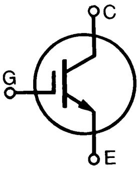
IXYS

Ultra-Low $V_{CE(sat)}$ IGBT

IXGH 60N60
IXGK 60N60
IXGT 60N60

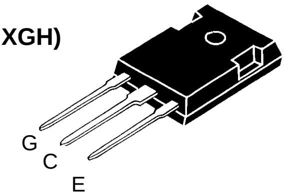
V_{CES} = 600 V
I_{C25} = 75 A
$V_{CE(sat)}$ = 1.7 V



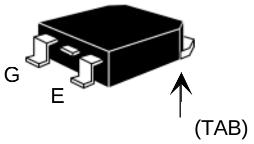
Symbol	Test Conditions	Maximum Ratings	
V_{CES}	T_J = 25°C to 150°C	600	V
V_{CGR}	T_J = 25°C to 150°C; R_{GE} = 1 MΩ	600	V
V_{GES}	Continuous	±20	V
V_{GEM}	Transient	±30	V
I_{C25}	T_C = 25°C, limited by leads	75	A
I_{C90}	T_C = 90°C	60	A
I_{CM}	T_C = 25°C, 1 ms	200	A
SSOA (RBSOA)	V_{GE}= 15 V, T_{VJ} = 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

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}	T_J = 25°C			200	µA
	V_{GE} = 0 V	T_J = 125°C			1	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

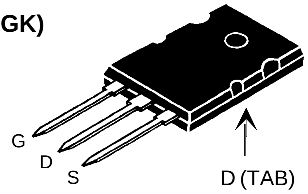
TO-247 AD (IXGH)



TO-268 (IXGT)



TO-264 (IXGK)



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

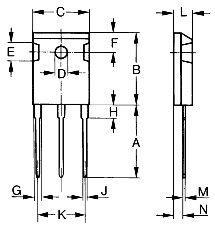
- AC motor speed control
- DC servo and robot drives
- DC choppers
- Uninterruptible power supplies (UPS)
- Switch-mode and resonant-mode power supplies

Advantages

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

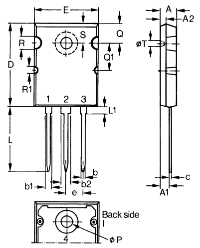
Symbol	Test Conditions	Characteristic Values (T_J = 25°C, unless otherwise specified) min.	typ.	max.	
g_{fs}	$I_C = I_{C90}$; V_{CE} = 10 V, Pulse test, $t \leq 300$ µs, duty cycle ≤ 2 %	30	55		S
C_{ies}	V_{CE} = 25 V, V_{GE} = 0 V, f = 1 MHz		3700		pF
C_{oes}			290		pF
C_{res}			86		pF
Q_g	$I_C = I_{C90}$, V_{GE} = 15 V, $V_{CE} = 0.5\ V_{CES}$		130		nC
Q_{ge}			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, $V_{CE} = 0.8\ V_{CES}$, $R_G = R_{off} = 2.7\ \Omega$		25		ns
$t_{d(off)}$	Remarks: Switching times may increase		300	600	ns
t_{fi}	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}	$V_{CE} = 0.8\ V_{CES}$, $R_G = R_{off} = 2.7\ \Omega$		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



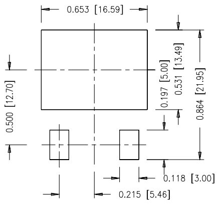
Dim.	Millimeter Min.	Millimeter Max.	Inches Min.	Inches Max.
A	19.81	20.32	0.780	0.800
B	20.80	21.46	0.819	0.845
C	15.75	16.26	0.610	0.640
D	3.55	3.65	0.140	0.144
E	4.32	5.49	0.170	0.216
F	5.4	6.2	0.212	0.244
G	1.65	2.13	0.065	0.084
H	-	4.5	-	0.177
J	1.0	1.4	0.040	0.055
K	10.8	11.0	0.426	0.433
L	4.7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

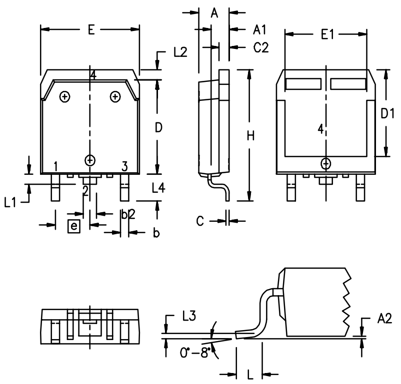


Dim.	Millimeter Min.	Millimeter Max.	Inches Min.	Inches Max.
A	4.82	5.13	.190	.202
A1	2.54	2.89	.100	.114
A2	2.00	2.10	.079	.083
b	1.12	1.42	.044	.056
b1	2.39	2.69	.094	.106
b2	2.90	3.09	.114	.122
c	0.53	0.83	.021	.033
D	25.91	26.16	1.020	1.030
E	19.81	19.96	.780	.786
e	5.46 BSC		.215 BSC	
J	0.00	0.25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

Min. Recommended Footprint



TO-268AA (IXFT) (D³ PAK)



Dim.	Millimeter Min.	Millimeter Max.	Inches Min.	Inches 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

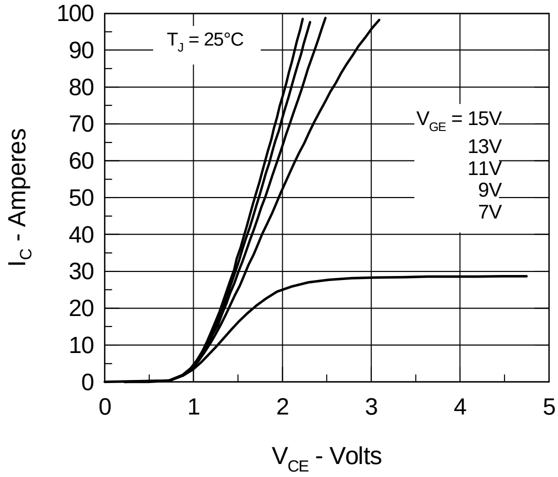


Fig. 1. Saturation Voltage Characteristics

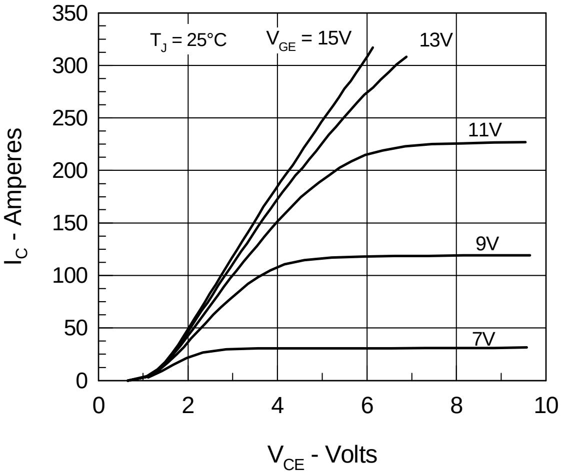


Fig. 2. Extended Output Characteristics

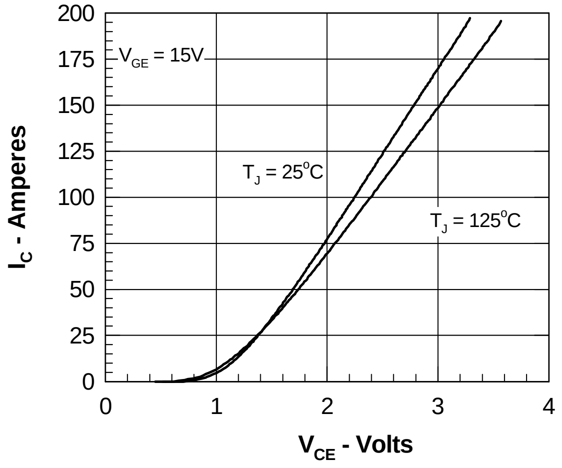


Fig. 3. Saturation Voltage Characteristics

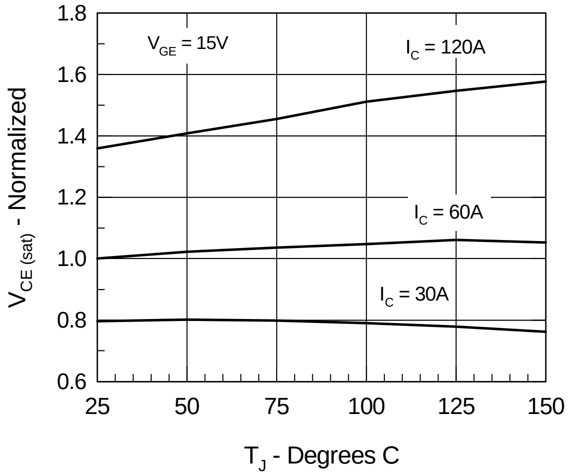


Fig. 4. Temperature Dependence of $V_{CE(sat)}$

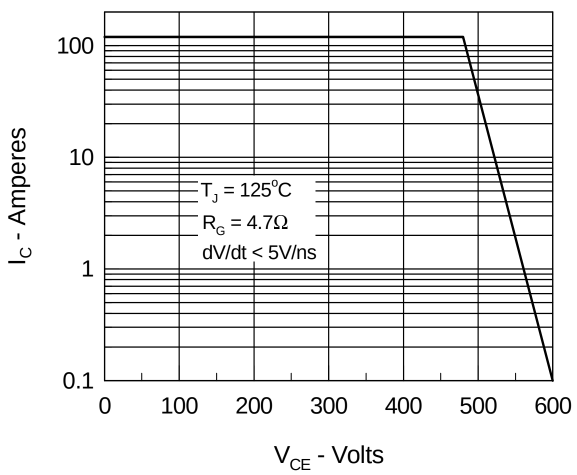


Fig. 5. Turn-off Safe Operating Area

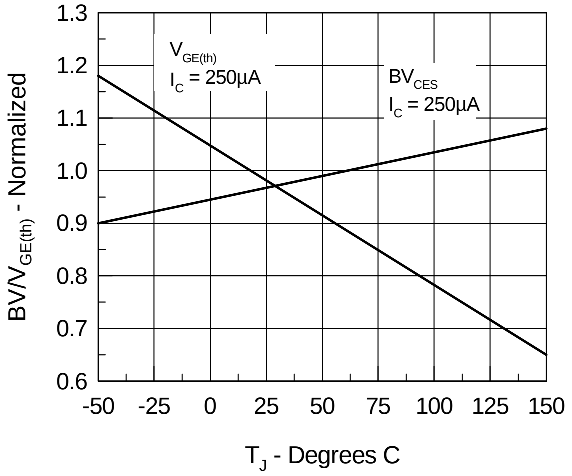


Fig. 6. Temperature Dependence of BV_{CES} & $V_{GE(th)}$

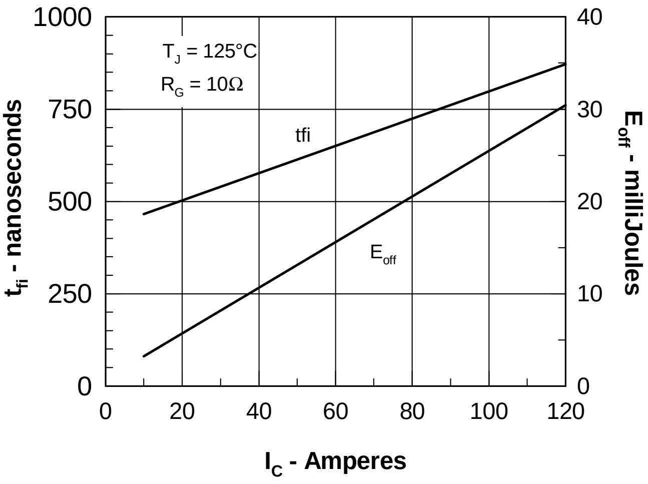


Fig. 7. Dependence of tfi and E_{OFF} on I_C.

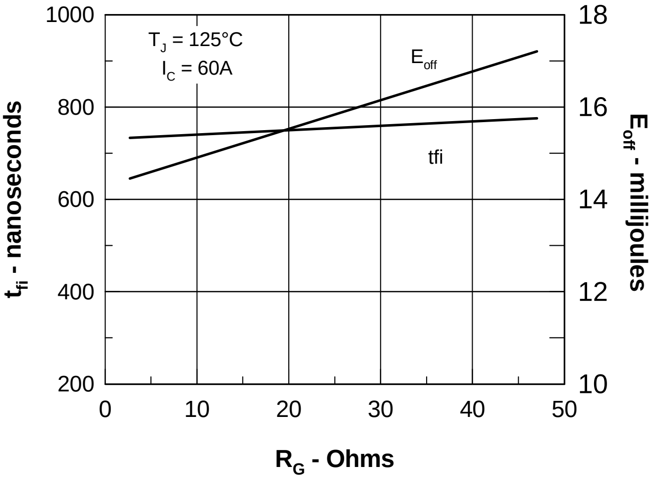


Fig. 8. Dependence of tfi and E_{OFF} on R_G.

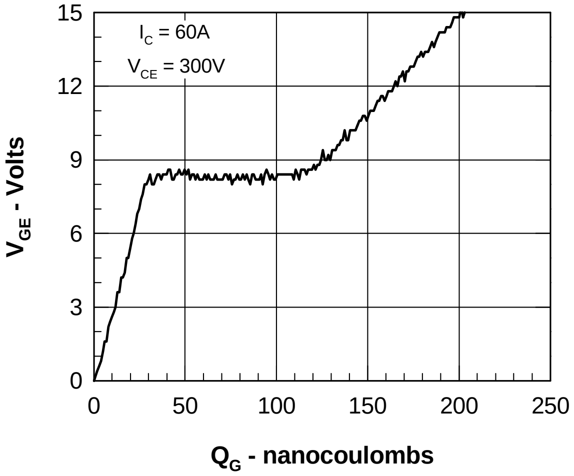


Fig. 9. Gate Charge

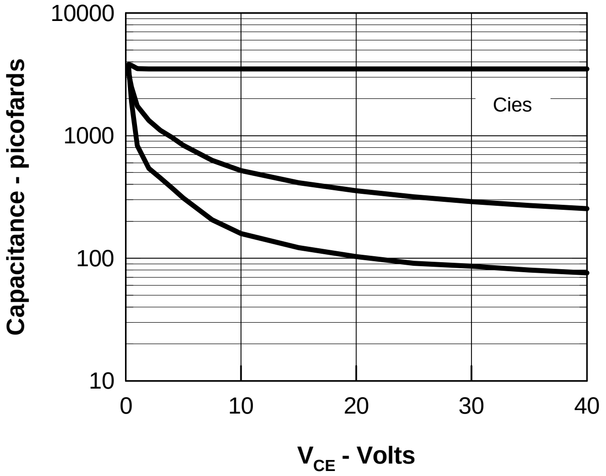


Fig. 10. Junction Capacitance Curves

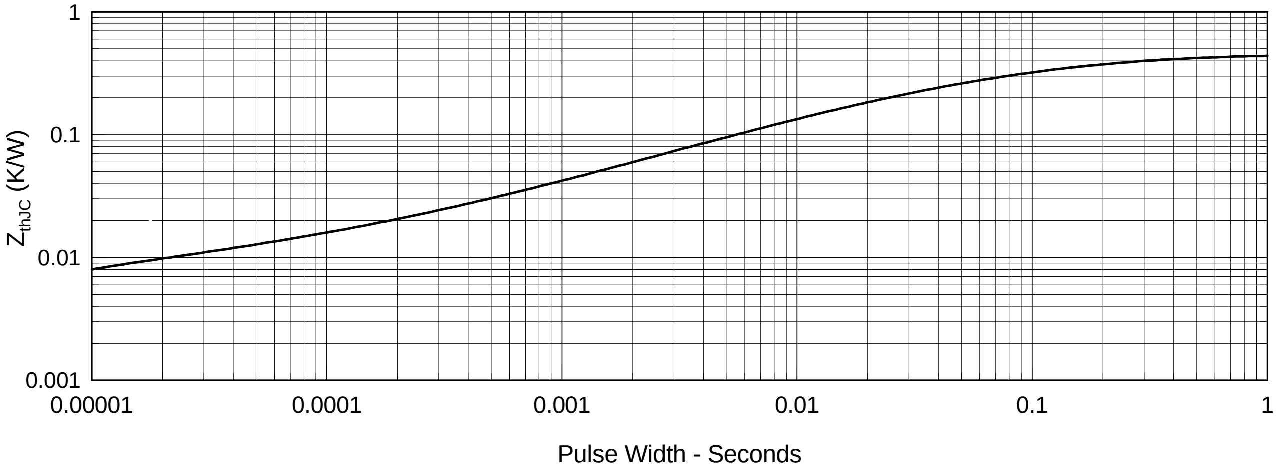


Fig. 11. Transient Thermal Resistance