

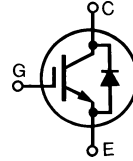
# IGBT

Combi Pack

**IXGA/IXGP12N100U1**  
**IXGA/IXGP12N100AU1**

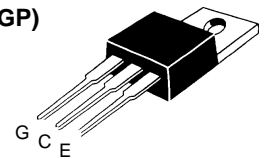
$V_{CES}$	$I_{C25}$	$V_{CE(sat)}$
1000 V	24 A	3.5 V
1000 V	24 A	4.0 V

Preliminary Data Sheet

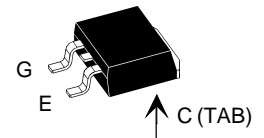


Symbol	Test Conditions	Maximum Ratings	
$V_{CES}$	$T_J = 25^\circ\text{C}$ to $150^\circ\text{C}$	1000	V
$V_{CGR}$	$T_J = 25^\circ\text{C}$ to $150^\circ\text{C}$ ; $R_{GE} = 1\text{ M}\Omega$	1000	V
$V_{GES}$	Continuous	$\pm 20$	V
$V_{GEM}$	Transient	$\pm 30$	V
$I_{C25}$	$T_C = 25^\circ\text{C}$	24	A
$I_{C90}$	$T_C = 90^\circ\text{C}$	12	A
$I_{CM}$	$T_C = 25^\circ\text{C}$ , 1 ms	48	A
<b>SSOA</b> <b>(RBSOA)</b>	$V_{GE} = 15\text{ V}$ , $T_{VJ} = 125^\circ\text{C}$ , $R_G = 150\ \Omega$ Clamped inductive load, $L = 300\ \mu\text{H}$	$I_{CM} = 24$ @ $0.8 V_{CES}$	A
$P_C$	$T_C = 25^\circ\text{C}$	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 with screw M3 Mounting torque with screw M3.5	0.45/4 0.55/5	Nm/lb.in.
<b>Weight</b>		4	g
Maximum lead temperature for soldering 1.6 mm (0.062 in.) from case for 10 s		300	$^\circ\text{C}$

**TO-220AB(IXGP)**



**TO-263 AA (IXGA)**



## Features

- International standard packages JEDEC TO-220AB and TO-263AA
- IGBT with antiparallel FRED in one package
- Second generation HDMOS™ process
- Low  $V_{CE(sat)}$ 
  - for minimum on-state conduction losses
- MOS Gate turn-on
  - drive simplicity
- Fast Recovery Epitaxial Diode (FRED)
  - soft recovery with low  $I_{RM}$

## Applications

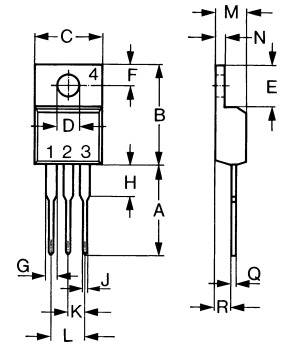
- AC motor speed control
- DC servo and robot drives
- DC choppers
- Uninterruptible power supplies (UPS)
- Switch-mode and resonant-mode power supplies

## Advantages

- Easy to mount with one screw
- Space savings (two devices in one package)
- Reduces assembly time and cost
- High power density

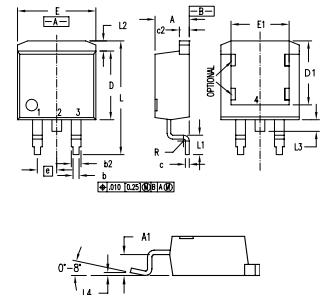
Symbol	Test Conditions	Characteristic Values		
		Min.	Typ.	Max.
$BV_{CES}$	$I_C = 3\text{ mA}$ , $V_{GE} = 0\text{ V}$	1000		V
$V_{GE(th)}$	$I_C = 250\ \mu\text{A}$ , $V_{GE} = V_{GE}$	2.5		V
$I_{CES}$	$V_{CE} = 0.8$ , $V_{CES}$ $V_{GE} = 0\text{ V}$	$T_J = 25^\circ\text{C}$		300 $\mu\text{A}$
		$T_J = 125^\circ\text{C}$		3 mA
$I_{GES}$	$V_{CE} = 0\text{ V}$ , $V_{GE} = \pm 20\text{ V}$			$\pm 100\text{ nA}$
$V_{CE(sat)}$	$I_C = I_{CE90}$ , $V_{GE} = 15$	12N100		3.5 V
		12N100A		4.0 V

Symbol	Test Conditions	Characteristic Values		
		Min.	Typ.	Max.
$(T_J = 25^\circ\text{C}, \text{ unless otherwise specified})$				
$g_{fs}$	$I_C = I_{C90}; V_{CE} = 10\text{ V},$ Pulse test, $t \leq 300\ \mu\text{s}$ , duty cycle $\leq 2\%$	6	10	S
$Q_g$	$I_C = I_{C90}; V_{GE} = 15\text{ V}, V_{CE} = 0.5 V_{CES}$		65	90
$Q_{ge}$			8	20
$Q_{gc}$			24	45
$t_{d(on)}$	<b>Inductive load, <math>T_J = 25^\circ\text{C}</math></b> $I_C = I_{C90}, V_{GE} = 15\text{ V}, L = 300\ \mu\text{H}$ $V_{CE} = 800\text{ V}, R_G = R_{off} = 120\ \Omega$ Remarks: Switching times may increase for $V_{CE} (\text{Clamp}) > 0.8 V_{CES}$ , higher $T_J$ or increased $R_G$		100	ns
$t_{ri}$			200	ns
$t_{d(off)}$			850	1000
$t_{fi}$		12N100A	500	700
		12N100	800	1000
$E_{off}$		12N100A	4	6
$t_{d(on)}$	<b>Inductive load, <math>T_J = 125^\circ\text{C}</math></b> $I_C = I_{C90}, V_{GE} = 15\text{ V}, L = 300\ \mu\text{H}$ $V_{CE} = 800\text{ V}, R_G = R_{off} = 120\ \Omega$ Remarks: Switching times may increase for $V_{CE} (\text{Clamp}) > 0.8 V_{CES}$ , higher $T_J$ or increased $R_G$		100	ns
$t_{ri}$			200	ns
$E_{on}$			1.1	mJ
$t_{d(off)}$		12N100A	900	ns
$t_{fi}$		12N100	950	ns
$E_{off}$		12N100A	8	mJ
	12N100	10	mJ	
$R_{thJC}$			1.25	K/W
$R_{thCK}$		0.25		K/W

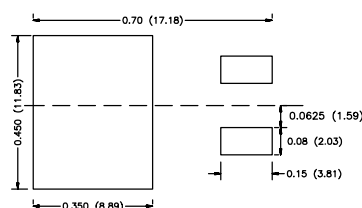
**TO-220 AB (IXGP) Outline**


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

Reverse Diode (FRED)		Characteristic Values		
$(T_J = 25^\circ\text{C}, \text{ unless otherwise specified})$				
Symbol	Test Conditions	Min.	Typ.	Max.
$V_F$	$I_F = 8\text{ A}, V_{GE} = 0\text{ V},$ Pulse test, $t \leq 300\ \mu\text{s}$ , duty cycle $d \leq 2\%$			2.75
$I_{RM}$	$I_F = I_{C90}, V_{GE} = 0\text{ V}, -di_F/dt = 100\text{ A}/\mu\text{s}$		6.5	A
$t_{rr}$	$V_R = 100\text{ V}, T_J = 125^\circ\text{C}$ $I_F = 1\text{ A}, -di/dt = 50\text{ A}/\mu\text{s}, V_R = 30\text{ V}, T_J = 25^\circ\text{C}$		140	ns
			50	60
$R_{thJC}$				2.5

**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

**Min. Recommended Footprint**


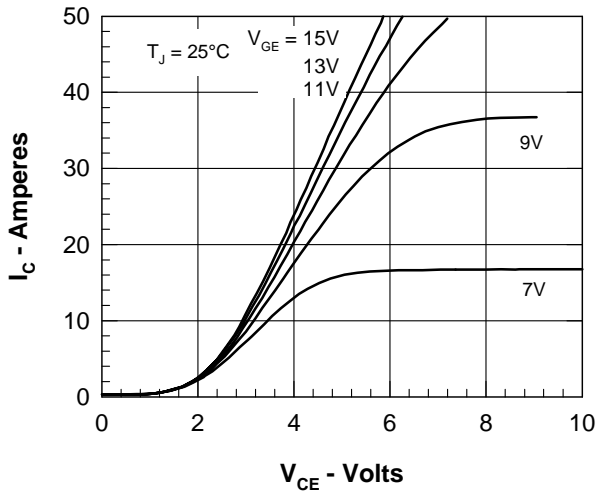


Figure 1. Saturation Voltage Characteristics

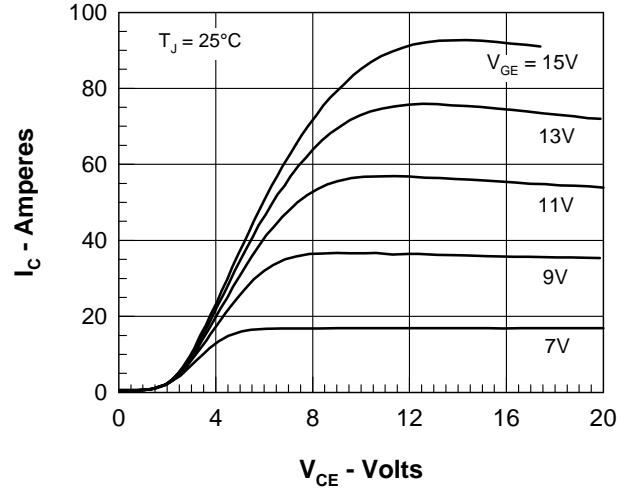


Figure 2. Extended Output Characteristics

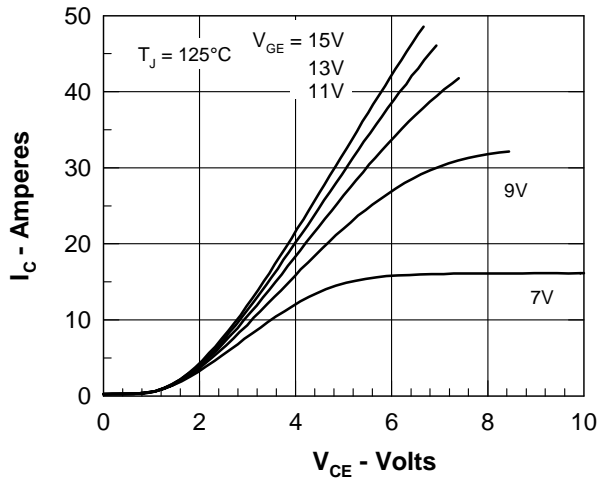


Figure 3. Saturation Voltage Characteristics

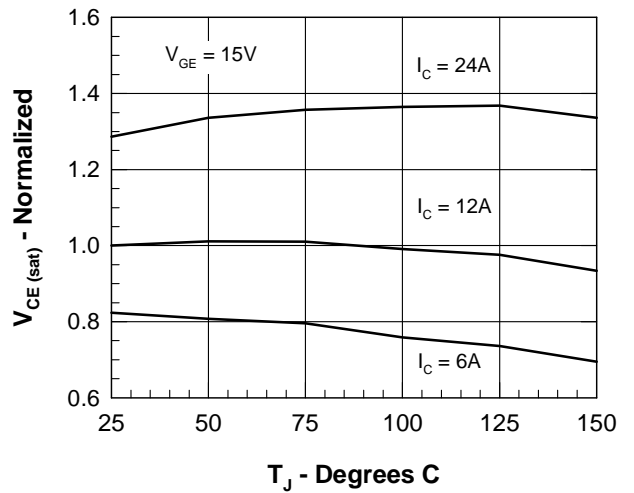


Figure 4. Temperature Dependence of  $V_{CE(sat)}$

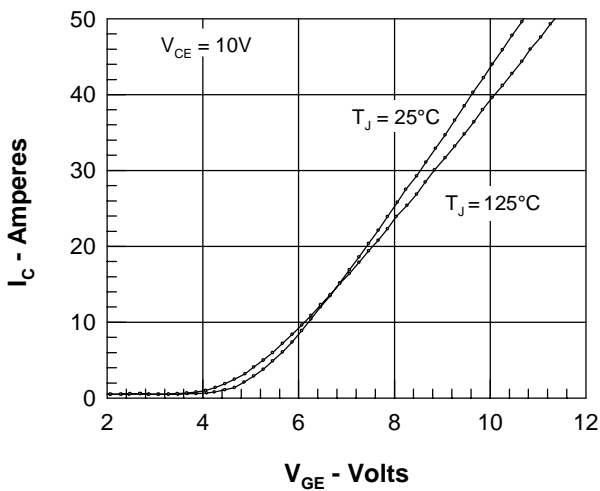


Figure 5. Admittance Curves

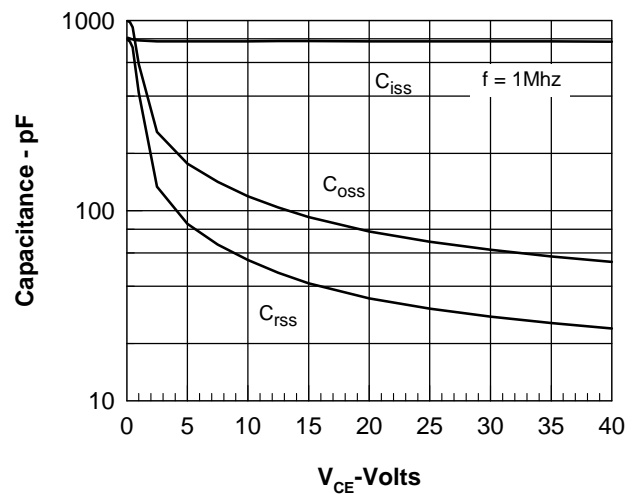


Figure 6. Capacitance Curves

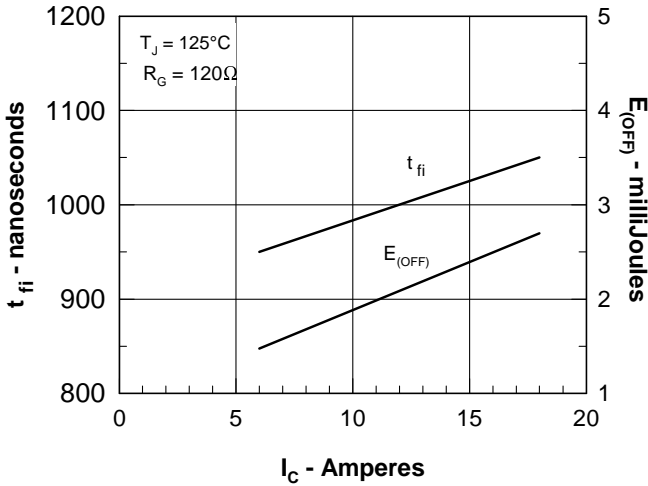


Figure 7. Dependence of  $t_{fi}$  and  $E_{OFF}$  on  $I_C$ .

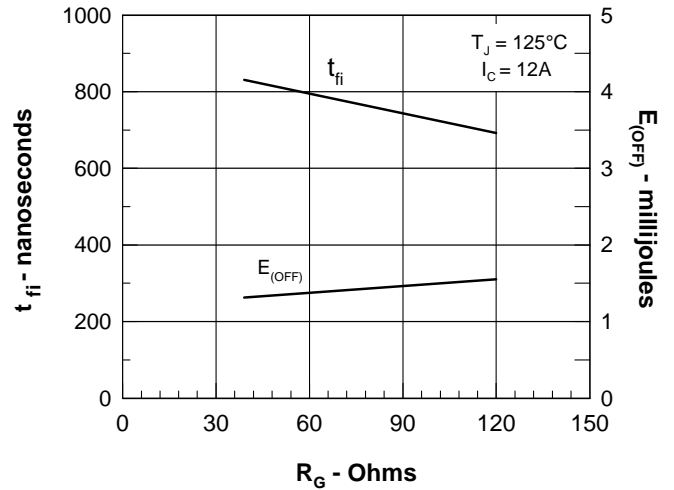


Figure 8. Dependence of  $t_{fi}$  and  $E_{OFF}$  on  $R_G$ .

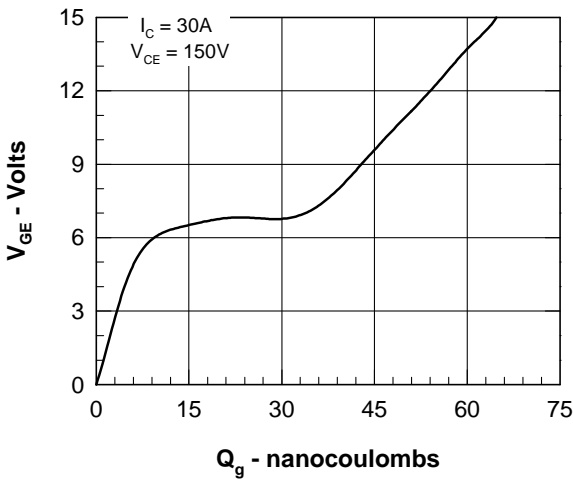


Figure 9. Gate Charge

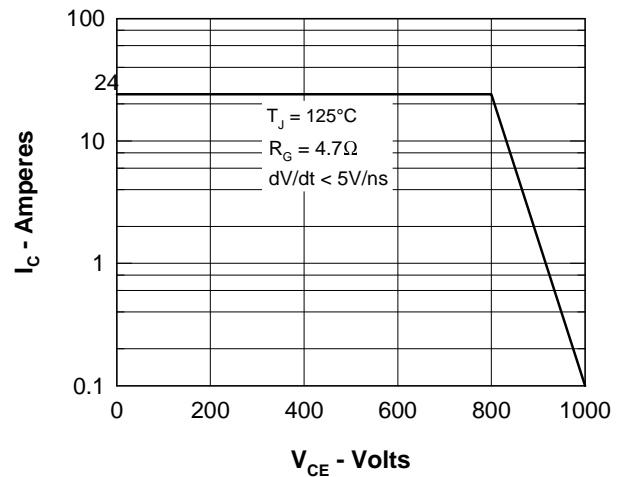


Figure 10. Turn-off Safe Operating Area

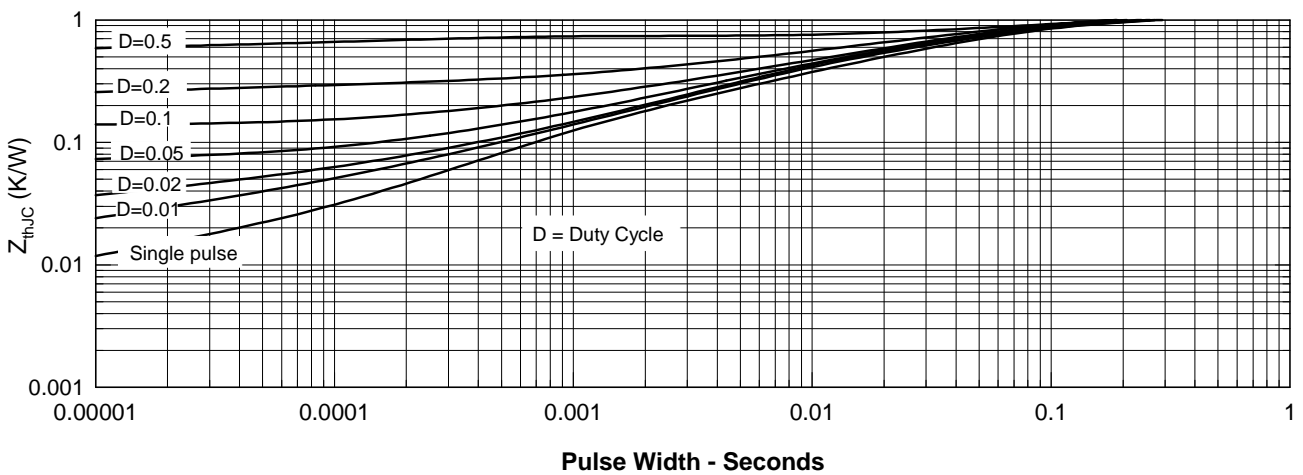


Figure 11. Transient Thermal Resistance



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