IXYS

High Voltage IGBT with Diode

Combi Pack

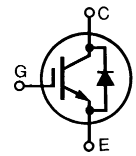
Short Circuit SOA Capability

IXSX 35N120AU1

V_{CES} = 1200 V

I_{C25} = 70 A

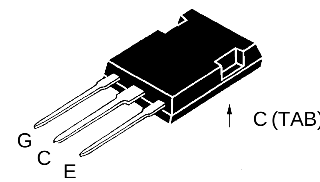
$V_{CE(SAT)}$ = 4 V



Symbol	Test Conditions		Maximum Ratings	
V_{CES}	T_J = 25°C to 150°C		1200	V
V_{CGR}	T_J = 25°C to 150°C; R_{GE} = 1 MΩ		1200	V
V_{GES}	Continuous		±20	V
V_{GEM}	Transient		±30	V
I_{C25}	T_C = 25°C		70	A
I_{C90}	T_C = 90°C		35	A
I_{CM}	T_C = 25°C, 1 ms		140	A
SSOA (RBSOA)	V_{GE}= 15 V, T_J = 125°C, R_G = 22 Ω Clamped inductive load, L = 30 µH		I_{CM} = 70 @ 0.8 V_{CES}	A
t_{SC} **(SCSOA)**	V_{GE}= 15 V, V_{CE} = 720 V, T_J = 125°C R_G = 22 Ω, non repetitive		10	µs
P_C	T_C = 25°C	IGBT Diode	300 190	W W
T_J			-55 ... +150	°C
T_{JM}			150	°C
T_{stg}			-55 ... +150	°C
T_L	1.6 mm (0.063 in) from case for 10 s		300	°C
Weight	TO-247 HL		6	g

Symbol	Test Conditions		Characteristic Values (T_J = 25°C, unless otherwise specified) min.	typ.	max.	
BV_{CES}	I_C = 5 mA, V_{GE} = 0 V		1200			V
$V_{GE(th)}$	I_C = 4 mA, V_{CE} = V_{GE}		4		8	V
I_{CES} ①	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				4	V

PLUS TO-247™ (IXSX35N120AU1)



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

Features

- Hole-less TO-247 package for clip mounting
- 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

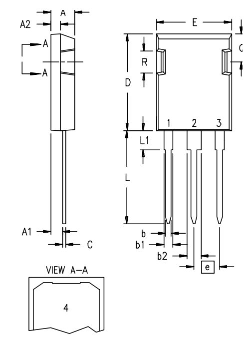
Advantages

- Space savings (two devices in one package)
- Reduces assembly time and cost
- High power density

IXYS reserves the right to change limits, test conditions, and dimensions. 97514D (7/00)

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 %	20	26		S
$I_{C(on)}$	V_{GE} = 15 V, V_{CE} = 10 V		170		A
C_{ies}	V_{CE} = 25 V, V_{GE} = 0 V, f = 1 MHz		3900		pF
C_{oes}			295		pF
C_{res}			60		pF
Q_g	$I_C = I_{C90}$, V_{GE} = 15 V, V_{CE} = 0.5 V_{CES}		150	190	nC
Q_{ge}			40	60	nC
Q_{gc}			70	100	nC
$t_{d(on)}$	**Inductive load, T_J = 25°C**		80		ns
t_{ri}	$I_C = I_{C90}$, V_{GE} = 15 V,		150		ns
$t_{d(off)}$	L = 100 µH, V_{CE} = 0.8 V_{CES}, R_G = 2.7 Ω		400	900	ns
t_{fi}	Switching times may increase for V_{CE} (Clamp) > 0.8 • V_{CES}, higher T_J or		500	700	ns
E_{off}	increased R_G		10		mJ
$t_{d(on)}$	**Inductive load, T_J = 125°C**		80		ns
t_{ri}	$I_C = I_{C90}$, V_{GE} = 15 V,		150		ns
E_{on}	L = 100 µH, V_{CE} = 0.8 V_{CES}, R_G = 2.7 Ω		8		mJ
$t_{d(off)}$	Switching times may increase for V_{CE}		400		ns
t_{fi}	(Clamp) > 0.8 • V_{CES}, higher T_J or		700		ns
E_{off}	increased R_G		15		mJ
R_{thJC}				0.42	K/W
R_{thCK}			0.15		K/W

PLUS247™ (IXSX)



Dim.	Millimeter Min.	Max.	Inches Min.	Max.
A	4.83	5.21	.190	.205
A_1	2.29	2.54	.090	.100
A_2	1.91	2.16	.075	.085
b	1.14	1.40	.045	.055
b_1	1.91	2.13	.075	.084
b_2	2.92	3.12	.115	.123
C	0.61	0.80	.024	.031
D	20.80	21.34	.819	.840
E	15.75	16.13	.620	.635
e	5.45 BSC		.215 BSC	
L	19.81	20.32	.780	.800
L1	3.81	4.32	.150	.170
Q	5.59	6.20	.220	.244
R	4.32	4.83	.170	.190

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 %, T_J = 125°C			2.35	V
I_{RM}	$I_F = I_{C90}$, V_{GE} = 0 V, -di_F/dt = 480 A/µs		32	36	A
t_{rr}	V_R = 540 V, T_J = 100°C		225		ns
	I_F = 1 A; -di/dt = 200 A/µs; V_R = 30 V, T_J = 25°C		40	60	ns
R_{thJC}				0.65	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

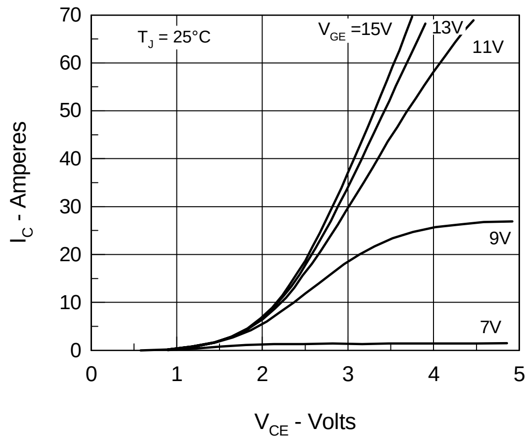


Fig.2 Output Characterstics

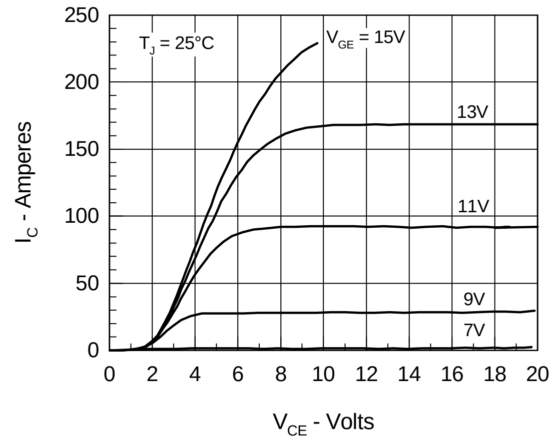


Fig.3 Collector-Emitter Voltage vs. Gate-Emitter Voltage

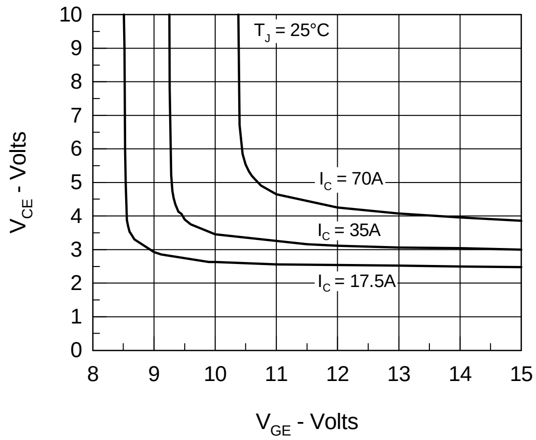


Fig.4 Temperature Dependence of Output Saturation Voltage

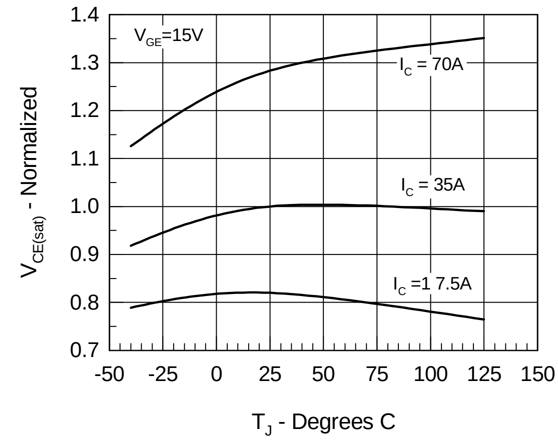


Fig.5 Input Admittance

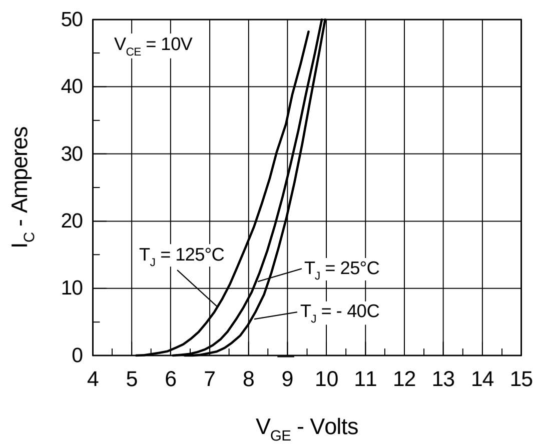


Fig.6 Temperature Dependence of Breakdown and Threshold Voltage

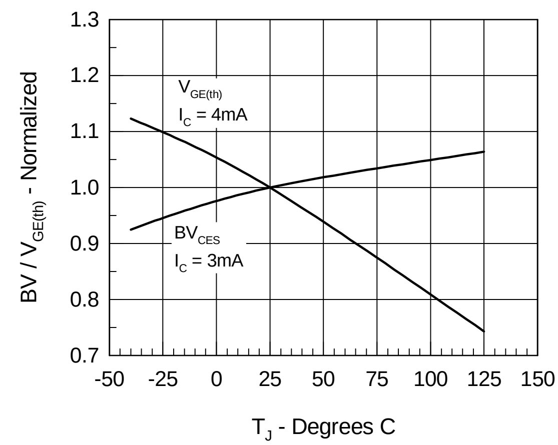


Fig.7 Turn-Off Energy per Pulse and Fall Time on Collector Current

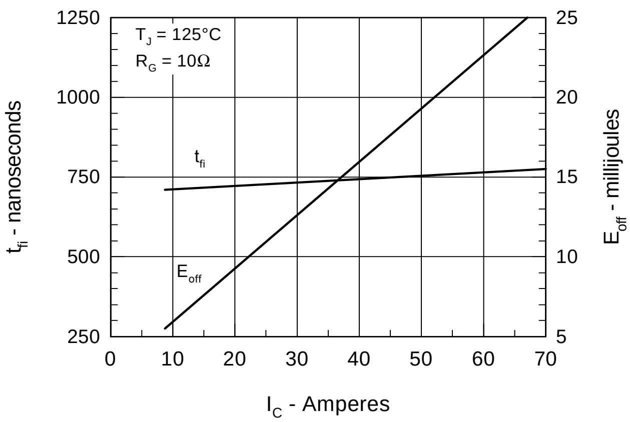


Fig.8 Dependence of Turn-Off Energy Per Pulse and Fall Time on R_G

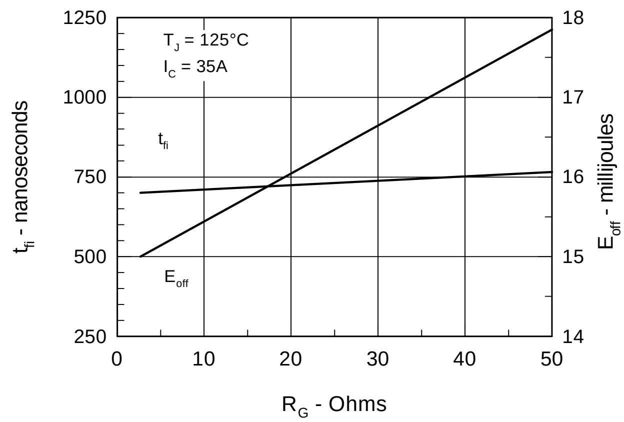


Fig.9 Gate Charge Characteristic Curve

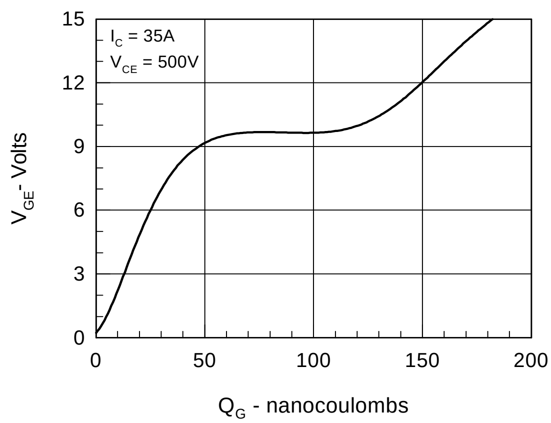


Fig.10 Turn-Off Safe Operating Area

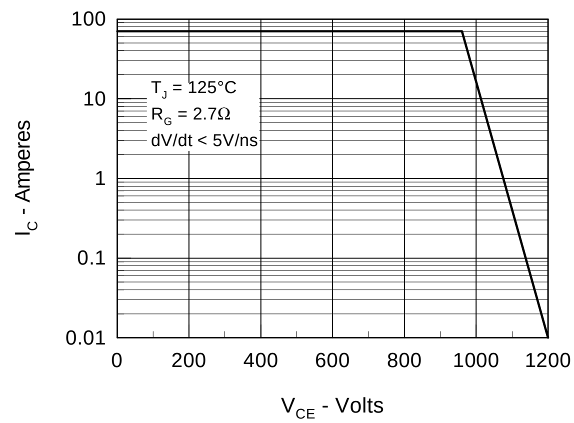


Fig.11 Transient Thermal Impedance

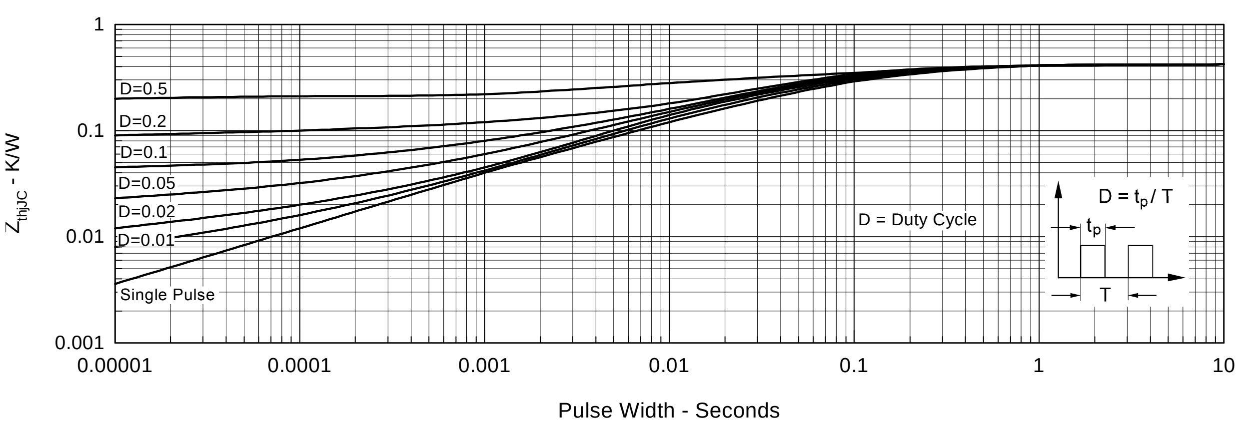


Fig.12 Maximum Forward Voltage Drop

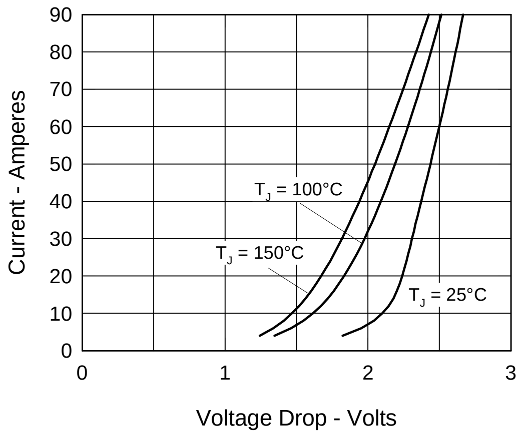


Fig.13 Peak Forward Voltage V_{FR} and Forward Recovery Time t_{FR}

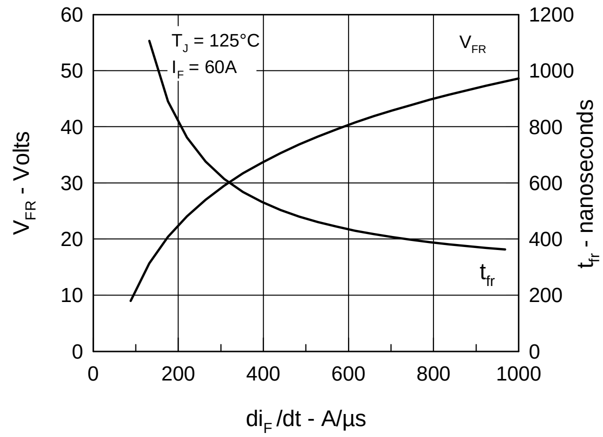


Fig.14 Junction Temperature Dependence off I_{RM} and Q_r

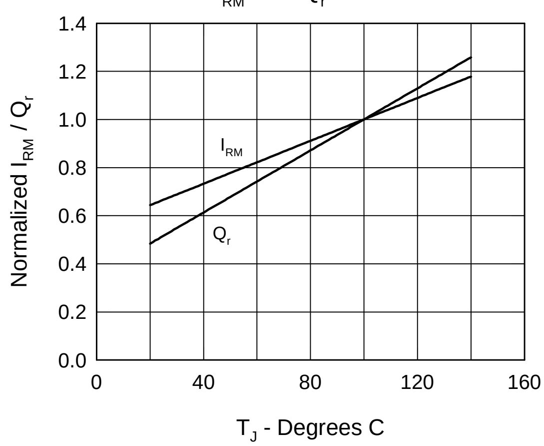


Fig.15 Reverse Recovery Chargee

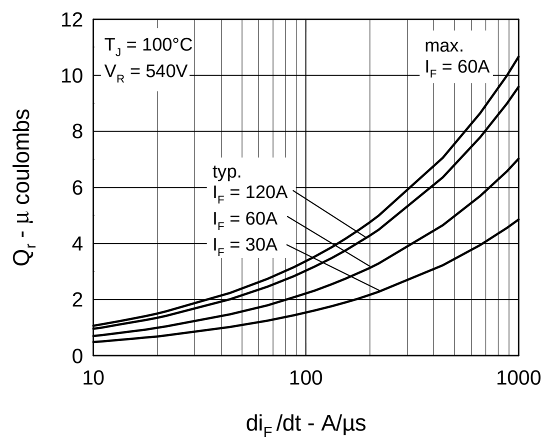


Fig.16 Peak Reverse Recovery Current

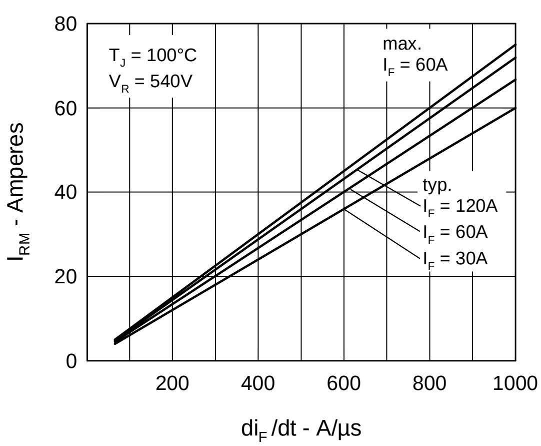


Fig.17 Reverse Recovery Time