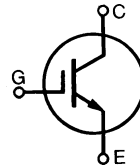


# Low $V_{CE(sat)}$ IGBT

**IXSH 45N100**  
**IXSM 45N100**

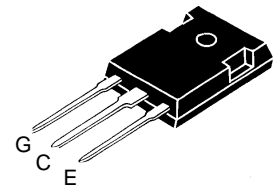
$V_{CES} = 1000\text{ V}$   
 $I_{C25} = 75\text{ A}$   
 $V_{CE(sat)} = 2.7\text{ V}$

## Short Circuit SOA Capability

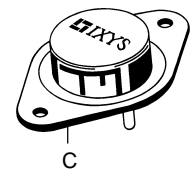


Symbol	Test Conditions	Maximum Ratings	
$V_{CES}$	$T_J = 25^\circ\text{C}$ to $150^\circ\text{C}$	1000	V
$V_{CGR}$	$T_J = 25^\circ\text{C}$ to $150^\circ\text{C}$ ; $R_{GE} = 1\text{ M}\Omega$	1000	V
$V_{GES}$	Continuous	$\pm 20$	V
$V_{GEM}$	Transient	$\pm 30$	V
$I_{C25}$	$T_C = 25^\circ\text{C}$	75	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>		TO-204 = 18 g, TO-247 = 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 (IXSH)



TO-204 AE (IXSM)



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

### Features

- International standard packages
- Guaranteed Short Circuit SOA capability
- Low  $V_{CE(sat)}$ 
  - for low on-state conduction losses
- High current handling capability
- MOS Gate turn-on
  - drive simplicity

### Applications

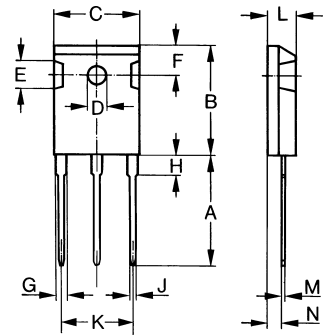
- AC motor speed control
- Uninterruptible power supplies (UPS)
- Welding

### Advantages

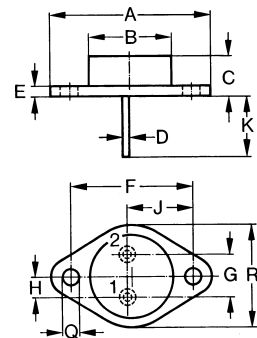
- Easy to mount with 1 screw (TO-247) (isolated mounting screw hole)
- High power density

Symbol	Test Conditions	Characteristic Values ( $T_J = 25^\circ\text{C}$ , unless otherwise specified)		
		min.	typ.	max.
$BV_{CES}$	$I_C = 3\text{ mA}$ , $V_{GE} = 0\text{ V}$	1000		V
$V_{GE(th)}$	$I_C = 4\text{ mA}$ , $V_{CE} = V_{GE}$	5		V
$I_{CES}$	$V_{CE} = 0.8 \cdot V_{CES}$ , $T_J = 25^\circ\text{C}$ $V_{GE} = 0\text{ V}$ , $T_J = 125^\circ\text{C}$			250 $\mu\text{A}$ 1 mA
$I_{GES}$	$V_{CE} = 0\text{ V}$ , $V_{GE} = \pm 20\text{ V}$			$\pm 100\text{ nA}$
$V_{CE(sat)}$	$I_C = I_{C90}$ , $V_{GE} = 15\text{ V}$			2.7 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, $t \leq 300\ \mu\text{s}$ , duty cycle $d \leq 2\%$	20	25	S	
$I_{C(on)}$	$V_{GE} = 15\text{ V}$ , $V_{CE} = 10\text{ V}$		195	A	
$C_{ies}$	$V_{CE} = 25\text{ V}$ , $V_{GE} = 0\text{ V}$ , $f = 1\text{ MHz}$		4150	pF	
$C_{oes}$			300	pF	
$C_{res}$			60	pF	
$Q_g$	$I_C = I_{C90}$ , $V_{GE} = 15\text{ V}$ , $V_{CE} = 0.5 V_{CES}$		165	260	nC
$Q_{ge}$			40	60	nC
$Q_{gc}$			80	200	nC
$t_{d(on)}$	<b>Inductive load, <math>T_J = 25^\circ\text{C}</math></b> $I_C = I_{C90}$ , $V_{GE} = 15\text{ V}$ , $L = 100\ \mu\text{H}$ $V_{CE} = 0.8 V_{CES}$ , $R_G = 2.7\ \Omega$ Remarks: Switching times may increase for $V_{CE}(\text{Clamp}) > 0.8 \cdot V_{CES}$ , higher $T_J$ or increased $R_G$		80		ns
$t_{ri}$			150		ns
$t_{d(off)}$			400		ns
$t_{fi}$			1000	1500	ns
$E_{off}$			15		mJ
$t_{d(on)}$	<b>Inductive load, <math>T_J = 125^\circ\text{C}</math></b> $I_C = I_{C90}$ , $V_{GE} = 15\text{ V}$ , $L = 100\ \mu\text{H}$ $V_{CE} = 0.8 V_{CES}$ , $R_G = 2.7\ \Omega$ Remarks: Switching times may increase for $V_{CE}(\text{Clamp}) > 0.8 \cdot V_{CES}$ , higher $T_J$ or increased $R_G$		100		ns
$t_{ri}$			300		ns
$E_{on}$			5.4		mJ
$t_{d(off)}$			550	900	ns
$t_{fi}$			2200	2900	ns
$E_{off}$		25		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

**TO-204 AE (IXSM) Outline**


Dim.	Millimeter		Inches	
	Min.	Max.	Min.	Max.
A	38.61	39.12	1.520	1.540
B	-	22.22	-	0.875
C	6.40	11.40	0.252	0.449
D	1.45	1.60	0.057	0.063
E	1.52	3.43	0.060	0.135
F	30.15	BSC	1.187	BSC
G	10.67	11.17	0.420	0.440
H	5.21	5.71	0.205	0.225
J	16.64	17.14	0.655	0.675
K	11.18	12.19	0.440	0.480
Q	3.84	4.19	0.151	0.165
R	25.16	26.66	0.991	1.050

Fig.1 Saturation Characteristics

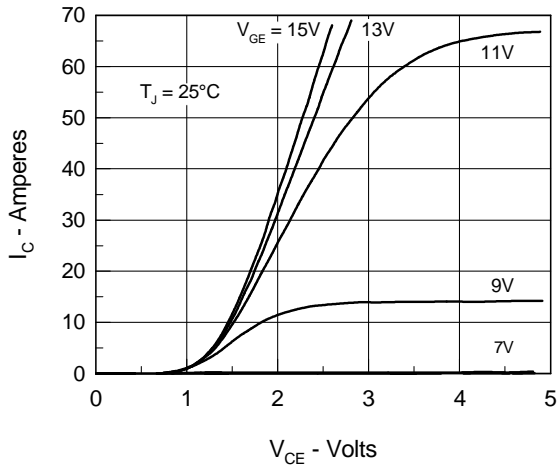


Fig.2 Output Characteristics

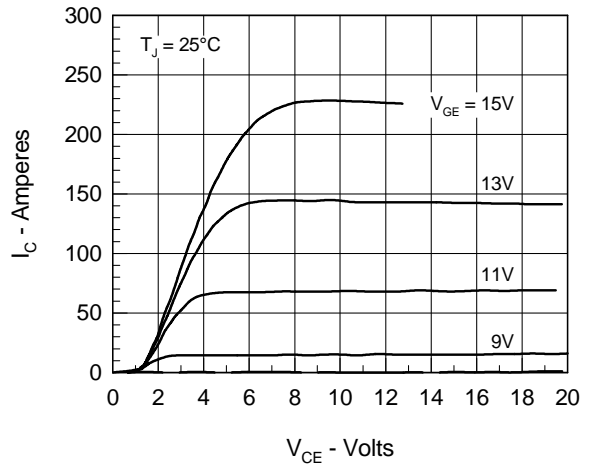


Fig.3 Collector-Emitter Voltage vs. Gate-Emitter Voltage

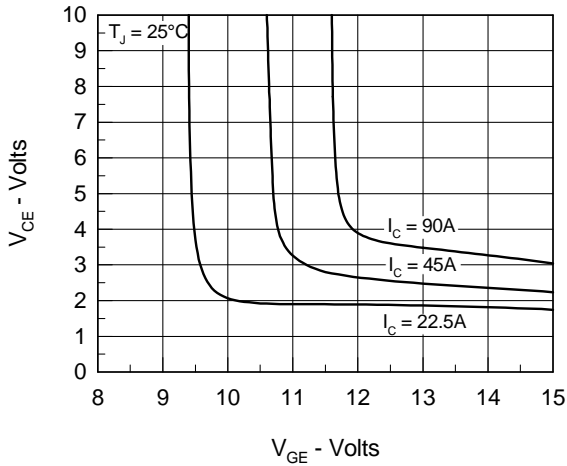


Fig.4 Temperature Dependence of Output Saturation Voltage

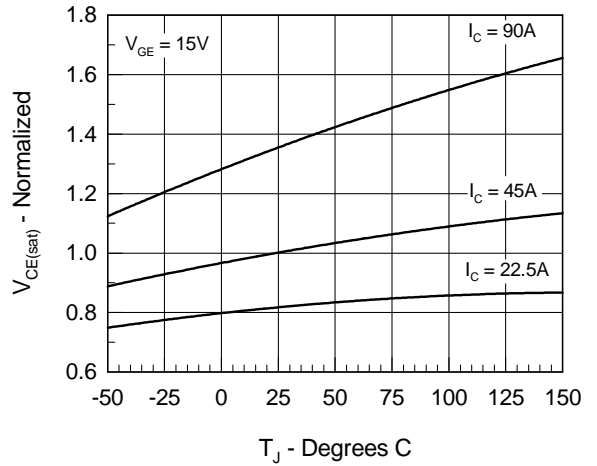


Fig.5 Input Admittance

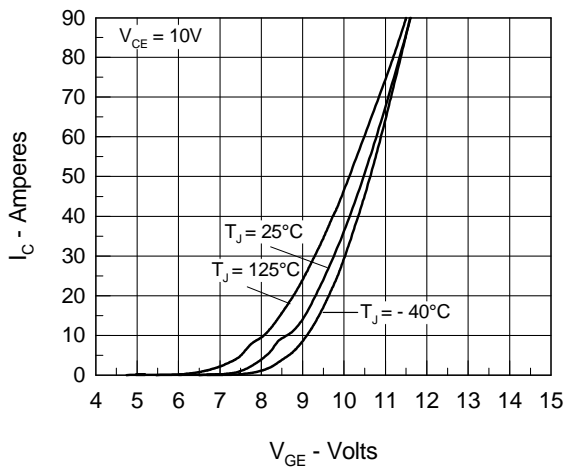
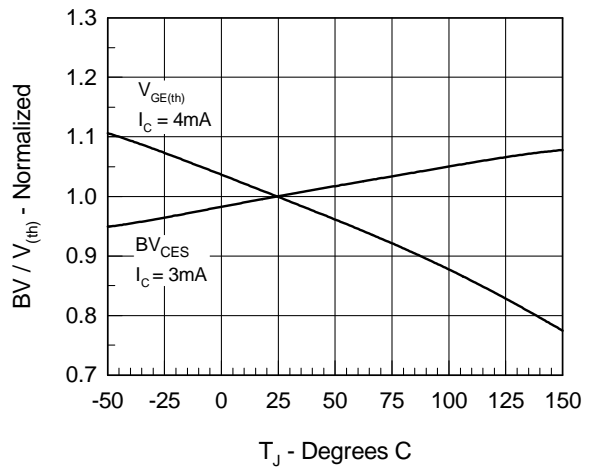
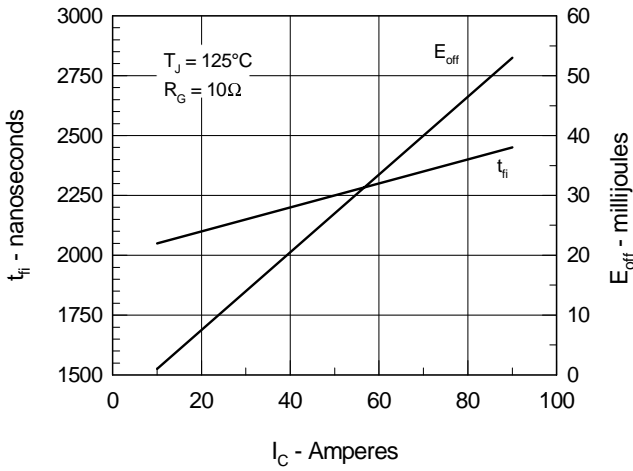


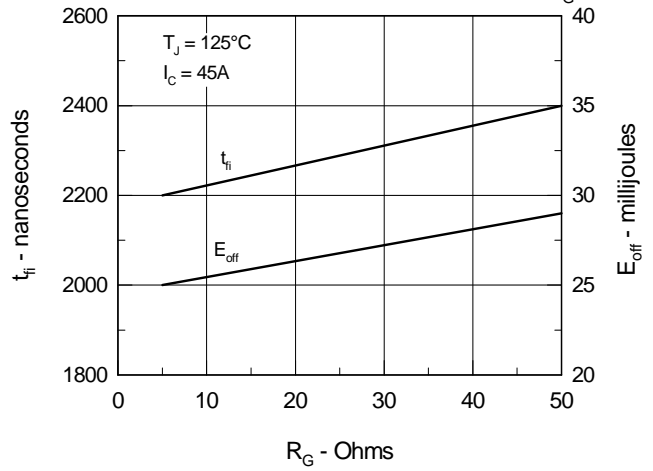
Fig.6 Temperature Dependence of Breakdown and Threshold Voltage



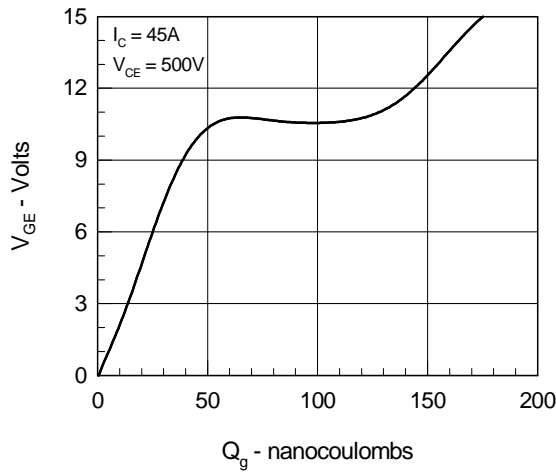
**Fig.7 Turn-Off Energy per Pulse and Fall Time on Collector Current**



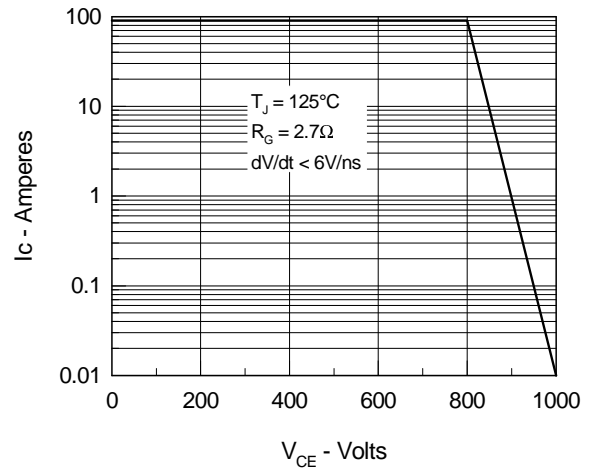
**Fig.8 Dependence of Turn-Off Energy Per Pulse and Fall Time on  $R_G$**



**Fig.9 Gate Charge Characteristic Curve**



**Fig.10 Turn-Off Safe Operating Area**



**Fig.11 Transient Thermal Impedance**

