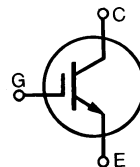


# High Voltage, Low $V_{CE(sat)}$ IGBT

## IXSH 45N120

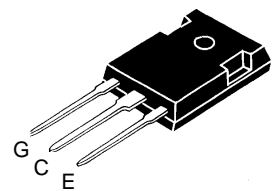
$$\begin{aligned} V_{CES} &= 1200 \text{ V} \\ I_{C25} &= 75 \text{ A} \\ V_{CE(sat)} &= 3 \text{ V} \end{aligned}$$

### Short Circuit SOA Capability



Symbol	Test Conditions	Maximum Ratings	
$V_{CES}$	$T_J = 25^\circ\text{C}$ to $150^\circ\text{C}$	1200	V
$V_{CGR}$	$T_J = 25^\circ\text{C}$ to $150^\circ\text{C}$ ; $R_{GE} = 1 \text{ M}\Omega$	1200	V
$V_{GES}$	Continuous	$\pm 20$	V
$V_{GEM}$	Transient	$\pm 30$	V
$I_{C25}$	$T_C = 25^\circ\text{C}$ , limited by leads	75	A
$I_{C90}$	$T_C = 90^\circ\text{C}$	45	A
$I_{CM}$	$T_C = 25^\circ\text{C}$ , 1 ms	180	A
<b>SSOA (RBSOA)</b>	$V_{GE} = 15 \text{ V}$ , $T_J = 125^\circ\text{C}$ , $R_G = 2.7 \Omega$ Clamped inductive load, $L = 30 \mu\text{H}$	$I_{CM} = 90$ @ $0.8 V_{CES}$	A
<b><math>t_{SC}</math> (SCSOA)</b>	$V_{GE} = 15 \text{ V}$ , $V_{CE} = 0.6 \cdot V_{CES}$ , $T_J = 125^\circ\text{C}$ $R_G = 22 \Omega$ , non repetitive	10	$\mu\text{s}$
$P_C$	$T_C = 25^\circ\text{C}$	300	W
$T_J$		-55 ... +150	$^\circ\text{C}$
$T_{JM}$		150	$^\circ\text{C}$
$T_{stg}$		-55 ... +150	$^\circ\text{C}$
$M_d$	Mounting torque	1.13/10	Nm/lb.in.
<b>Weight</b>		6	g
Maximum lead temperature for soldering 1.6 mm (0.062 in.) from case for 10 s		300	$^\circ\text{C}$

TO-247 AD



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

### Features

- International standard package JEDEC TO-247
- High frequency IGBT with guaranteed Short Circuit SOA capability
- Fast Fall Time for switching speeds up to 20 kHz
- 2nd generation HDMOS™ process
- Low  $V_{CE(sat)}$ 
  - for minimum on-state conduction losses
- MOS Gate turn-on
  - drive simplicity

### Applications

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

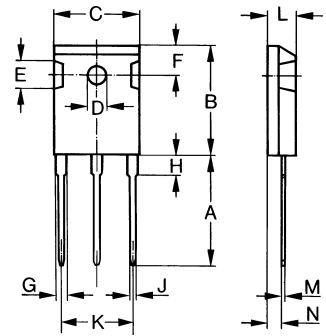
### Advantages

- Easy to mount with 1 screw (isolated mounting screw hole)
- High power density

Symbol	Test Conditions	Characteristic Values ( $T_J = 25^\circ\text{C}$ , unless otherwise specified)		
		min.	typ.	max.
$BV_{CES}$	$I_C = 3 \text{ mA}$ , $V_{GE} = 0 \text{ V}$	1200		V
$V_{GE(th)}$	$I_C = 4 \text{ mA}$ , $V_{CE} = V_{GE}$	4	6	8 V
$I_{CES}$	$V_{CE} = 0.8 \cdot V_{CES}$ $V_{GE} = 0 \text{ V}$			400 $\mu\text{A}$ 1.2 mA
$I_{GES}$	$V_{CE} = 0 \text{ V}$ , $V_{GE} = \pm 20 \text{ V}$			$\pm 100 \text{ nA}$
$V_{CE(sat)}$	$I_C = I_{C90}$ , $V_{GE} = 15 \text{ V}$			3 V

Symbol	Test Conditions	Characteristic Values ( $T_J = 25^\circ\text{C}$ , unless otherwise specified)		
		min.	typ.	max.
$g_{fs}$	$I_C = I_{C90}$ ; $V_{CE} = 10\text{ V}$ , Pulse test, $t \leq 300\text{ }\mu\text{s}$ , duty cycle $d \leq 2\%$		26	S
$I_{C(on)}$	$V_{GE} = 15\text{ V}$ , $V_{CE} = 10\text{ V}$		170	A
$C_{ies}$	$V_{CE} = 25\text{ V}$ , $V_{GE} = 0\text{ V}$ , $f = 1\text{ MHz}$		4150	pF
$C_{oes}$			285	pF
$C_{res}$			65	pF
$Q_g$	$I_C = I_{C90}$ , $V_{GE} = 15\text{ V}$ , $V_{CE} = 0.5 V_{CES}$		150	200 nC
$Q_{ge}$			45	60 nC
$Q_{gc}$			75	100 nC
$t_{d(on)}$	<b>Inductive load, <math>T_J = 25^\circ\text{C}</math></b> $I_C = I_{C90}$ , $V_{GE} = 15\text{ V}$ , $L = 100\text{ }\mu\text{H}$ $V_{CE} = 0.8 V_{CES}$ , $R_G = 2.7\text{ }\Omega$ Remarks: Switching times may increase for $V_{CE}(\text{Clamp}) > 0.8 \cdot V_{CES}$ , higher $T_J$ or increased $R_G$		80	ns
$t_{ri}$			250	ns
$t_{d(off)}$			400	ns
$t_{fi}$			1000	ns
$E_{off}$			21	mJ
$t_{d(on)}$	<b>Inductive load, <math>T_J = 125^\circ\text{C}</math></b> $I_C = I_{C90}$ , $V_{GE} = 15\text{ V}$ , $L = 100\text{ }\mu\text{H}$ $V_{CE} = 0.8 V_{CES}$ , $R_G = 2.7\text{ }\Omega$ Remarks: Switching times may increase for $V_{CE}(\text{Clamp}) > 0.8 \cdot V_{CES}$ , higher $T_J$ or increased $R_G$		80	ns
$t_{ri}$			250	ns
$E_{on}$			7.1	mJ
$t_{d(off)}$			450	ns
$t_{fi}$			1200	ns
$E_{off}$			27	mJ
$R_{thJC}$				0.42 K/W
$R_{thCK}$			0.25	K/W

### TO-247 AD (IXSH) Outline



Dim.	Millimeter		Inches	
	Min.	Max.	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

Fig.1 Saturation Characteristics

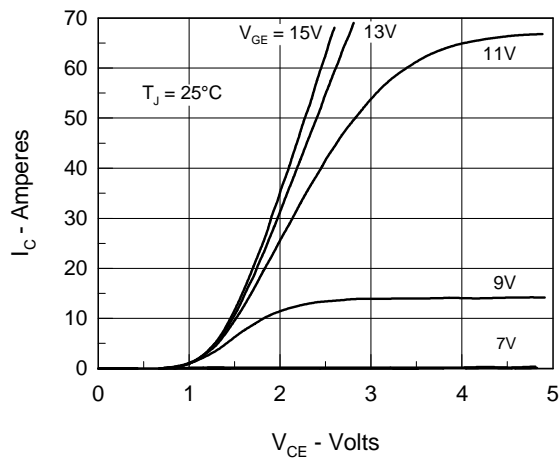


Fig.2 Output Characteristics

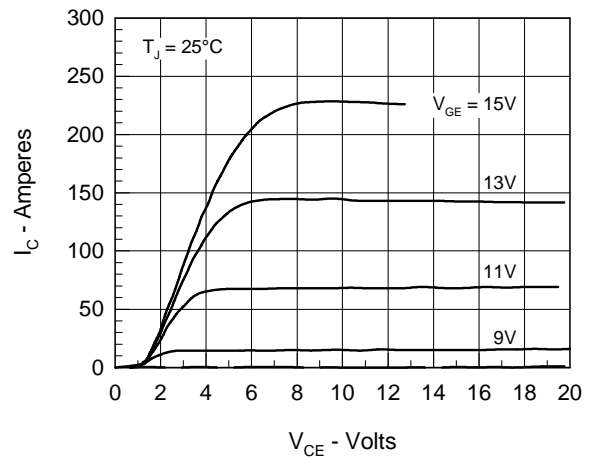


Fig.3 Collector-Emitter Voltage vs. Gate-Emitter Voltage

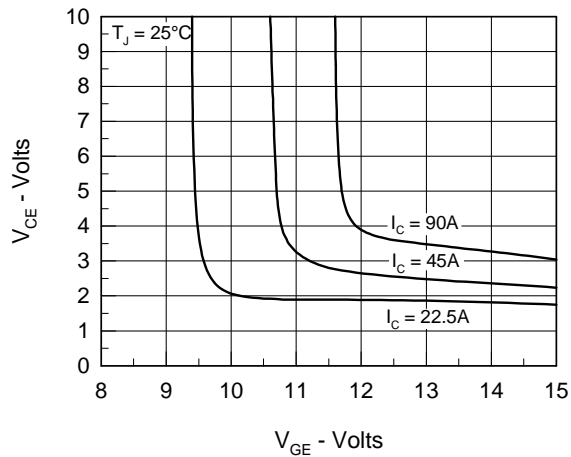


Fig.4 Temperature Dependence of Output Saturation Voltage

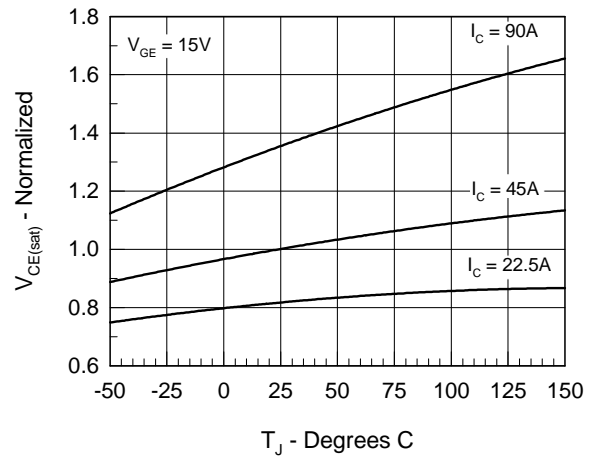


Fig. 5 Input Admittance

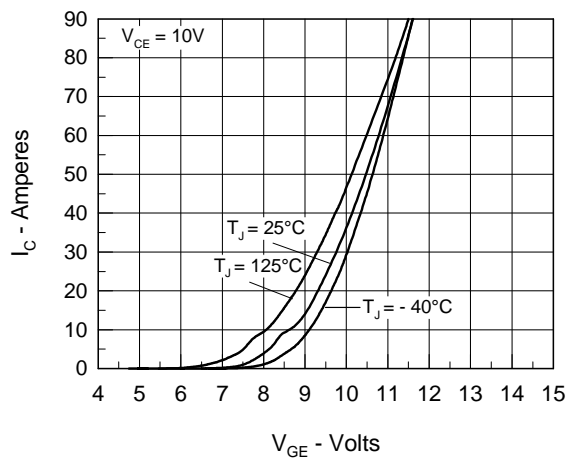


Fig.6 Temperature Dependence of Breakdown and Threshold Voltage

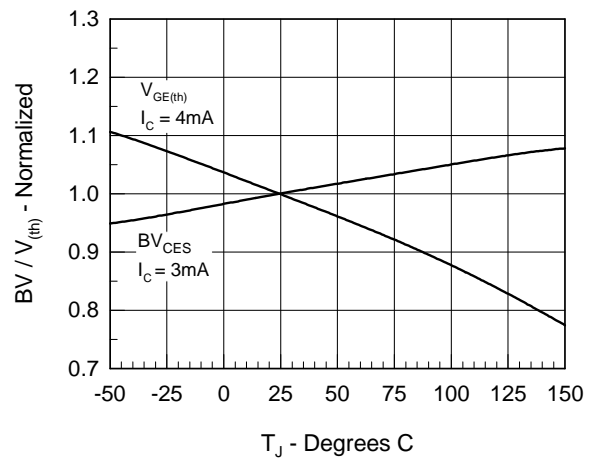


Fig.7 Turn-Off Energy per Pulse and Fall Time on Collector Current

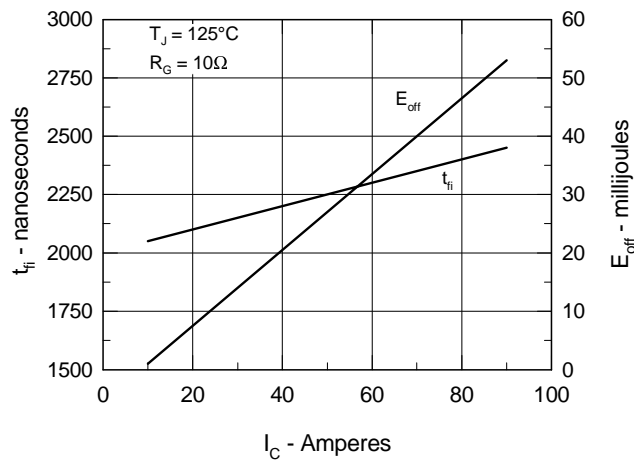


Fig.9 Gate Charge Characteristic Curve

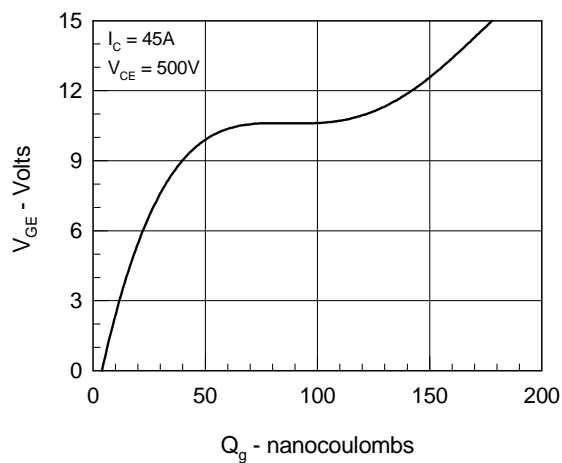


Fig.11 Transient Thermal Impedance

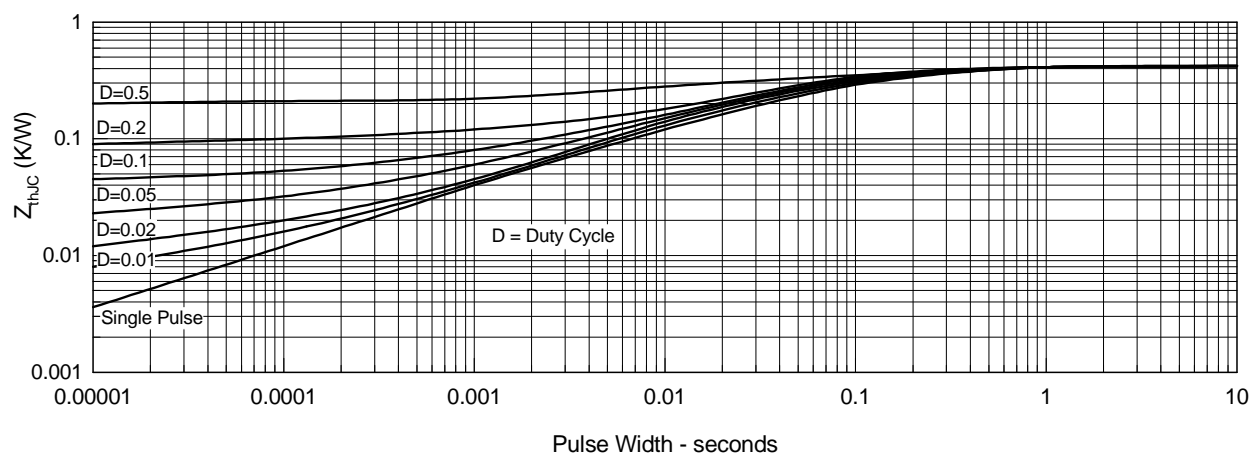


Fig.8 Dependence of Turn-Off Energy Per Pulse and Fall Time on  $R_G$

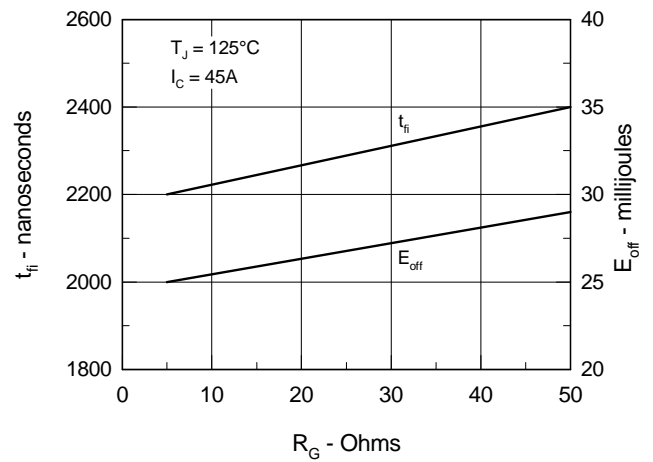


Fig.10 Turn-Off Safe Operating Area

