

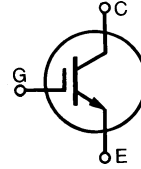
Preliminary data

# High Speed IGBT

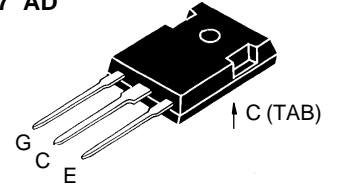
## Short Circuit SOA Capability

**IXSH10N60**  
**IXSH10N60A**

$V_{CES}$	$I_{C(25)}$	$V_{CE(sat)}$
600 V	20 A	2.5 V
600 V	20 A	3.0 V



TO-247 AD



G = Gate      C = Collector  
E = Emitter    Tab = Collector

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
$I_{C25}$	$T_C = 25^\circ\text{C}$	20	A
$I_{C90}$	$T_C = 90^\circ\text{C}$	10	A
$I_{CM}$	$T_C = 25^\circ\text{C}$ , 1 ms	40	A
<b>SSOA (RBSOA)</b>	$V_{GE} = 15\text{ V}$ , $T_J = 125^\circ\text{C}$ , $R_G = 150\ \Omega$ Clamped inductive load, $L = 300\ \mu\text{H}$	$I_{CM} = 20$ @ $0.8 V_{CES}$	A
<b><math>t_{SC}</math> (SCSOA)</b>	$V_{GE} = 15\text{ V}$ , $V_{CE} = 360\text{ V}$ , $T_J = 125^\circ\text{C}$ $R_G = 82\ \Omega$ , non repetitive	10	$\mu\text{s}$
$P_C$	$T_C = 25^\circ\text{C}$	100	W
$T_J$		-55 ... +150	$^\circ\text{C}$
$T_{JM}$		150	$^\circ\text{C}$
$T_{stg}$		-55 ... +150	$^\circ\text{C}$
$M_d$	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	$^\circ\text{C}$

### 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
- Fast Fall Time for switching speeds up to 20 kHz

### Applications

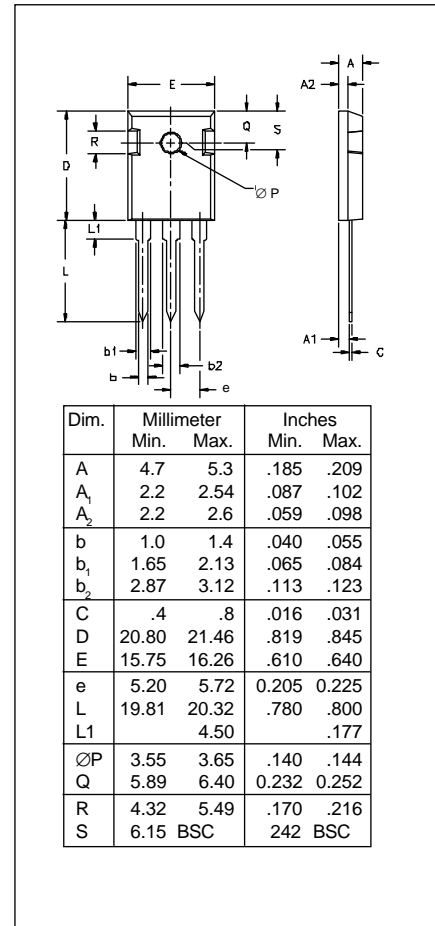
- AC motor speed control
- Uninterruptible power supplies (UPS)
- Welding

### 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.
$BV_{CES}$	$I_C = 250\ \mu\text{A}$ , $V_{GE} = 0\text{ V}$	600		V
$V_{GE(th)}$	$I_C = 750\ \mu\text{A}$ , $V_{CE} = V_{GE}$	3.5		6.5 V
$I_{CES}$	$V_{CE} = 0.8 \cdot V_{CES}$ , $T_J = 25^\circ\text{C}$ $V_{GE} = 0\text{ V}$ , $T_J = 125^\circ\text{C}$			200 $\mu\text{A}$ 1 mA
$I_{GES}$	$V_{CE} = 0\text{ V}$ , $V_{GE} = \pm 20\text{ V}$			$\pm 100\text{ nA}$
$V_{CE(sat)}$	$I_C = I_{C90}$ , $V_{GE} = 15\text{ V}$			10N60: 2.5 V 10N60A: 3.0 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 $\leq 2\%$	2		S	
$I_{C(on)}$	$V_{GE} = 15\text{ V}$ , $V_{CE} = 10\text{ V}$		50	A	
$C_{ies}$ $C_{oes}$ $C_{res}$	$V_{CE} = 25\text{ V}$ , $V_{GE} = 0\text{ V}$ , $f = 1\text{ MHz}$		750	pF	
			125	pF	
			30	pF	
$Q_g$ $Q_{ge}$ $Q_{gc}$	$I_C = I_{C90}$ , $V_{GE} = 15\text{ V}$ , $V_{CE} = 0.5 V_{CES}$		40	nC	
			12	nC	
			20	80	nC
$t_{d(on)}$ $t_{ri}$ $t_{d(off)}$ $t_{fi}$ $E_{off}$	<b>Inductive load, <math>T_J = 25^\circ\text{C}</math></b> $I_C = I_{C90}$ , $V_{GE} = 15\text{ V}$ , $L = 300\ \mu\text{H}$ , $V_{CE} = 0.8 V_{CES}$ , $R_G = 150\ \Omega$		100	ns	
			200	ns	
			250	750	ns
		10N60A	175	410	ns
		10N60	720		ns
	10N60A	0.75	1.2	mJ	
	Note 1	10N60	1.2	1.9	mJ
$t_{d(on)}$ $t_{ri}$ $E_{on}$ $t_{d(off)}$ $t_{fi}$ $E_{off}$	<b>Inductive load, <math>T_J = 125^\circ\text{C}</math></b> $I_C = I_{C90}$ , $V_{GE} = 15\text{ V}$ , $L = 300\ \mu\text{H}$ , $V_{CE} = 0.8 V_{CES}$ , $R_G = 150\ \Omega$		100	ns	
			200	ns	
			1.0		mJ
			300		ns
		10N60AU1	400		ns
		Note 1	10N60AU1	1.5	mJ
$R_{thJC}$ $R_{thCK}$			1.25	K/W	
		0.25		K/W	

**TO-247 AD Outline**


- Notes:
- Switching times may increase for  $V_{CE}$  (Clamp)  $> 0.8 \cdot V_{CES}$ , higher  $T_J$  or  $R_G$  values.
  - Device must be heatsunk for high temperature leakage current measurements to avoid thermal runaway.

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

Fig.1. Output Characteristics

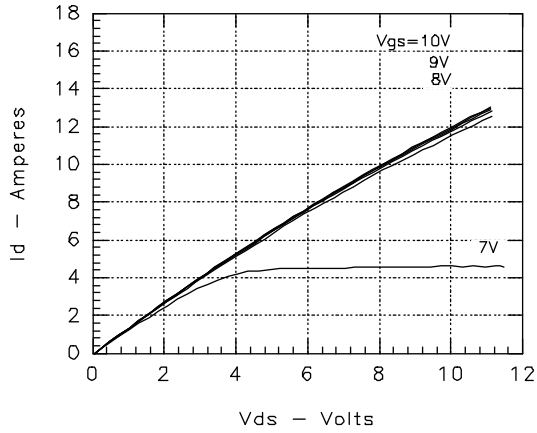


Fig. 2. Input Admittance

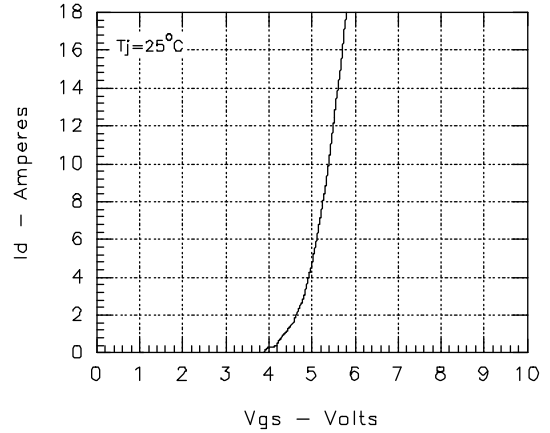


Fig. 3. Rds(on) vs. Drain Current

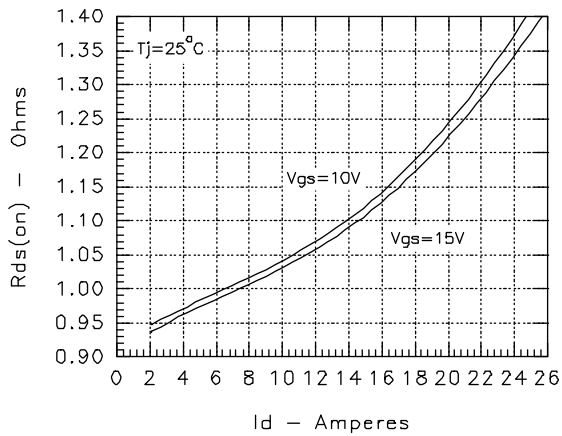


Fig. 4. Temperature Dependence of Drain to Source Resistance

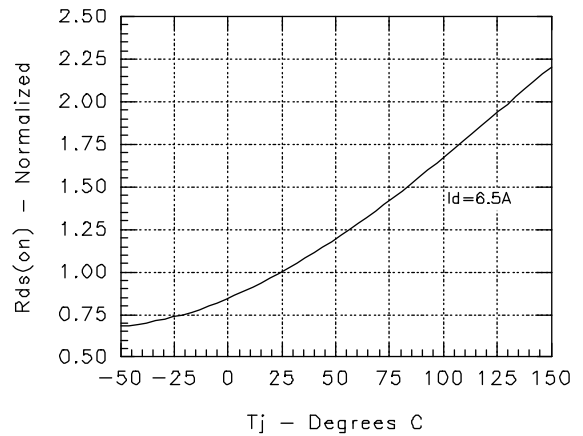


Fig. 5. Drain Current vs. Case Temperature

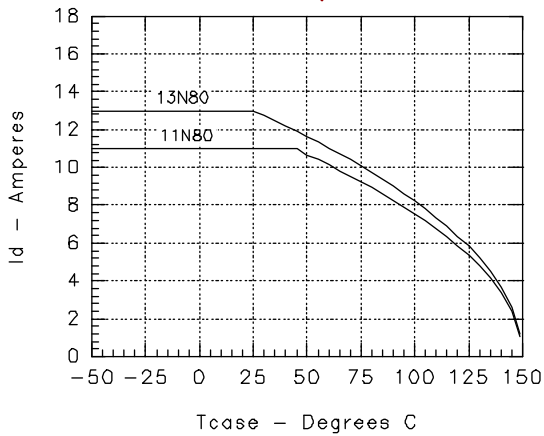
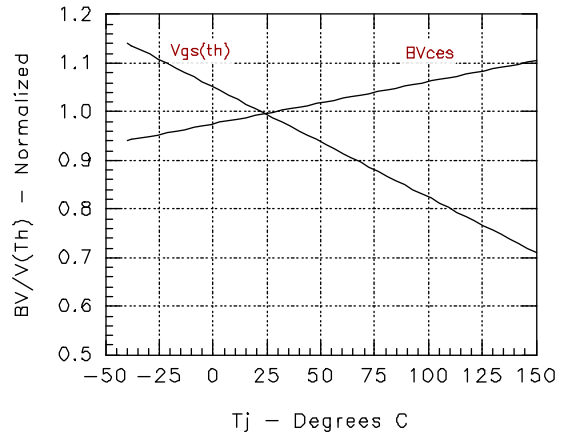
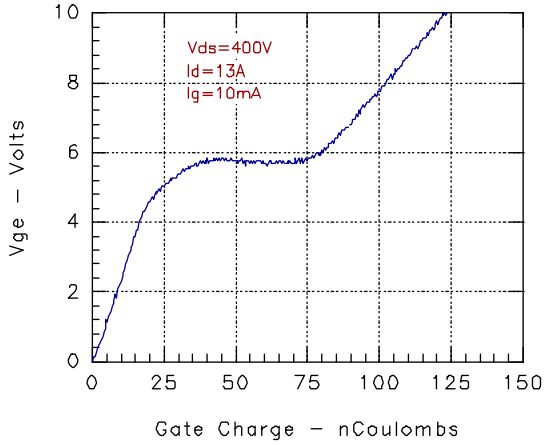
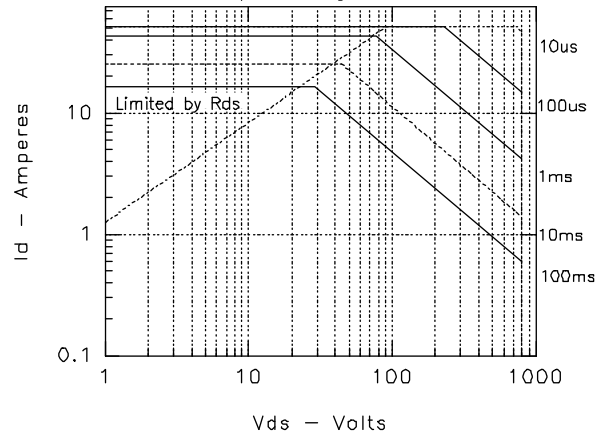
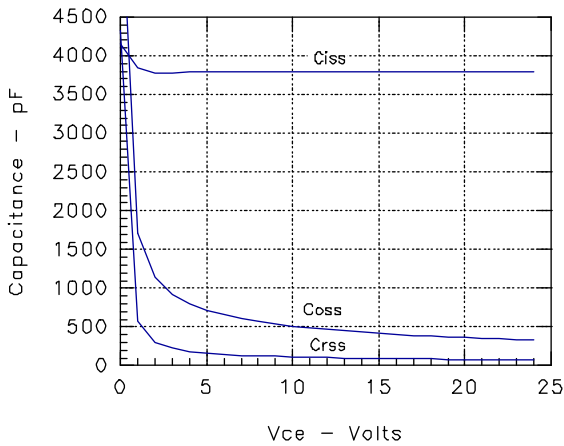
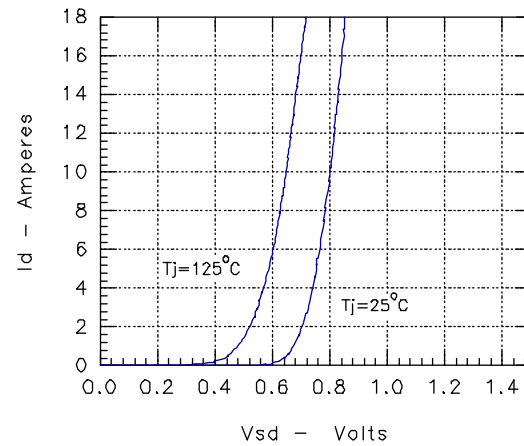
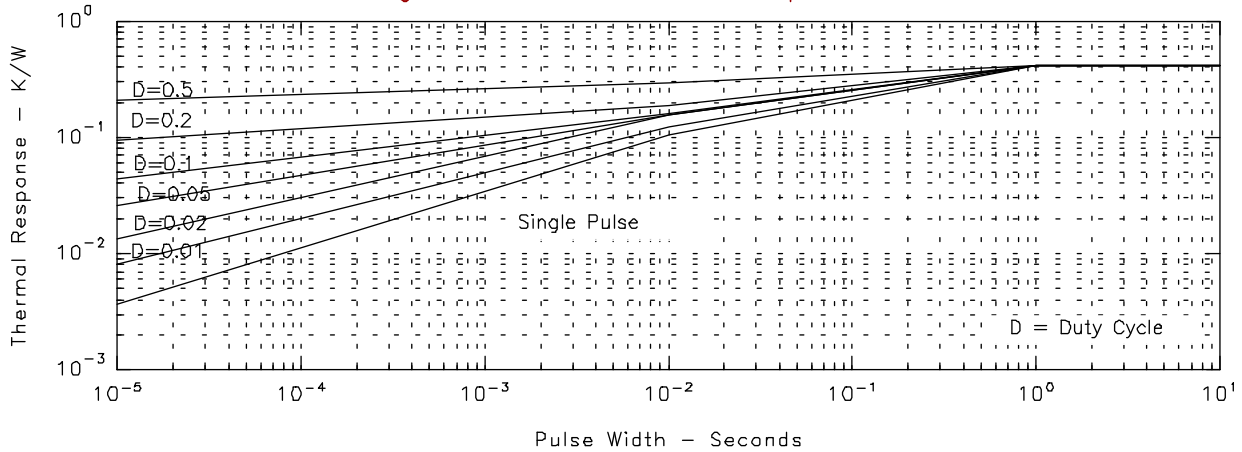


Fig. 6. Temperature Dependence of Breakdown Voltage and Threshold Voltage



**Fig. 7. Gate Charge**

**Fig. 8. Forward Bias Safe Operating Area**

**Fig. 9. Capacitance Curves**

**Fig. 10. Source Current vs. Source to Drain Voltage**

**Fig. 11. Transient Thermal Impedance**


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