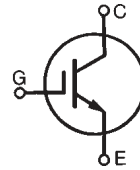


# Very High Voltage IGBT

## IXEL40N400

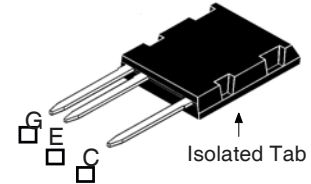
( Electrically Isolated Tab )



$V_{CES} = 4000V$   
 $I_{C110} = 40A$   
 $V_{CE(sat)} \leq 3.2V$   
 $t_{fi(typ)} = 425ns$

Symbol	Test Conditions	Maximum Ratings	
$V_{CES}$	$T_J = 25^\circ C$ to $150^\circ C$	4000	V
$V_{GES}$	Continuous	$\pm 20$	V
$V_{GEM}$	Transient	$\pm 30$	V
$I_{C25}$	$T_C = 25^\circ C$	90	A
$I_{C110}$	$T_C = 110^\circ C$	40	A
$I_{CM}$	Pulse Width Limited by $T_{JM}$ , 1ms, $V_{GE} = 25V$	400	A
$P_C$	$T_C = 25^\circ C$	380	W
$T_J$		- 40 ... +150	$^\circ C$
$T_{JM}$		150	$^\circ C$
$T_{stg}$		- 40 ... +150	$^\circ C$
$T_L$	Maximum Lead Temperature for Soldering	300	$^\circ C$
$T_{SOLD}$	1.6 mm (0.062 in.) from Case for 10s	260	$^\circ C$
$V_{ISOL}$	$I_{ISOL} < 1mA$ , 50/60 Hz, t = 1 minute	4000	V~
$F_C$	Mounting Force	30..170 / 7..36	Nm/lb-in.
<b>Weight</b>		8	g

### ISOPLUS i5-Pak™



G = Gate      C = Collector  
 E = Emitter

### Features

- Silicon Chip on Direct-Copper Bond (DCB) Substrate
- Isolated Mounting Surface
- 4000V~ Electrical Isolation
- UL Recognized Package
- High Peak Current Capability
- Low Saturation Voltage
- Molding Epoxies Meet UL 94 V-0 Flammability Classification

### Advantages

- High Power Density
- Easy to Mount

### Applications

- Capacitor Discharge
- Pulsar Circuits

Symbol	Test Conditions ( $T_J = 25^\circ C$ , Unless Otherwise Specified)	Characteristic Values		
		Min.	Typ.	Max.
$V_{GE(th)}$	$I_C = 10mA$ , $V_{CE} = V_{GE}$	5.5		7.0 V
$I_{CES}$	$V_{CE} = V_{CES}$ , $V_{GE} = 0V$ Note 2, $T_J = 125^\circ C$		1.5	100 $\mu A$ mA
$I_{GES}$	$V_{CE} = 0V$ , $V_{GE} = \pm 20V$			$\pm 500$ nA
$V_{CE(sat)}$	$I_C = I_{C110}$ , $V_{GE} = 15V$ , Note 1 $T_J = 125^\circ C$		2.4 3.0	3.2 V V

Symbol	Test Conditions ( $T_J = 25^\circ\text{C}$ , Unless Otherwise Specified)	Characteristic Values		
		Min.	Typ.	Max.
$g_{fs}$	$I_C = I_{C110}, V_{CE} = 10\text{V}$ , Note 1	14	24	S
$I_{SC}$	$I_C = I_{C110}, V_{CC} = 3400\text{V}, V_{CM} < 4000\text{V}$ $V_{GE} = 15\text{V}, t_{SC} \leq 10\mu\text{s}$		200	A
$C_{ies}$		$V_{CE} = 25\text{V}, V_{GE} = 0\text{V}, f = 1\text{MHz}$		6040
$C_{oes}$			278	pF
$C_{res}$			120	pF
$R_{Gint}$			5.2	$\Omega$
$Q_{g(on)}$	$I_C = I_{C110}, V_{GE} = 15\text{V}, V_{CE} = 1000\text{V}$		275	nC
$Q_{ge}$			63	nC
$Q_{gc}$			134	nC
$t_{d(on)}$	<b>Inductive load, <math>T_J = 25^\circ\text{C}</math></b>		160	ns
$t_{ri}$			100	ns
$E_{on}$	$I_C = I_{C110}, V_{GE} = 15\text{V}$		55	mJ
$t_{d(off)}$		$V_{CE} = 2800\text{V}, R_G = 33\Omega$		630
$t_{fi}$	Note 3			425
$E_{off}$			165	mJ
$t_{d(on)}$	<b>Inductive load, <math>T_J = 125^\circ\text{C}</math></b>		155	ns
$t_{ri}$			105	ns
$E_{on}$	$I_C = I_{C110}, V_{GE} = 15\text{V}$		85	mJ
$t_{d(off)}$		$V_{CE} = 2800\text{V}, R_G = 33\Omega$		715
$t_{fi}$	Note 3			455
$E_{off}$			205	mJ
$R_{thJC}$				0.26 $^\circ\text{C/W}$
$R_{thCK}$	(Pressure Mount)		0.15	$^\circ\text{C/W}$

**ISOPLUS i5-Pak™ HV Outline**

SYM	INCHES		MILLIMETER	
	MIN	MAX	MIN	MAX
A	0.190	0.205	4.83	5.21
A1	0.102	0.118	2.59	3.00
A2	0.046	0.055	1.17	1.40
b	0.045	0.055	1.14	1.40
b1	0.063	0.072	1.60	1.83
b2	0.058	0.068	1.47	1.73
c	0.020	0.029	0.51	0.74
D	1.020	1.040	25.91	26.42
E	0.770	0.799	19.56	20.29
e	0.150 BSC		3.81 BSC	
e1	0.450 BSC		11.43 BSC	
L	0.780	0.820	19.81	20.83
L1	0.080	0.102	2.03	2.59
Q	0.210	0.235	5.33	5.97
Q1	0.490	0.513	12.45	13.03
R	0.150	0.180	3.81	4.57
R1	0.100	0.130	2.54	3.30
S	0.668	0.690	16.97	17.53
T	0.801	0.821	20.34	20.85
U	0.065	0.080	1.65	2.03

**Notes:**

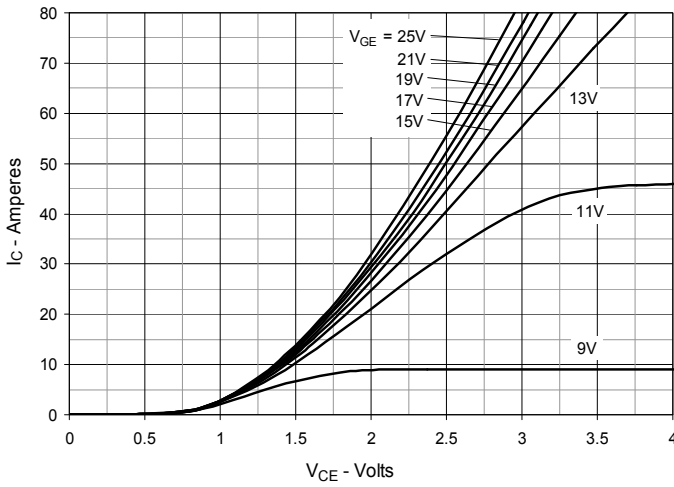
1. Pulse test,  $t \leq 300\mu\text{s}$ , duty cycle,  $d \leq 2\%$ .
2. Part must be heatsunk for high-temp  $I_{CES}$  measurement.
3. Switching times & energy losses may increase for higher  $V_{CE}$  (Clamp),  $T_J$  or  $R_G$ .

IXYS Reserves the Right to Change Limits, Test Conditions, and Dimensions.

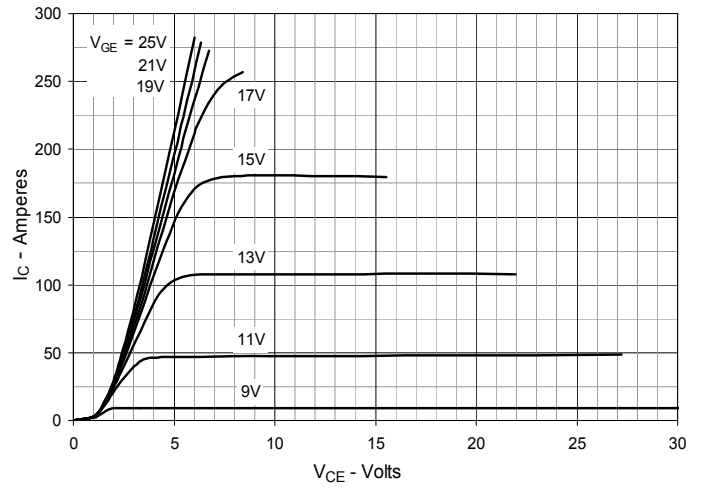
IXYS MOSFETs and IGBTs are covered by one or more of the following U.S. patents:

4,835,592	4,931,844	5,049,961	5,237,481	6,162,665	6,404,065 B1	6,683,344	6,727,585	7,005,734 B2	7,157,338B2
4,860,072	5,017,508	5,063,307	5,381,025	6,259,123 B1	6,534,343	6,710,405 B2	6,759,692	7,063,975 B2	
4,881,106	5,034,796	5,187,117	5,486,715	6,306,728 B1	6,583,505	6,710,463	6,771,478 B2	7,071,537	

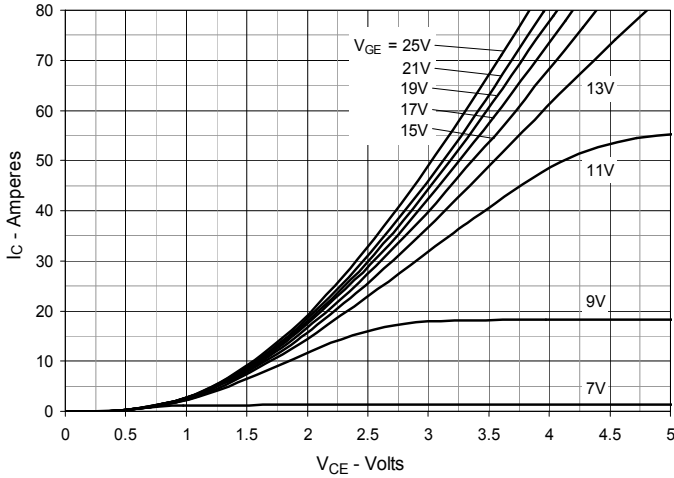
**Fig. 1. Output Characteristics @  $T_J = 25^\circ\text{C}$**



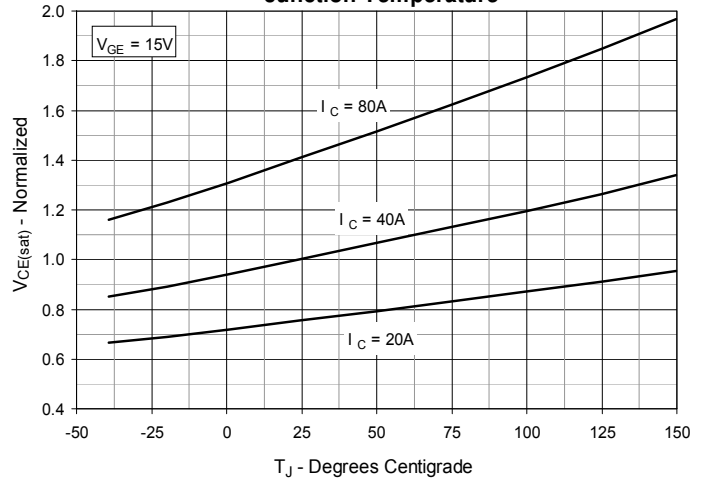
**Fig. 2. Extended Output Characteristics @  $T_J = 25^\circ\text{C}$**



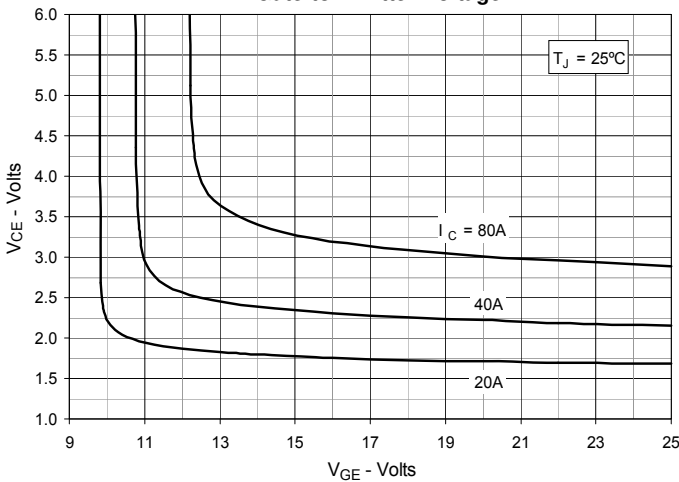
**Fig. 3. Output Characteristics @  $T_J = 125^\circ\text{C}$**



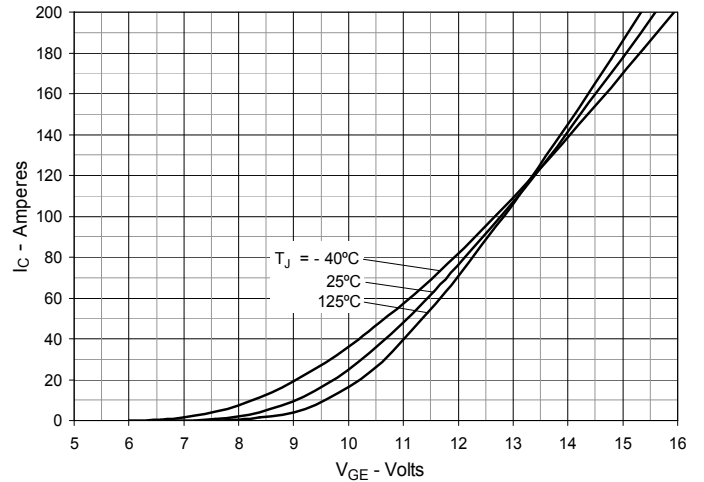
**Fig. 4. Dependence of  $V_{CE(sat)}$  on Junction Temperature**



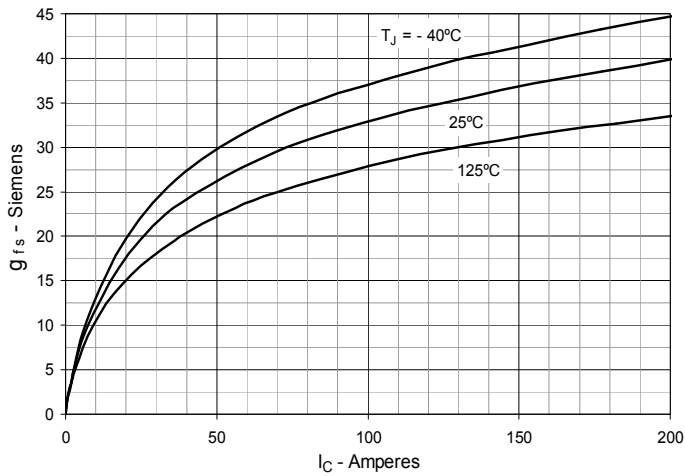
**Fig. 5. Collector-to-Emitter Voltage vs. Gate-to-Emitter Voltage**



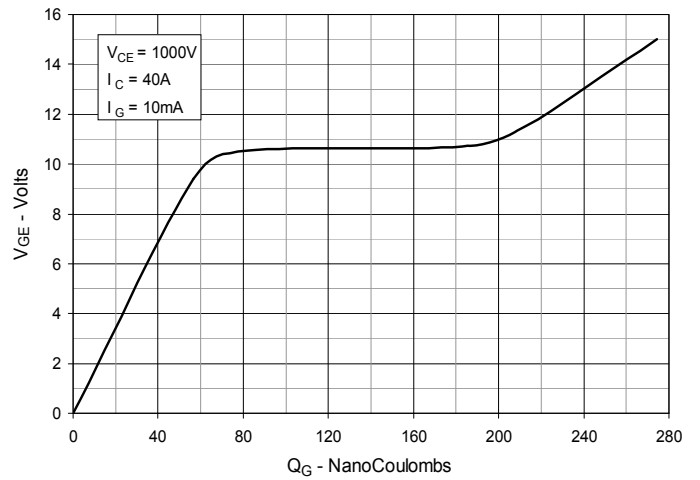
**Fig. 6. Input Admittance**



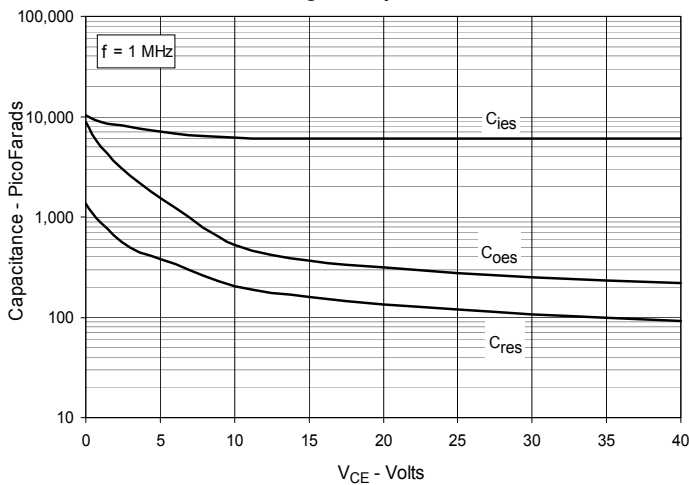
**Fig. 7. Transconductance**



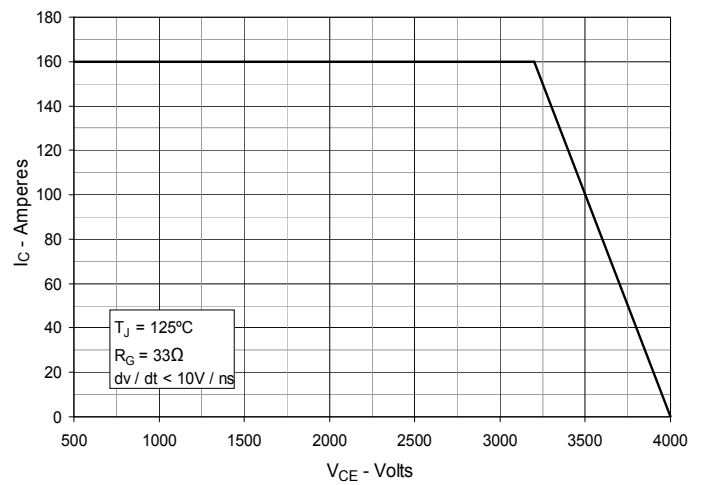
**Fig. 8. Gate Charge**



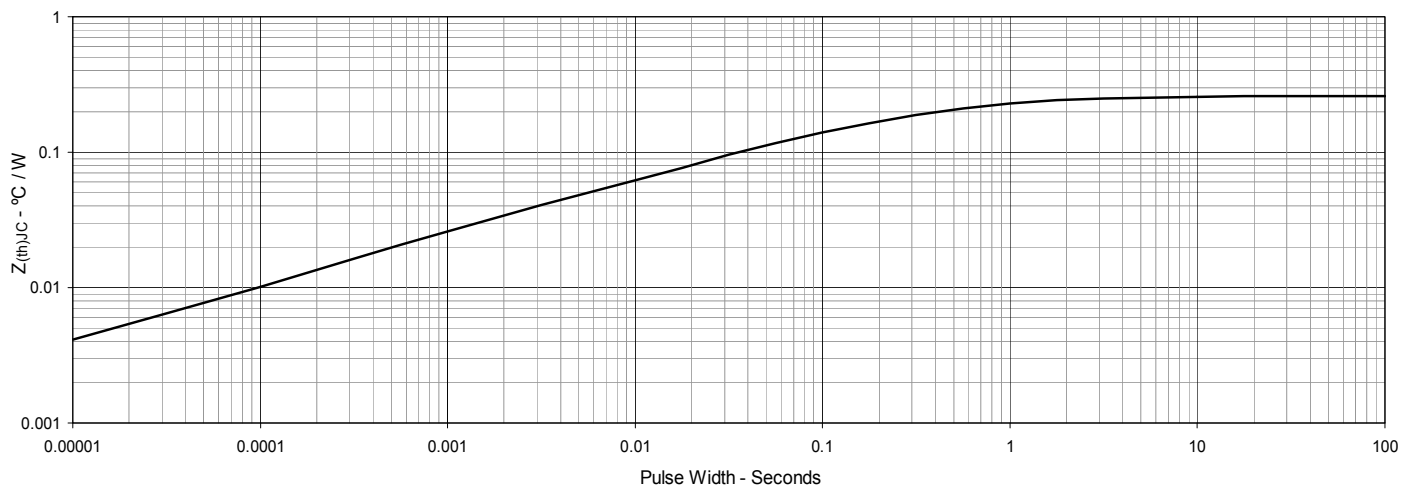
**Fig. 9. Capacitance**



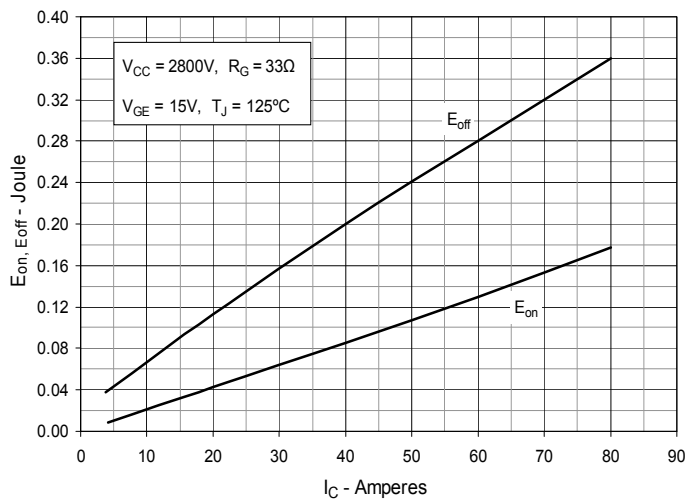
**Fig. 10. Reverse-Bias Safe Operating Area**



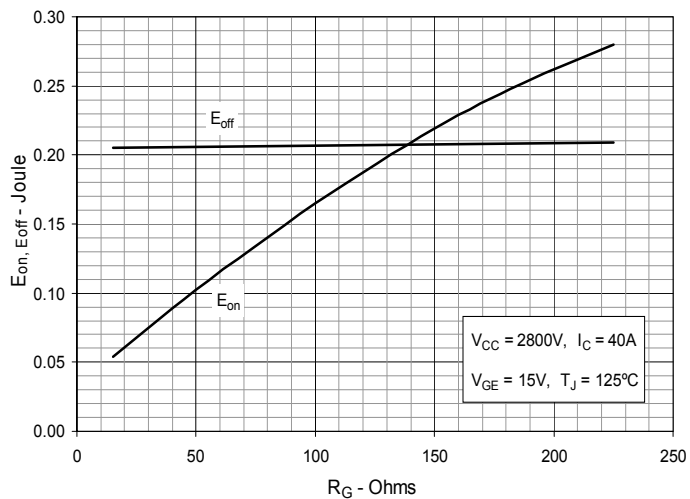
**Fig. 11. Maximum Transient Thermal Impedance**



**Fig. 12. Typ. Swiatching Characteristics vs. Collector Current**



**Fig. 13. Typ. Swiatching Characteristics vs. Gate Resistor**





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