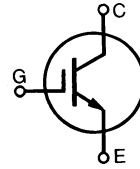


# HiPerFAST™ IGBT

**IXGA 20N60B**  
**IXGP 20N60B**

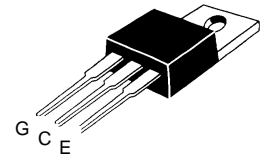
**$V_{CES}$  = 600 V**  
 **$I_{C25}$  = 40 A**  
 **$V_{CE(sat)typ}$  = 1.7 V**  
 **$t_{fi}$  = 100 ns**

Preliminary data sheet

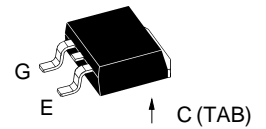


Symbol	Test Conditions	Maximum Ratings	
$V_{CES}$	$T_J = 25^\circ\text{C}$ to $150^\circ\text{C}$	600	V
$V_{CGR}$	$T_J = 25^\circ\text{C}$ to $150^\circ\text{C}$ ; $R_{GE} = 1\text{ M}\Omega$	600	V
$V_{GES}$	Continuous	$\pm 20$	V
$V_{GEM}$	Transient	$\pm 30$	V
$I_{C25}$	$T_C = 25^\circ\text{C}$	40	A
$I_{C90}$	$T_C = 90^\circ\text{C}$	20	A
$I_{CM}$	$T_C = 25^\circ\text{C}$ , 1 ms	80	A
<b>SSOA (RBSOA)</b>	$V_{GE} = 15\text{ V}$ , $T_{VJ} = 125^\circ\text{C}$ , $R_G = 22\ \Omega$ Clamped inductive load, $L = 100\ \mu\text{H}$	$I_{CM} = 40$ @ $0.8 V_{CES}$	A
$P_C$	$T_C = 25^\circ\text{C}$	150	W
$T_J$		-55 ... +150	$^\circ\text{C}$
$T_{JM}$		150	$^\circ\text{C}$
$T_{stg}$		-55 ... +150	$^\circ\text{C}$
Maximum lead temperature for soldering 1.6 mm (0.062 in.) from case for 10 s		300	$^\circ\text{C}$
$M_d$	Mounting torque (TO-220)	M3 0.45/4 Nm/lb.in. M3.5 0.55/5 Nm/lb.in.	
<b>Weight</b>	TO-220	4	g
	TO-263	2	g

## TO-220AB (IXGP)



## TO-263 AA (IXGA)



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

## Features

- International standard packages JEDEC TO-263 surface mountable and JEDEC TO-220 AB
- High frequency IGBT
- High current handling capability
- HiPerFAST™ HDMOS™ process
- MOS Gate turn-on - drive simplicity

## Applications

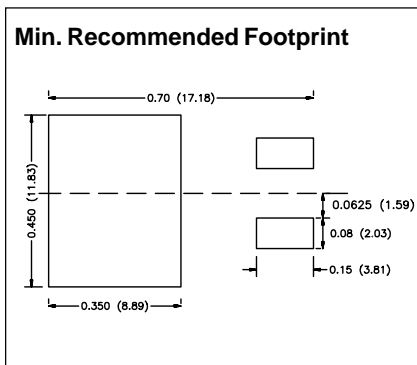
- Uninterruptible power supplies (UPS)
- Switched-mode and resonant-mode power supplies
- AC motor speed control
- DC servo and robot drives
- DC choppers

## Advantages

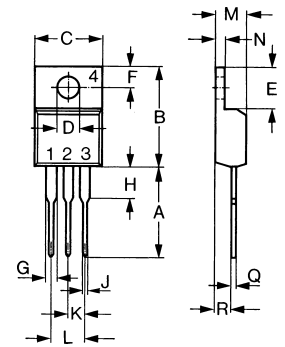
- High power density
- Suitable for surface mounting
- Very low switching losses for high frequency applications

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
$V_{GE(th)}$	$I_C = 250\ \mu\text{A}$ , $V_{CE} = V_{GE}$	2.5		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
$I_{GES}$	$V_{CE} = 0\text{ V}$ , $V_{GE} = \pm 20\text{ V}$			$\pm 100\text{ nA}$
$V_{CE(sat)}$	$I_C = I_{C90}$ , $V_{GE} = 15\text{ V}$	1.7	2.0	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 $\leq 2\%$	9	17	S
$C_{ies}$	$V_{CE} = 25\text{ V}$ , $V_{GE} = 0\text{ V}$ , $f = 1\text{ MHz}$		1500	pF
$C_{oes}$			175	pF
$C_{res}$			40	pF
$Q_g$	$I_C = I_{C90}$ , $V_{GE} = 15\text{ V}$ , $V_{CE} = 0.5 V_{CES}$		90	nC
$Q_{ge}$			11	nC
$Q_{gc}$			30	nC
$t_{d(on)}$	<b>Inductive load, <math>T_J = 25^\circ\text{C}</math></b> $I_C = I_{C90}$ , $V_{GE} = 15\text{ V}$ , $L = 100\ \mu\text{H}$ , $V_{CE} = 0.8 V_{CES}$ , $R_G = R_{off} = 10\ \Omega$ Remarks: Switching times may increase for $V_{CE}(\text{Clamp}) > 0.8 \cdot V_{CES}$ , higher $T_J$ or increased $R_G$		15	ns
$t_{ri}$			35	ns
$E_{on}$			0.15	mJ
$t_{d(off)}$			150	200 ns
$t_{fi}$			100	150 ns
$E_{off}$			0.7	1.0 mJ
$t_{d(on)}$	<b>Inductive load, <math>T_J = 125^\circ\text{C}</math></b> $I_C = I_{C90}$ , $V_{GE} = 15\text{ V}$ , $L = 100\ \mu\text{H}$ $V_{CE} = 0.8 V_{CES}$ , $R_G = R_{off} = 10\ \Omega$ Remarks: Switching times may increase for $V_{CE}(\text{Clamp}) > 0.8 \cdot V_{CES}$ , higher $T_J$ or increased $R_G$		15	ns
$t_{ri}$			35	ns
$E_{on}$			0.15	mJ
$t_{d(off)}$			220	ns
$t_{fi}$			140	ns
$E_{off}$			1.2	mJ
$R_{thJC}$			0.83	K/W
$R_{thCK}$	(TO-220)	0.25		K/W

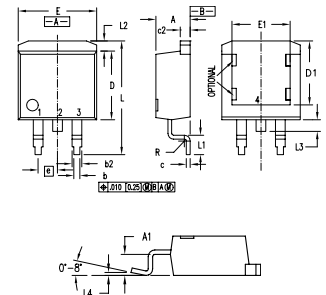


### TO-220 AB (IXGP) Outline



Dim.	Millimeter		Inches	
	Min.	Max.	Min.	Max.
A	12.70	13.97	0.500	0.550
B	14.73	16.00	0.580	0.630
C	9.91	10.66	0.390	0.420
D	3.54	4.08	0.139	0.161
E	5.85	6.85	0.230	0.270
F	2.54	3.18	0.100	0.125
G	1.15	1.65	0.045	0.065
H	2.79	5.84	0.110	0.230
J	0.64	1.01	0.025	0.040
K	2.54	BSC	0.100	BSC
M	4.32	4.82	0.170	0.190
N	1.14	1.39	0.045	0.055
Q	0.35	0.56	0.014	0.022
R	2.29	2.79	0.090	0.110

### TO-263 AA (IXGA) 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

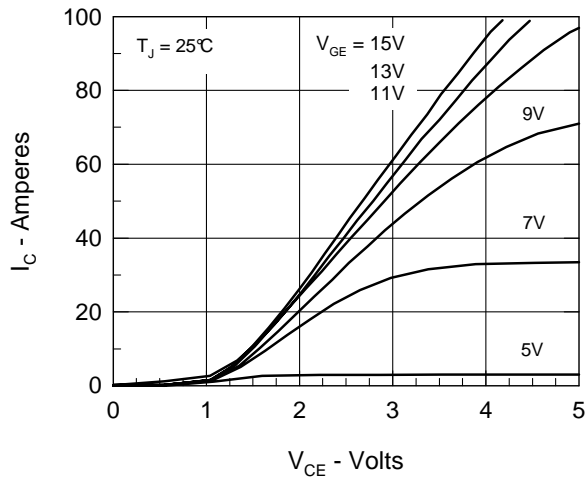


Fig. 1. Output Characteristics

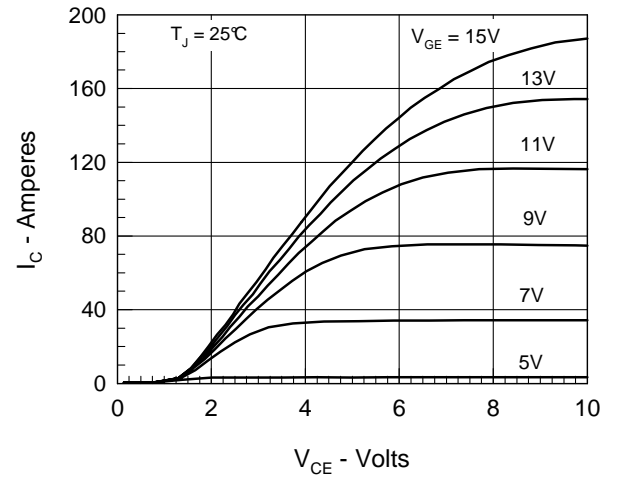


Fig. 2. Extended Output Characteristics

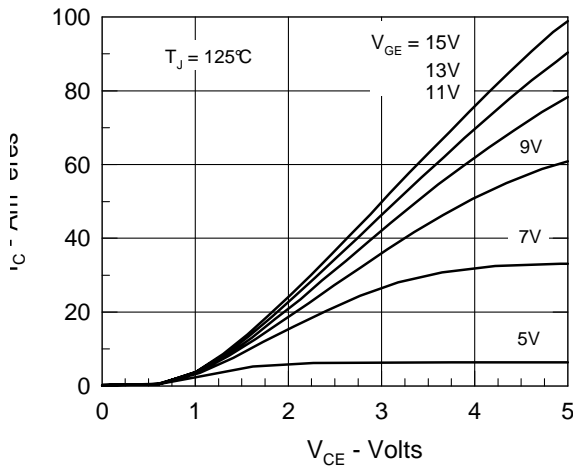


Fig. 3. High Temperature Output Characteristics

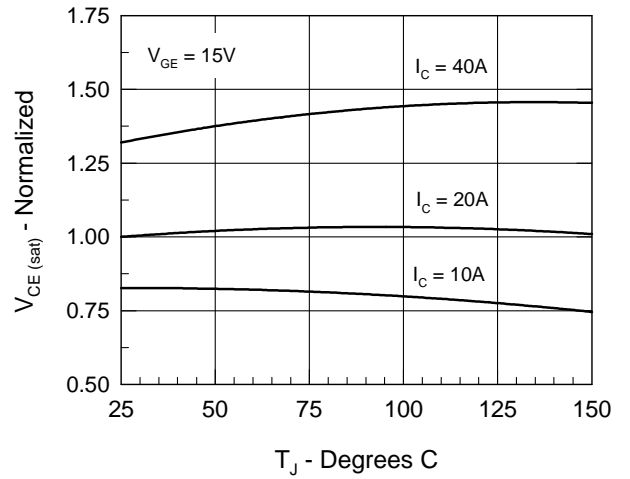
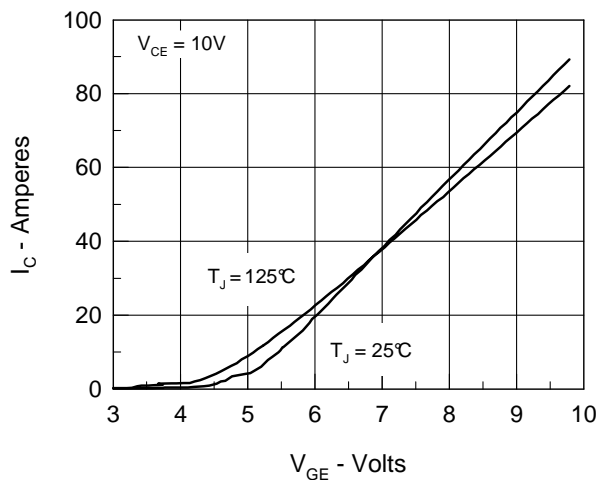

 Fig. 4. Temperature Dependence of  $V_{CE(sat)}$ 


Fig. 5. Admittance Curves

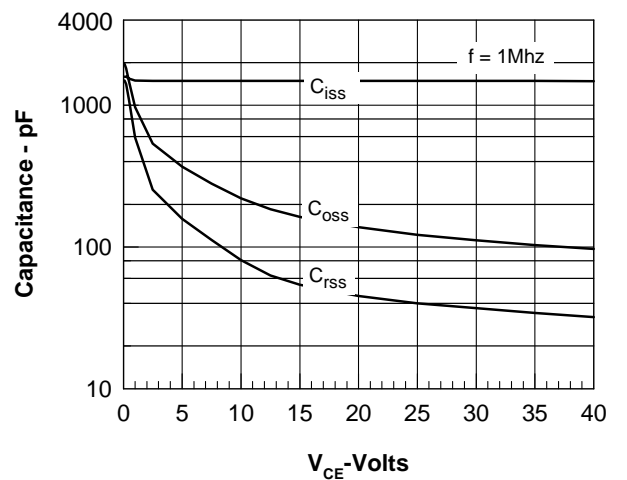


Fig. 6. Capacitance Curves

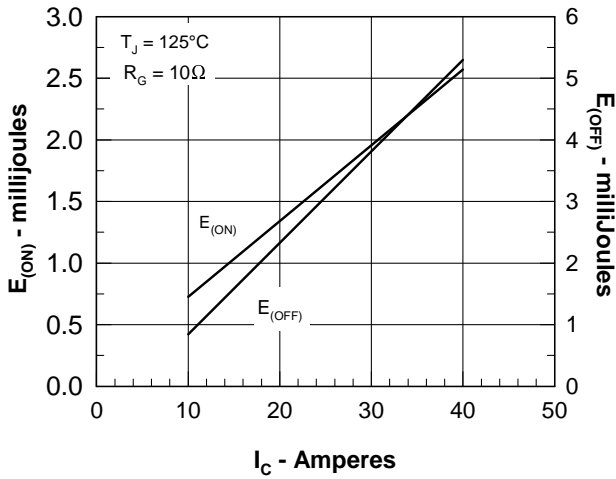


Fig. 7. Dependence of  $E_{ON}$  and  $E_{OFF}$  on  $I_C$ .

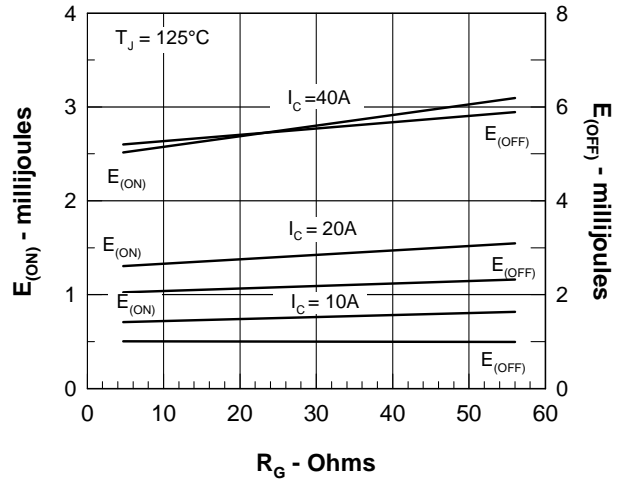


Fig. 8. Dependence of  $E_{ON}$  and  $E_{OFF}$  on  $R_G$ .

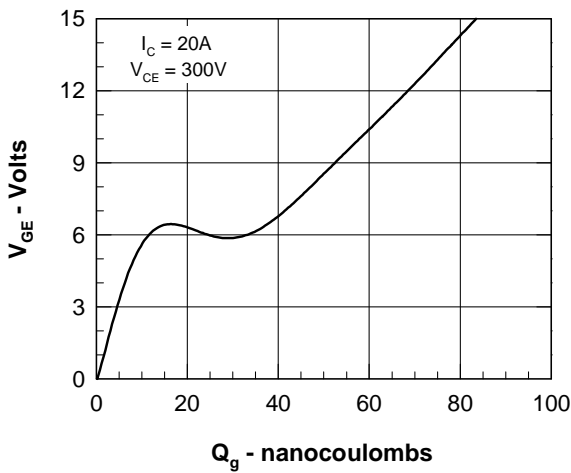


Fig. 9. Gate Charge

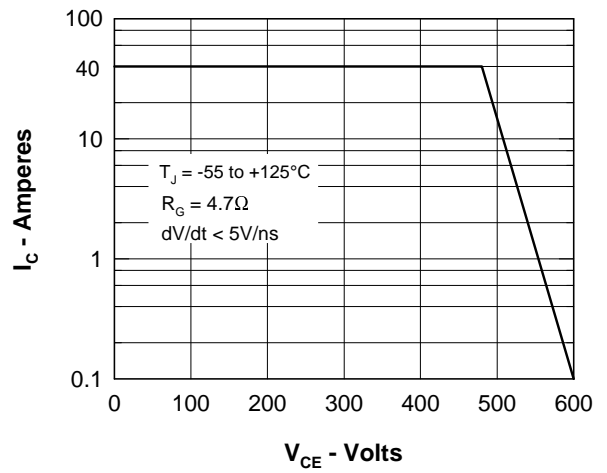


Fig. 10. Turn-off Safe Operating Area

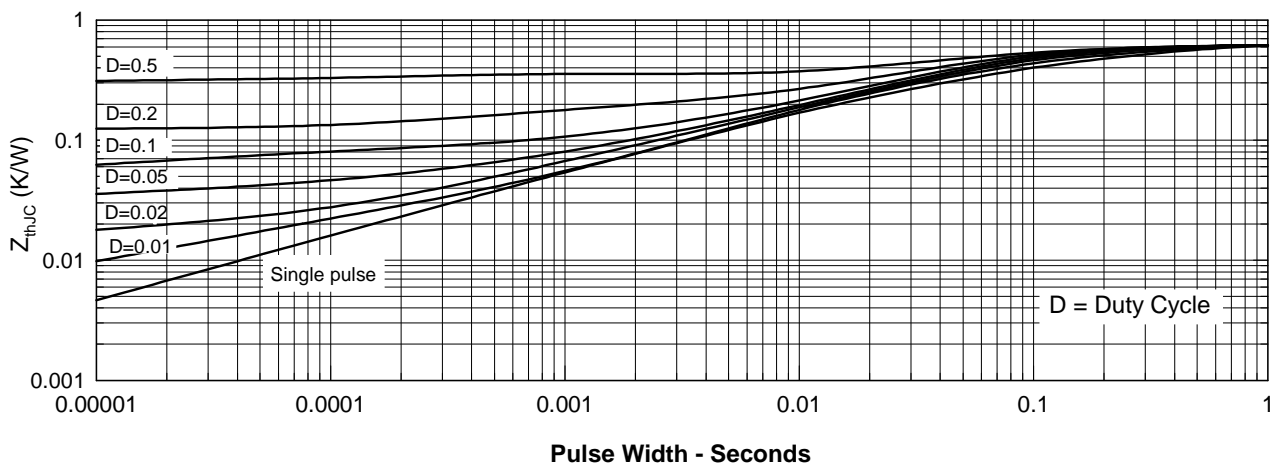


Fig. 11. IGBT Transient Thermal Resistance Junction-to-Case