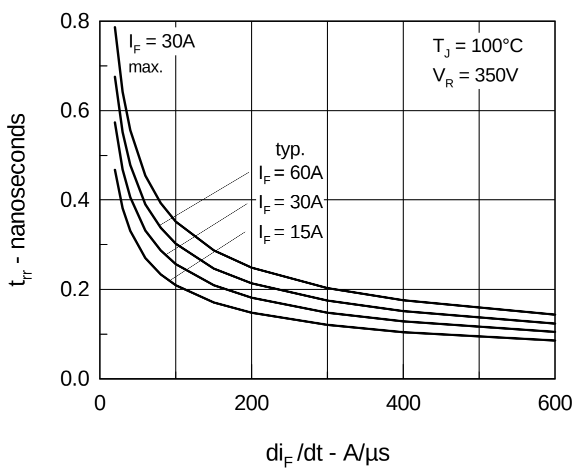


Fig.18 Diode Transient Thermal resistance junction to case