IXYS

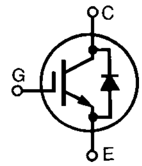
Preliminary Data Sheet

High Voltage IGBT with Diode

Combi Pack
Short Circuit SOA Capability

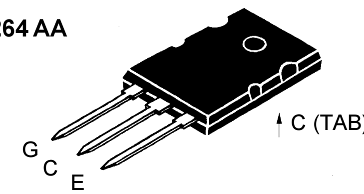
IXSK35N120AU1

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	300	W
		Diode	190	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
M_d	Mounting torque		1.15/13	Nm/lb.in.
Weight			10	g

TO-264 AA



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

Features

- International standard package JEDEC TO-264 AA
- High frequency IGBT and anti-parallel FRED in one package
- 2nd generation HDMOS™ process
- 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

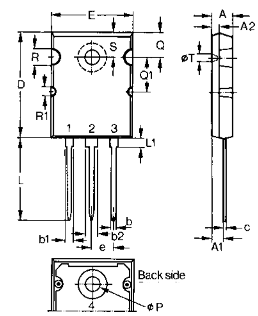
- Space savings (two devices in one package)
- Easy to mount with one screw (isolated mounting screw hole)
- High power density

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}	T_J = 25°C			750	µA
	V_{GE} = 0 V	T_J = 125°C			15	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

① Device must be heatsunk for high temperature measurements to avoid thermal runaway.
IXYS reserves the right to change limits, test conditions and dimensions.

Symbol	Test Conditions	min.	typ.	max.	
	Characteristic Values (T_J = 25°C, unless otherwise specified)				
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** $I_C = I_{C90}$, V_{GE} = 15 V, L = 100 µH R_G = 2.7 Ω, V_{CE} = 0.8 V_{CES} Switching times may increase for V_{CE} (Clamp) > 0.8 V_{CES}, higher T_J or increased R_G.		80		ns
t_{ri}			150		ns
$t_{d(off)}$			400	900	ns
t_{fi}			500	700	ns
E_{off}			10		mJ
$t_{d(on)}$	**Inductive load, T_J = 125°C** $I_C = I_{C90}$, V_{GE} = 15 V, L = 100 µH R_G = 2.7 Ω, V_{CE} = 0.8 V_{CES} Switching times may increase for V_{CE} (Clamp) > 0.8 V_{CES}, higher T_J or increased R_G.		80		ns
t_{ri}			150		ns
E_{on}			8		mJ
$t_{d(off)}$			400		ns
t_{fi}			700		ns
E_{off}			15		mJ
R_{thJC}				0.42	K/W
R_{thCK}			0.15		K/W

TO-264 AA Outline



Dim.	Millimeter Min.	Millimeter Max.	Inches Min.	Inches Max.
A	4.82	5.13	.190	.202
A1	2.54	2.89	.100	.114
A2	2.00	2.10	.079	.083
b	1.12	1.42	.044	.056
b1	2.39	2.69	.094	.106
b2	2.90	3.09	.114	.122
c	0.53	0.83	.021	.033
D	25.91	26.16	1.020	1.030
E	19.81	19.96	.780	.786
e	5.46 BSC		.215 BSC	
J	0.00	0.25	.000	.010
K	0.00	0.25	.000	.010
L	20.32	20.83	.800	.820
L1	2.29	2.59	.090	.102
P	3.17	3.66	.125	.144
Q	6.07	6.27	.239	.247
Q1	8.38	8.69	.330	.342
R	3.81	4.32	.150	.170
R1	1.78	2.29	.070	.090
S	6.04	6.30	.238	.248
T	1.57	1.83	.062	.072

Reverse Diode (FRED)

Symbol	Test Conditions	min.	typ.	max.	
	Characteristic Values (T_J = 25°C, unless otherwise specified)				
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

IXSK 35N120AU1 characteristic curves are located in the IXSX 35N120AU1.

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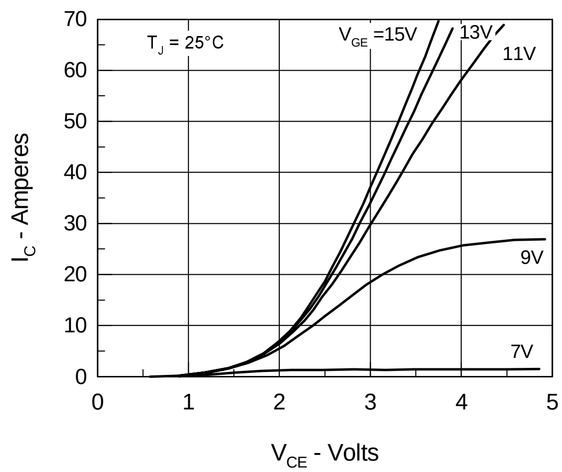

Fig.1 Saturation Characteristics

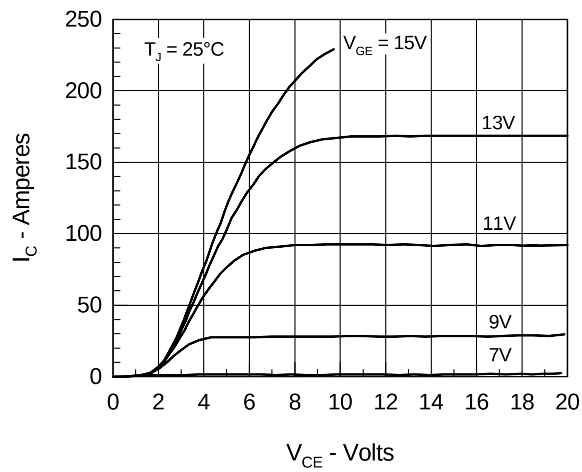

Fig.2 Output Characterstics

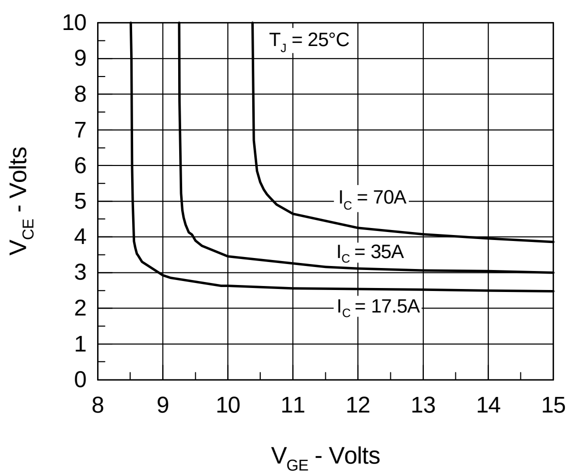

Fig.3 Collector-Emitter Voltage vs. Gate-Emitter Voltage

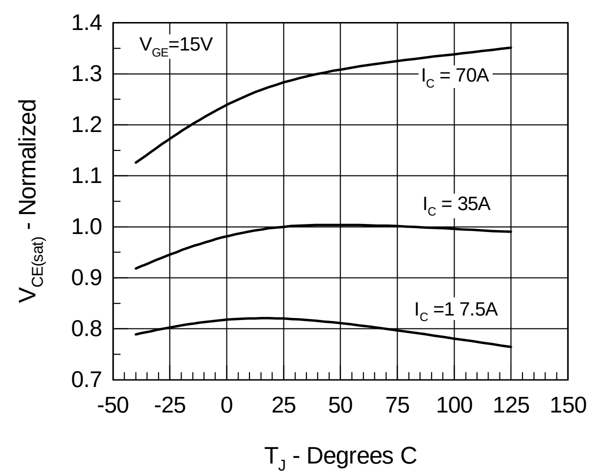

Fig.4 Temperature Dependence of Output Saturation Voltage

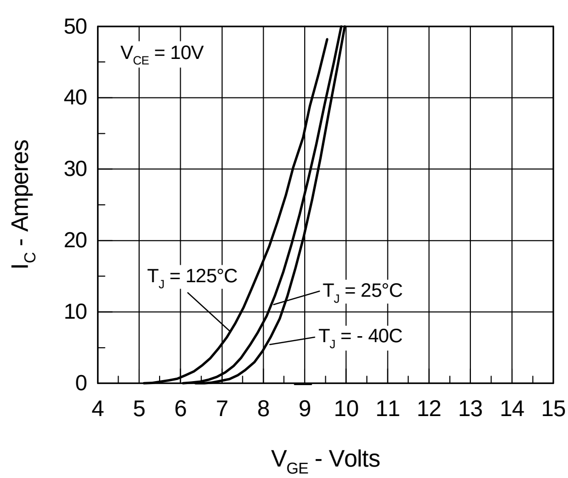

Fig.5 Input Admittance

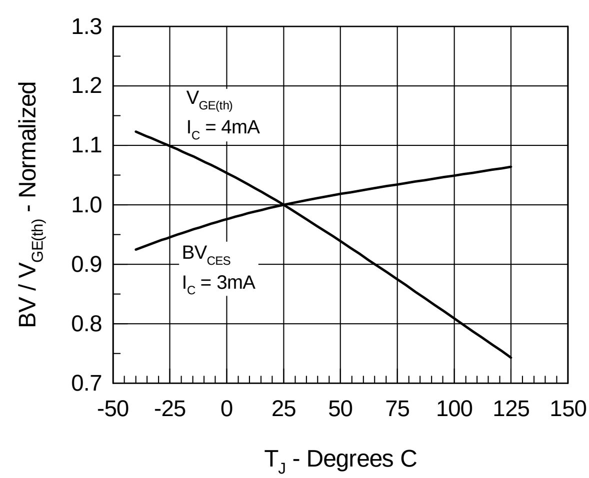

Fig.6 Temperature Dependence of Breakdown and Threshold Voltage

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

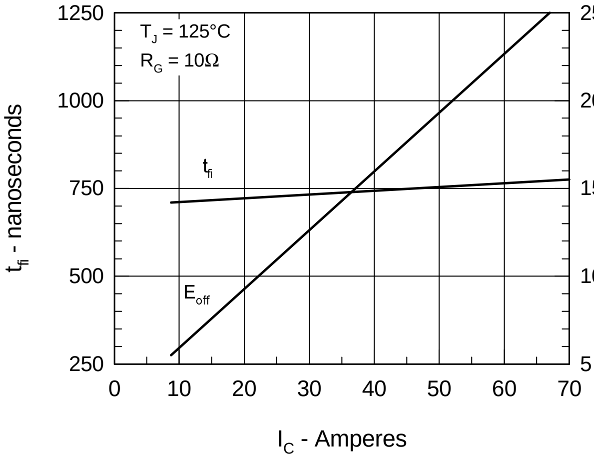

Fig.8 Dependence of Turn-Off Energy Per Pulse and Fall Time on R_G

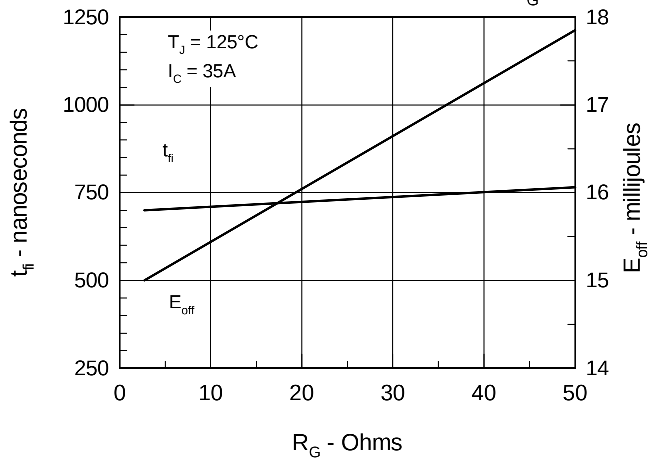

Fig.9 Gate Charge Characteristic Curve

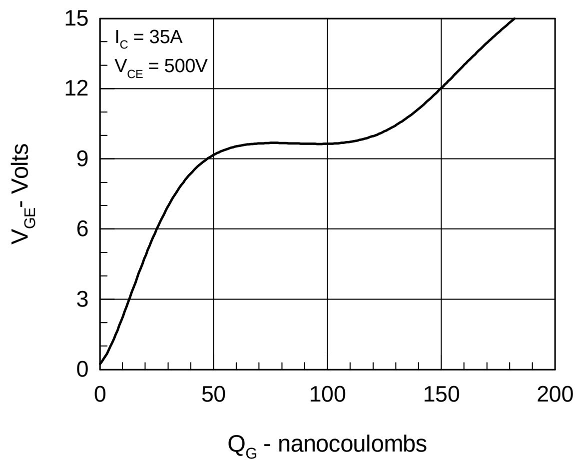

Fig.10 Turn-Off Safe Operating Area

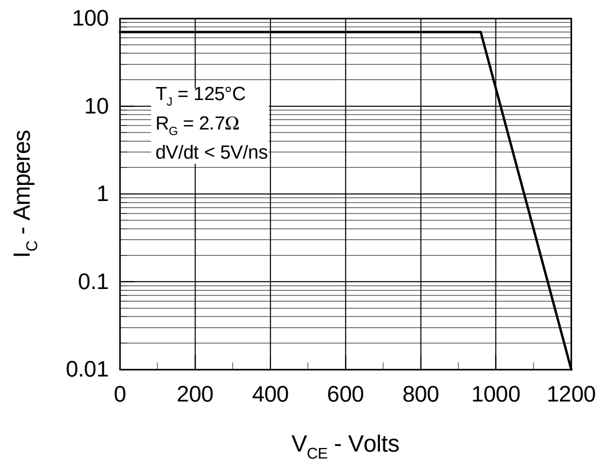

Fig.11 Transient Thermal Impedance

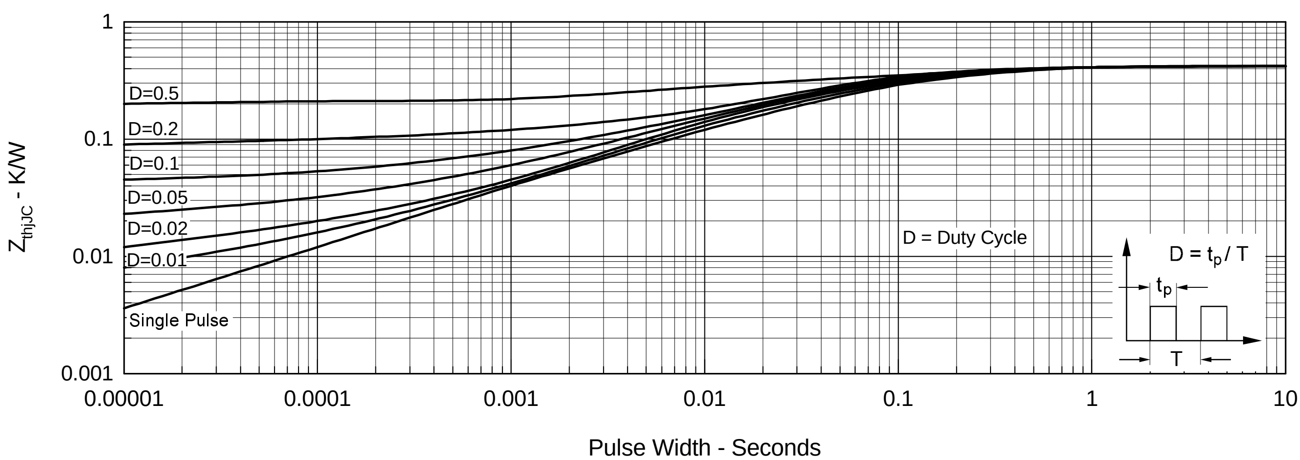

Fig.12 Maximum Forward Voltage Drop

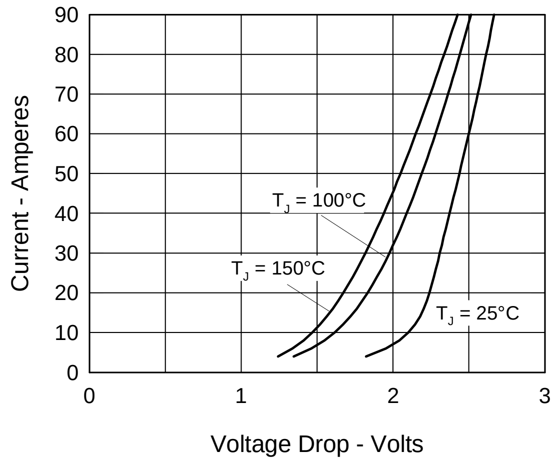

Fig.13 Peak Forward Voltage V_{FR} and Forward Recovery Time t_{FR}

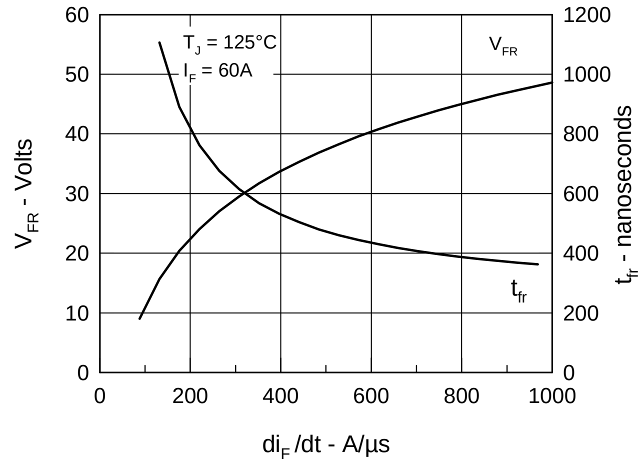

Fig.14 Junction Temperature Dependence off I_{RM} and Q_r

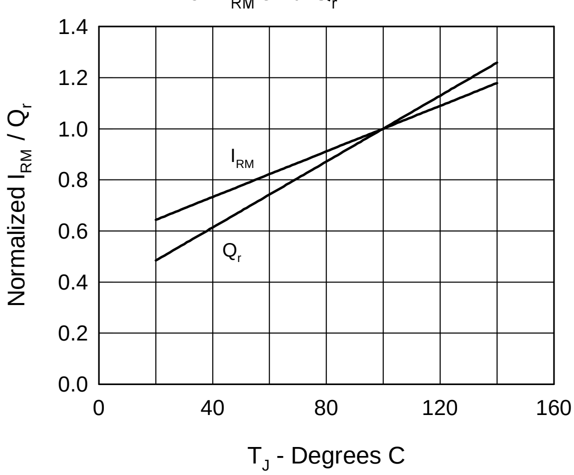

Fig.15 Reverse Recovery Chargee

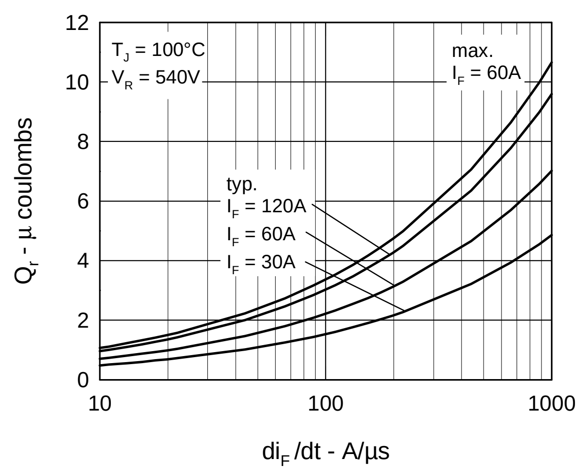

Fig.16 Peak Reverse Recovery Current

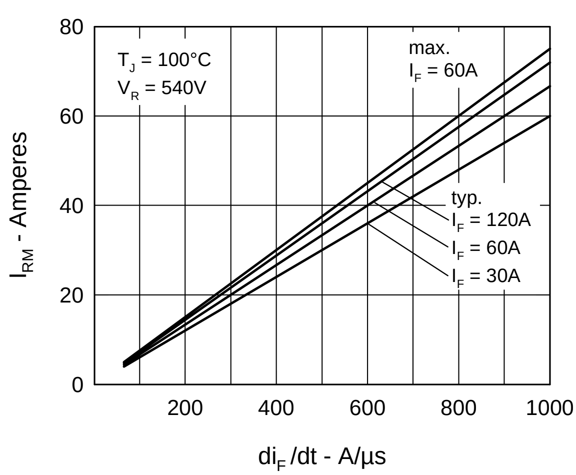

Fig.17 Reverse Recovery Time