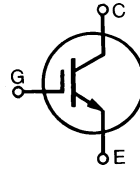


## Low $V_{CE(sat)}$ IGBT

Short Circuit SOA Capability

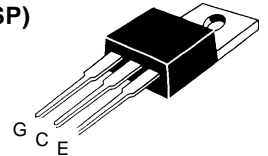
**IXSA 16N60**  
**IXSP 16N60**



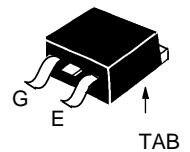
$$\begin{aligned} V_{CES} &= 600V \\ I_{C25} &= 16A \\ V_{CE(sat)typ} &= 1.8V \end{aligned}$$

Symbol	Test Conditions	Maximum Ratings	
$V_{CES}$	$T_J = 25^\circ\text{C}$ to $150^\circ\text{C}$	600	V
$V_{CGR}$	$T_J = 25^\circ\text{C}$ to $150^\circ\text{C}$ ; $R_{GE} = 1\text{ M}\Omega$	600	V
$V_{GES}$	Continuous	$\pm 20$	V
$V_{GEM}$	Transient	$\pm 30$	V
$I_{C25}$	$T_C = 25^\circ\text{C}$	32	A
$I_{C90}$	$T_C = 90^\circ\text{C}$	16	A
$I_{CM}$	$T_C = 25^\circ\text{C}$ , 1 ms	52	A
<b>SSOA</b> <b>(RBSOA)</b>	$V_{GE} = 15\text{ V}$ , $T_J = 125^\circ\text{C}$ , $R_G = 150\ \Omega$ Clamped inductive load, $L = 300\ \mu\text{H}$	$I_{CM} = 32$ @ $0.8 V_{CES}$	A
$t_{SC}$ <b>(SCSOA)</b>	$V_{GE} = 15\text{ V}$ , $V_{CE} = 360\text{ V}$ , $T_J = 125^\circ\text{C}$ $R_G = 82\ \Omega$ , non repetitive	5	$\mu\text{s}$
$P_C$	$T_C = 25^\circ\text{C}$	100	W
$T_J$		-55 ... +150	$^\circ\text{C}$
$T_{JM}$		150	$^\circ\text{C}$
$T_{stg}$		-55 ... +150	$^\circ\text{C}$
<b>Weight</b>		2	g
Maximum lead temperature for soldering 1.6 mm (0.062 in.) from case for 10 s		300	$^\circ\text{C}$
Maximum tab temperature for soldering for 10s		260	$^\circ\text{C}$

TO-220AB(IXSP)



TO-263AA



G = Gate,  
E = Emitter,

C = Collector,  
TAB = Collector

### Features

- International standard package
- 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
- Fast fall time for switching speeds up to 20 kHz

### Applications

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

### Advantages

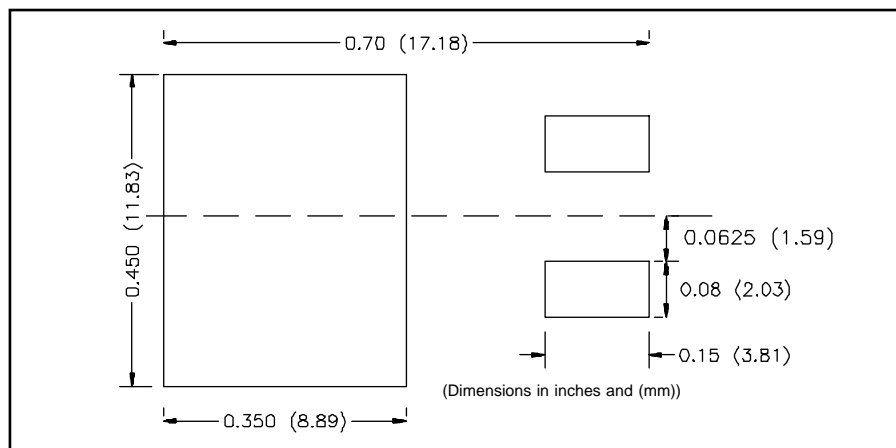
- High power density

Symbol	Test Conditions	Characteristic Values ( $T_J = 25^\circ\text{C}$ , unless otherwise specified)		
		min.	typ.	max.
$BV_{CES}$	$I_C = 250\ \mu\text{A}$ , $V_{GE} = 0\text{ V}$	600		V
$V_{GE(th)}$	$I_C = 750\ \mu\text{A}$ , $V_{CE} = V_{GE}$	3.5		6.5 V
$I_{CES}$	$V_{CE} = 0.8 \cdot V_{CES}$ $V_{GE} = 0\text{ V}$ $T_J = 25^\circ\text{C}$ $T_J = 125^\circ\text{C}$			200 $\mu\text{A}$ 1 mA
$I_{GES}$	$V_{CE} = 0\text{ V}$ , $V_{GE} = \pm 20\text{ V}$			$\pm 100\text{ nA}$
$V_{CE(sat)}$	$I_C = I_{C90}$ , $V_{GE} = 15\text{ V}$		1.8	2.3 V

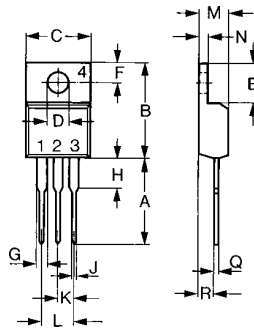
Symbol	Test Conditions	Characteristic Values ( $T_J = 25^\circ\text{C}$ , unless otherwise specified)		
		min.	typ.	max.
$g_{fs}$	$I_C = I_{C90}$ ; $V_{CE} = 10\text{ V}$ , Pulse test, $t \leq 300\text{ }\mu\text{s}$ , duty cycle $\leq 2\%$	3.3	5.0	S
$I_{C(on)}$	$V_{GE} = 15\text{ V}$ , $V_{CE} = 10\text{ V}$		50	A
$C_{ies}$	$V_{CE} = 25\text{ V}$ , $V_{GE} = 0\text{ V}$ , $f = 1\text{ MHz}$		920	pF
$C_{oes}$			65	pF
$C_{res}$			14	pF
$Q_g$	$I_C = I_{C90}$ , $V_{GE} = 15\text{ V}$ , $V_{CE} = 0.5 V_{CES}$		40	nC
$Q_{ge}$			13	nC
$Q_{gc}$			18	nC
$t_{d(on)}$	<b>Inductive load, <math>T_J = 25^\circ\text{C}</math></b> $I_C = 16\text{ A}$ , $V_{GE} = 15\text{ V}$ , $L = 300\text{ }\mu\text{H}$ $V_{CE} = 0.8 V_{CES}$ , $R_G = 22\text{ }\Omega$		30	ns
$t_{ri}$			30	ns
$t_{d(off)}$		100	420	ns
$t_{fi}$		310	470	ns
$E_{off}$		1.9	2.9	mJ
$t_{d(on)}$	<b>Inductive load, <math>T_J = 125^\circ\text{C}</math></b> $I_C = 16\text{ A}$ , $V_{GE} = 15\text{ V}$ , $L = 300\text{ }\mu\text{H}$ $V_{CE} = 0.8 V_{CES}$ , $R_G = 22\text{ }\Omega$		30	ns
$t_{ri}$			30	ns
$E_{on}$		0.12		mJ
$t_{d(off)}$		150		ns
$t_{fi}$		510		ns
$E_{off}$		3.0		mJ
$R_{thJC}$				1.25 K/W

Note 1: Switching times may increase for  $V_{CE}$  (Clamp)  $> 0.8 \cdot V_{CES}$ , higher  $T_J$  or increased  $R_G$

#### Min. Recommended Footprint

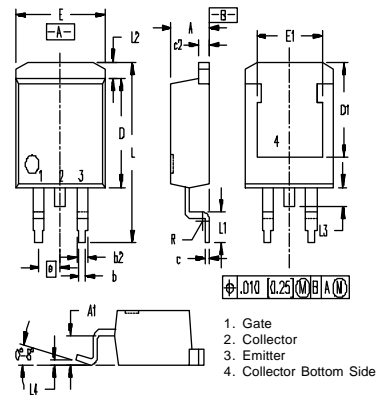


#### TO-220 AB Outline



Dim.	Millimeter		Inches	
	Min.	Max.	Min.	Max.
A	12.70	14.93	0.500	0.580
B	14.23	16.50	0.560	0.650
C	9.66	10.66	0.380	0.420
D	3.54	4.08	0.139	0.161
E	5.85	6.85	0.230	0.270
F	2.29	2.79	0.090	0.110
G	1.15	1.77	0.045	0.070
H	2.79	6.35	0.110	0.250
J	0.64	0.89	0.025	0.035
K	2.54	BSC	0.100	BSC
M	4.32	4.82	0.170	0.190
N	0.64	1.39	0.025	0.055
Q	0.51	0.76	0.020	0.030
R	2.04	2.49	0.080	0.115

#### TO-263 AA Outline



Dim.	Millimeter		Inches	
	Min.	Max.	Min.	Max.
A	4.06	4.83	.160	.190
A1	2.03	2.79	.080	.110
b	0.51	0.99	.020	.039
b2	1.14	1.40	.045	.055
c	0.46	0.74	.018	.029
c2	1.14	1.40	.045	.055
D	8.64	9.65	.340	.380
D1	7.11	8.13	.280	.320
E	9.65	10.29	.380	.405
E1	6.86	8.13	.270	.320
e	2.54	BSC	.100	BSC
L	14.61	15.88	.575	.625
L1	2.29	2.79	.090	.110
L2	1.02	1.40	.040	.055
L3	1.27	1.78	.050	.070
L4	0	0.38	0	.015
R	0.46	0.74	.018	.029

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

IXYS MOSFETs and IGBTs are covered by one or more of the following U.S. patents: 4,835,592 4,881,106 5,017,508 5,049,961 5,187,117 5,486,715  
4,850,072 4,931,844 5,034,796 5,063,307 5,237,481 5,381,025