IXYS

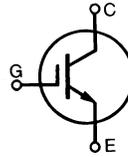## Ultra-Low $V_{CE(sat)}$ IGBT
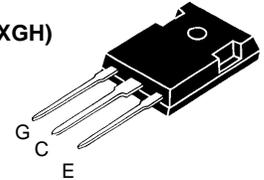
IXGH 60N60
IXGK 60N60
IXGT 60N60

V_{CES} = 600 V
I_{C25} = 75 A
$V_{CE(sat)}$ = 1.7 V

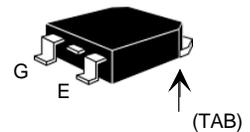| Symbol	Test Conditions	Maximum Ratings	
V_{CES}	T_J = 25°C to 150°C	600	V
V_{CGR}	T_J = 25°C to 150°C; R_{GE} = 1 MΩ	600	V
V_{GES}	Continuous	±20	V
V_{GEM}	Transient	±30	V
I_{C25}	T_C = 25°C, limited by leads	75	A
I_{C90}	T_C = 90°C	60	A
I_{CM}	T_C = 25°C, 1 ms	200	A
SSOA (RBSOA)	V_{GE}= 15 V, T_{VJ} = 125°C, R_G = 10 Ω Clamped inductive load, L = 30 µH	I_{CM} = 100 @ 0.8 V_{CES}	A
P_C	T_C = 25°C	300	W
T_J		-55 ... +150	°C
T_{JM}		150	°C
T_{stg}		-55 ... +150	°C
M_d	Mounting torque (M3)	1.13/10	Nm/lb.in.
	Maximum lead temperature for soldering 1.6 mm (0.062 in.) from case for 10 s	300	°C
Weight	TO-247	6	g
	TO-264	10	g
	TO-268	4	g

TO-247 AD (IXGH)

G
C
E

TO-268 (IXGT)

G
E
(TAB)

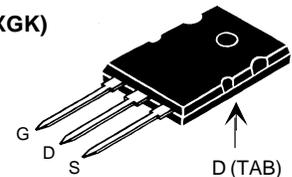**TO-264 (IXGK)**

G
D
S
D (TAB)

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

Features
- International standard package JEDEC TO-247 AD, TO-264, TO-268
- New generation HDMOS™ process
- Low $V_{CE(sat)}$ for minimum on-state conduction losses
- High current handling capability
- MOS Gate turn-on drive simplicity

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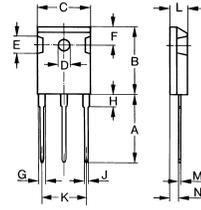- Switch-mode and resonant-mode power supplies

Advantages
- Easy to mount with 1 screw (isolated mounting screw hole)
- Low losses, high efficiency
- High power density
- High power, surface mount package

Symbol	Test Conditions		Characteristic Values $(T_J = 25°C$, unless otherwise specified)		
			min.	typ.	max.
BV_{CES}	I_C = 250 µA, V_{GE} = 0 V		600			V
$V_{GE(th)}$	I_C = 250 µA, $V_{CE} = V_{GE}$		2.5		5	V
I_{CES}	V_{CE} = 0.8 • V_{CES} V_{GE} = 0 V	T_J = 25°C T_J = 125°C			200 1	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				1.7	V

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

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Symbol	Test Conditions	min.	typ.	max.	
g_{fs}	$I_C = I_{C90}$; $V_{CE} = 10$ V, Pulse test, $t \leq 300$ µs, duty cycle $\leq 2\%$	30	55		S
C_{ies}			3700		pF
C_{oes}	$V_{CE} = 25$ V, $V_{GE} = 0$ V, $f = 1$ MHz		290		pF
C_{res}			86		pF
Q_g			130		nC
Q_{ge}	$I_C = I_{C90}$, $V_{GE} = 15$ V, $V_{CE} = 0.5$ V_{CES}		30		nC
Q_{gc}			45		nC
$t_{d(on)}$	**Inductive load, $T_J = 25°C$**		50		ns
t_{ri}	$I_C = I_{C90}$, $V_{GE} = 15$ V, $L = 100$ µH,		25		ns
$t_{d(off)}$	$V_{CE} = 0.8$ V_{CES}, $R_G = R_{off} = 2.7$ Ω		300	600	ns
t_{fi}	Remarks: Switching times may increase for V_{CE} (Clamp) > 0.8 • V_{CES}, higher T_J or		360	570	ns
E_{off}	increased R_G		8	15	mJ
$t_{d(on)}$	**Inductive load, $T_J = 125°C$**		50		ns
t_{ri}	$I_C = I_{C90}$, $V_{GE} = 15$ V, $L = 100$ µH		25		ns
E_{on}	$V_{CE} = 0.8$ V_{CES}, $R_G = R_{off} = 2.7$ Ω		3		mJ
$t_{d(off)}$	Remarks: Switching times may increase		650		ns
t_{fi}	for V_{CE} (Clamp) > 0.8 • V_{CES}, higher T_J or		550		ns
E_{off}	increased R_G		17		mJ
R_{thJC}				0.42	K/W
R_{thCK}	(IXGH)	0.25			K/W
	(IXGK)	0.15			K/W

TO-247 AD (IXFH) 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

TO-264 AA (IXFK) Outline
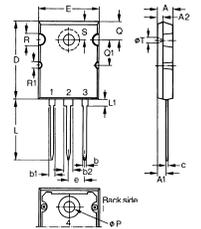
Dim.	Millimeter Min.	Max.	Inches Min.	Max.
A	4.82	5.13	.190	.202
A1	2.54	2.89	.100	.114
A2	2.00	2.10	.079	.083
b	1.12	1.42	.044	.056
b1	2.39	2.69	.094	.106
b2	2.90	3.09	.114	.122
c	0.53	0.83	.021	.033
D	25.91	26.16	1.020	1.030
E	19.81	19.96	.780	.786
e	5.46 BSC		.215 BSC	
J	0.00	0.25	.000	.010
K	0.00	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

TO-268AA (IXFT) (D³ PAK)
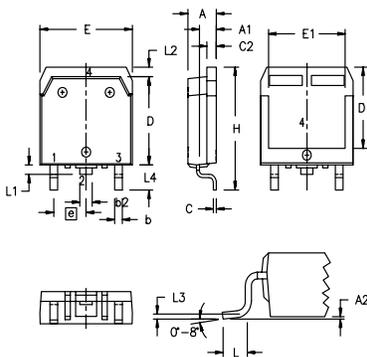
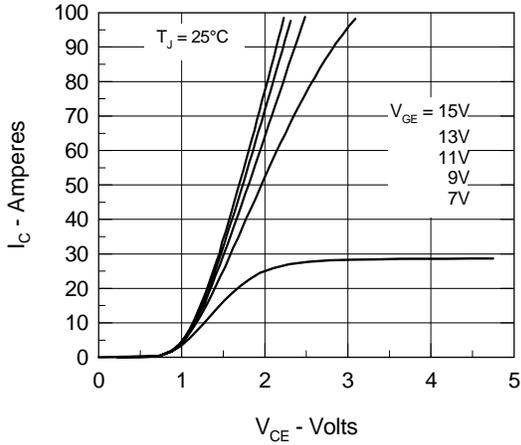| Dim.	Millimeter Min.	Max.	Inches Min.	Max.
A	4.9	5.1	.193	.201
A_1	2.7	2.9	.106	.114
A_2	.02	.25	.001	.010
b	1.15	1.45	.045	.057
b_2	1.9	2.1	.75	.83
C	.4	.65	.016	.026
D	13.80	14.00	.543	.551
E	15.85	16.05	.624	.632
E_1	13.3	13.6	.524	.535
e	5.45 BSC		.215 BSC	
H	18.70	19.10	.736	.752
L	2.40	2.70	.094	.106
L1	1.20	1.40	.047	.055
L2	1.00	1.15	.039	.045
L3	0.25 BSC		.010 BSC	
L4	3.80	4.10	.150	.161

Min. Recommended Footprint

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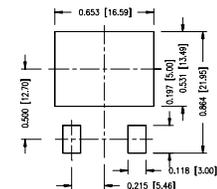
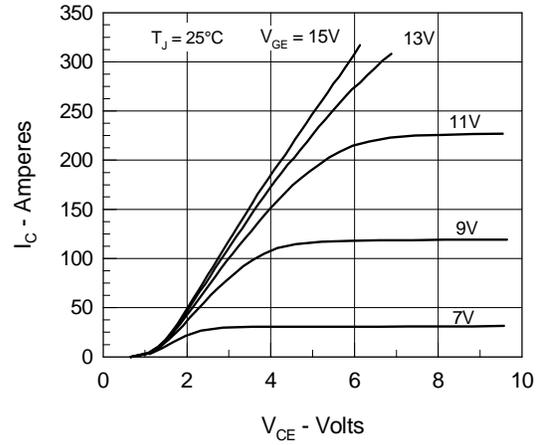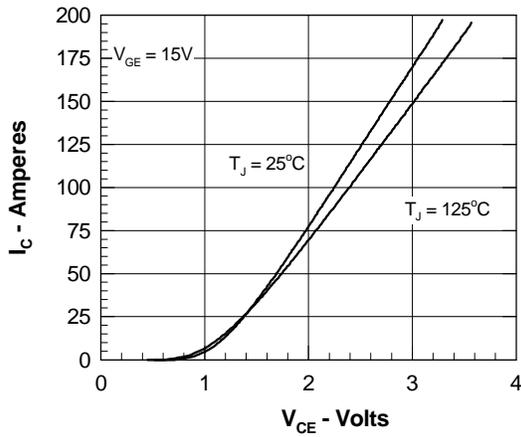Fig. 1. Saturation Voltage Characteristics

Fig. 2. Extended Output Characteristics

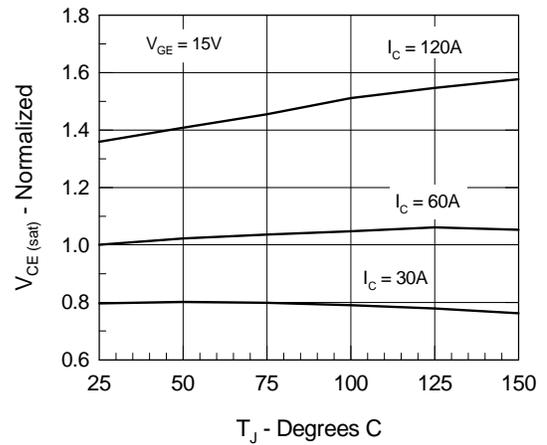Fig. 3. Saturation Voltage Characteristics

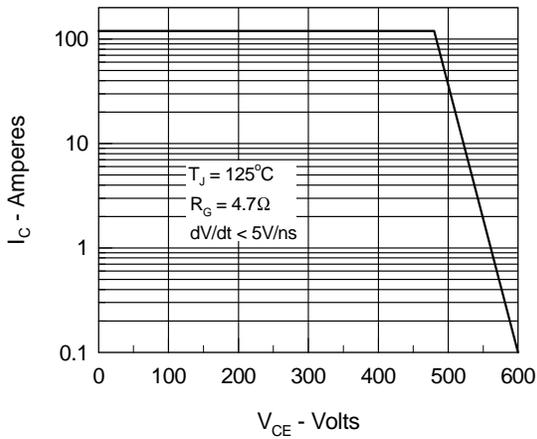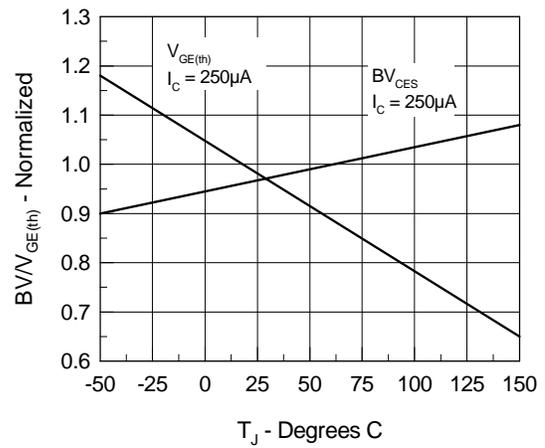Fig. 4. Temperature Dependence of $V_{CE(sat)}$

Fig. 5. Turn-off Safe Operating Area

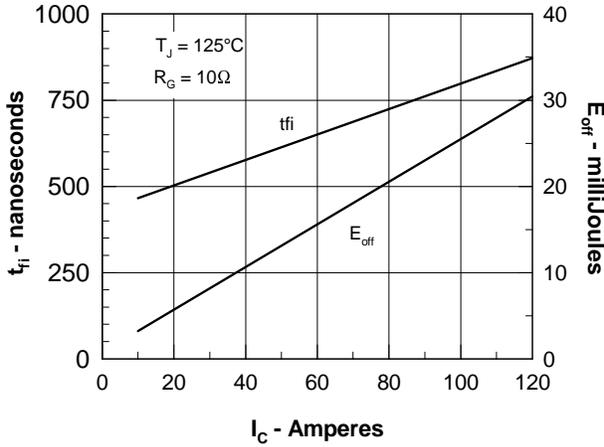Fig. 6. Temperature Dependence of
BV$_{CES}$ & V$_{GE(th)}$
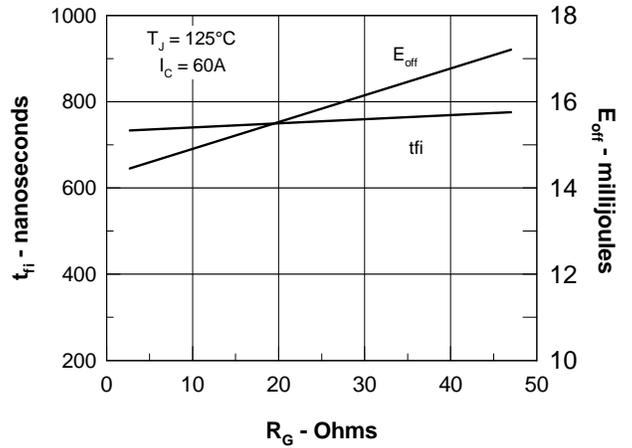
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Fig. 7. Dependence of tfi and E_{OFF} on I_C.

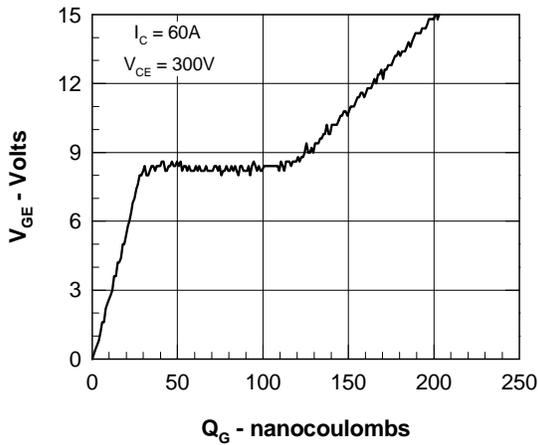Fig. 8. Dependence of tfi and E_{OFF} on R_G.
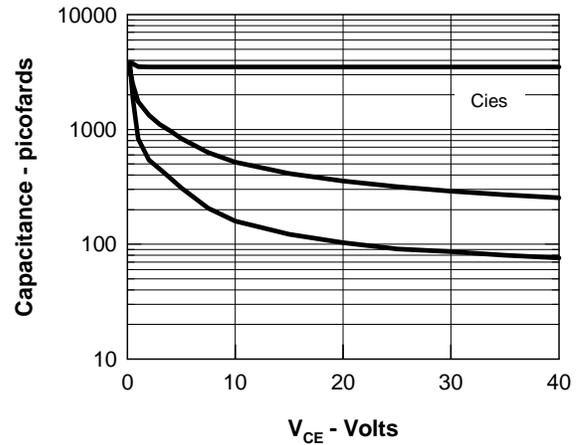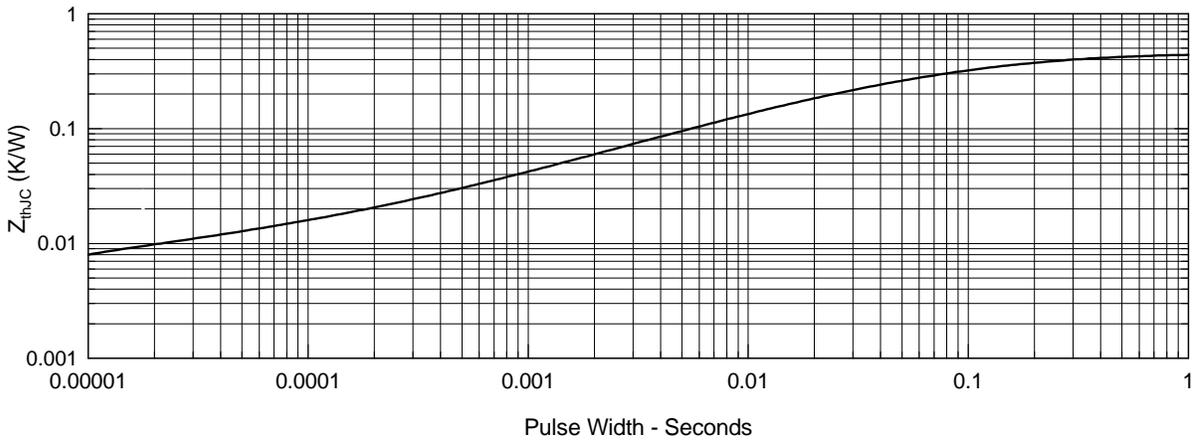
Fig. 9. Gate Charge

Fig. 10. Junction Capacitance Curves

Fig. 11. Transient Thermal Resistance

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