

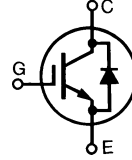
# IGBT with Diode PLUS247™ package

**IXSK 40N60CD1**  
**IXSX 40N60CD1**

**V<sub>CES</sub> = 600 V**  
**I<sub>C25</sub> = 75 A**  
**V<sub>CE(sat)</sub> = 2.5 V**  
**t<sub>fi(typ)</sub> = 70 ns**

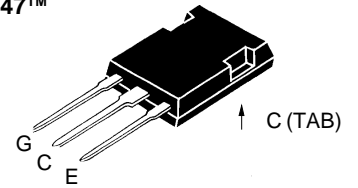
## Short Circuit SOA Capability

Preliminary data

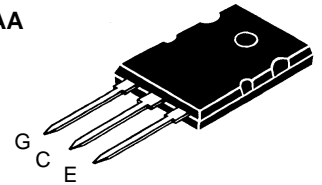


Symbol	Test Conditions	Maximum Ratings	
V <sub>CES</sub>	T <sub>J</sub> = 25°C to 150°C	600	V
V <sub>CGR</sub>	T <sub>J</sub> = 25°C to 150°C; R <sub>GE</sub> = 1 MΩ	600	V
V <sub>GES</sub>	Continuous	±20	V
V <sub>GEM</sub>	Transient	±30	V
I <sub>C25</sub>	T <sub>C</sub> = 25°C, limited by leads	75	A
I <sub>C90</sub>	T <sub>C</sub> = 90°C	40	A
I <sub>CM</sub>	T <sub>C</sub> = 25°C, 1 ms	150	A
<b>SSOA</b> <b>(RBSOA)</b>	V <sub>GE</sub> = 15 V, T <sub>VJ</sub> = 125°C, R <sub>G</sub> = 22 Ω Clamped inductive load, L = 30 μH	I <sub>CM</sub> = 80 @ 0.8 V <sub>CES</sub>	A
<b>t<sub>SC</sub></b> <b>(SCSOA)</b>	V <sub>GE</sub> = 15 V, V <sub>CE</sub> = 360 V, T <sub>J</sub> = 125°C R <sub>G</sub> = 22 Ω, non repetitive	10	μs
P <sub>C</sub>	T <sub>C</sub> = 25°C	280	W
T <sub>J</sub>		-55 ... +150	°C
T <sub>JM</sub>		150	°C
T <sub>stg</sub>		-55 ... +150	°C
M <sub>d</sub>	Mounting torque (TO-264)	0.9/6	Nm/lb.in.
Maximum lead temperature for soldering 1.6 mm (0.062 in.) from case for 10 s		300	°C
<b>Weight</b>	TO-264	10	g
	PLUS247	6	g

**PLUS 247™  
(IXSX)**



**TO-264 AA  
(IXSK)**



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

### Features

- International standard packages
- Guaranteed Short Circuit SOA capability
- High frequency IGBT and anti-parallel FRED in one package
- Latest generation HDMOS™ process
- MOS Gate turn-on
  - drive simplicity
- Fast Recovery, low leakage Epitaxial Diode
  - soft recovery with low I<sub>RM</sub>

### Applications

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

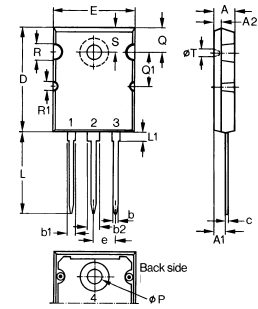
### Advantages

- PLUS 247™ package for clip or spring mounting
- Space savings (two devices in one package)
- Reduces assembly time and cost

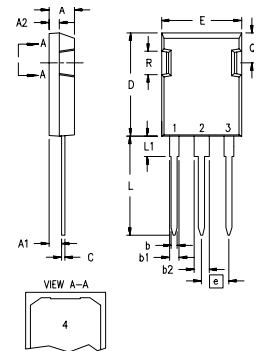
Symbol	Test Conditions	Characteristic Values (T <sub>J</sub> = 25°C, unless otherwise specified)		
		min.	typ.	max.
BV <sub>CES</sub>	I <sub>C</sub> = 1 mA, V <sub>GE</sub> = 0 V	600		V
V <sub>GE(th)</sub>	I <sub>C</sub> = 4 mA, V <sub>CE</sub> = V <sub>GE</sub>	4		V
I <sub>CES</sub>	V <sub>CE</sub> = 0.8 • V <sub>CES</sub> V <sub>GE</sub> = 0 V	T <sub>J</sub> = 25°C		650 μA
		T <sub>J</sub> = 150°C		5 mA
I <sub>GES</sub>	V <sub>CE</sub> = 0 V, V <sub>GE</sub> = ±20 V			±100 nA
V <sub>CE(sat)</sub>	I <sub>C</sub> = I <sub>C90</sub> , V <sub>GE</sub> = 15 V			2.5 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 $\leq 2\%$	16	23	S	
$C_{iss}$	$V_{GS} = 0\text{ V}$ , $V_{DS} = 25\text{ V}$ , $f = 1\text{ MHz}$		3700	pF	
$C_{oss}$			440	pF	
$C_{riss}$			60	pF	
$Q_g$	$I_C = I_{C90}$ , $V_{GE} = 15\text{ V}$ , $V_{CE} = 0.5 V_{CES}$		190	nC	
$Q_{ge}$			45	nC	
$Q_{gc}$			88	nC	
$t_{d(on)}$	<b>Inductive load, <math>T_J = 25^\circ\text{C}</math></b> $I_C = I_{C90}$ , $V_{GE} = 15\text{ V}$ , $L = 100\ \mu\text{H}$ , $V_{CE} = 0.8 V_{CES}$ , $R_G = 2.7\ \Omega$ Remarks: Switching times may increase for $V_{CE}(\text{Clamp}) > 0.8 \cdot V_{CES}$ , higher $T_J$ or increased $R_G$		50	ns	
$t_{ri}$			50	ns	
$t_{d(off)}$			70	140	ns
$t_{fi}$			70	120	ns
$E_{off}$			1.0	1.7	mJ
$t_{d(on)}$	<b>Inductive load, <math>T_J = 125^\circ\text{C}</math></b> $I_C = I_{C90}$ , $V_{GE} = 15\text{ V}$ , $L = 100\ \mu\text{H}$ $V_{CE} = 0.8 V_{CES}$ , $R_G = 2.7\ \Omega$ Remarks: Switching times may increase for $V_{CE}(\text{Clamp}) > 0.8 \cdot V_{CES}$ , higher $T_J$ or increased $R_G$		50	ns	
$t_{ri}$			50	ns	
$E_{on}$			2.2	mJ	
$t_{d(off)}$			140	ns	
$t_{fi}$			140	ns	
$E_{off}$			1.7	mJ	
$R_{thJC}$			0.48	K/W	
$R_{thCK}$		0.15		K/W	

Symbol	Test Conditions	Characteristic Values ( $T_J = 25^\circ\text{C}$ , unless otherwise specified)		
		min.	typ.	max.
$V_F$	$I_F = I_{C90}$ ; $V_{GE} = 0\text{ V}$ , Pulse test, $t \leq 300\ \mu\text{s}$ , duty cycle $d \leq 2\%$			1.8 V
$I_{RM}$	$I_F = I_{C90}$ , $V_{GE} = 0\text{ V}$ , $-di_F/dt = 100\text{ A}/\mu\text{s}$ $V_R = 100\text{ V}$		2	2.5 A
$t_{rr}$			$I_F = 1\text{ A}$ ; $-di_F/dt = 200\text{ A}/\mu\text{s}$ ; $V_R = 30\text{ V}$	35
$R_{thJC}$			0.75	K/W

**TO-264 AA Outline**


Dim.	Millimeter		Inches	
	Min.	Max.	Min.	Max.
A	4.82	5.13	.190	.202
A1	2.54	2.89	.100	.114
A2	2.00	2.10	.079	.083
b	1.12	1.42	.044	.056
b1	2.39	2.69	.094	.106
b2	2.90	3.09	.114	.122
c	0.53	0.83	.021	.033
D	25.91	26.16	1.020	1.030
E	19.81	19.96	.780	.786
e	5.46 BSC		.215 BSC	
J	0.00	0.25	.000	.010
K	0.00	0.25	.000	.010
L	20.32	20.83	.800	.820
L1	2.29	2.59	.090	.102
P	3.17	3.66	.125	.144
Q	6.07	6.27	.239	.247
Q1	8.38	8.69	.330	.342
R	3.81	4.32	.150	.170
R1	1.78	2.29	.070	.090
S	6.04	6.30	.238	.248
T	1.57	1.83	.062	.072

**PLUS247™ (IXSX)**


Dim.	Millimeter		Inches	
	Min.	Max.	Min.	Max.
A	4.83	5.21	.190	.205
A1	2.29	2.54	.090	.100
A2	1.91	2.16	.075	.085
b	1.14	1.40	.045	.055
b1	1.91	2.13	.075	.084
b2	2.92	3.12	.115	.123
C	0.61	0.80	.024	.031
D	20.80	21.34	.819	.840
E	15.75	16.13	.620	.635
e	5.45 BSC		.215 BSC	
L	19.81	20.32	.780	.800
L1	3.81	4.32	.150	.170
Q	5.59	6.20	.220	.244
R	4.32	4.83	.170	.190