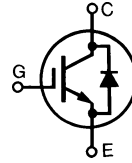


IGBT with Diode PLUS247™ package

IXSK 40N60BD1
IXSX 40N60BD1

Short Circuit SOA Capability

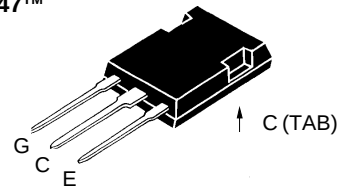
Preliminary data



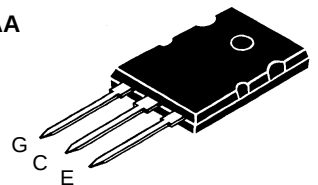
$$\begin{aligned} V_{CES} &= 600 \text{ V} \\ I_{C25} &= 75 \text{ A} \\ V_{CE(sat)} &= 2.2 \text{ V} \\ t_{fi(typ)} &= 120 \text{ ns} \end{aligned}$$

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	± 20	V
V_{GEM}	Transient	± 30	V
I_{C25}	$T_C = 25^\circ\text{C}$, limited by leads	75	A
I_{C90}	$T_C = 90^\circ\text{C}$	40	A
I_{CM}	$T_C = 25^\circ\text{C}$, 1 ms	150	A
SSOA (RBSOA)	$V_{GE} = 15 \text{ V}$, $T_{VJ} = 125^\circ\text{C}$, $R_G = 22 \Omega$ Clamped inductive load, $L = 30 \mu\text{H}$	$I_{CM} = 80$ @ $0.8 V_{CES}$	A
t_{SC} (SCSOA)	$V_{GE} = 15 \text{ V}$, $V_{CE} = 360 \text{ V}$, $T_J = 125^\circ\text{C}$ $R_G = 22 \Omega$, non repetitive	10	μs
P_C	$T_C = 25^\circ\text{C}$	280	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 (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	$^\circ\text{C}$
Weight	TO-264	10	g
	PLUS247	5	g

**PLUS 247™
(IXSX)**



**TO-264 AA
(IXSK)**



G = Gate, C = Collector,
E = Emitter

Features

- International standard packages
- Guaranteed Short Circuit SOA capability
- Medium frequency IGBT and anti-parallel FRED in one package
- Latest generation HDMOS™ process
- Low $V_{CE(sat)}$
 - for minimum on-state conduction losses
- MOS Gate turn-on
 - drive simplicity
- Fast Recovery, low leakage Epitaxial Diode
 - 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

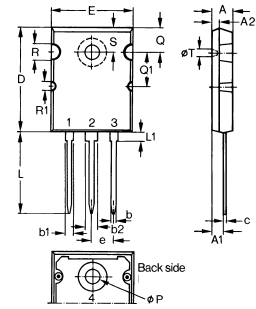
- PLUS 247™ package for clip or spring mounting
- Space savings (two devices in one package)
- Reduces assembly time and cost

Symbol	Test Conditions	Characteristic Values ($T_J = 25^\circ\text{C}$, unless otherwise specified)		
		min.	typ.	max.
BV_{CES}	$I_C = 1 \text{ mA}$, $V_{GE} = 0 \text{ V}$	600		V
$V_{GE(th)}$	$I_C = 4 \text{ mA}$, $V_{CE} = V_{GE}$	4		7 V
I_{CES}	$V_{CE} = 0.8 \cdot V_{CES}$, $V_{GE} = 0 \text{ V}$ $T_J = 25^\circ\text{C}$ $T_J = 150^\circ\text{C}$			650 μA 5 mA
I_{GES}	$V_{CE} = 0 \text{ V}$, $V_{GE} = \pm 20 \text{ V}$			$\pm 100 \text{ nA}$
$V_{CE(sat)}$	$I_C = I_{C90}$, $V_{GE} = 15 \text{ V}$			2.2 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, $t \leq 300\text{ }\mu\text{s}$, 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_{rss}			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
$t_{d(on)}$	Inductive load, $T_J = 25^\circ\text{C}$ $I_C = I_{C90}$, $V_{GE} = 15\text{ V}$, $L = 100\text{ }\mu\text{H}$, $V_{CE} = 0.8 V_{CES}$, $R_G = 2.7\text{ }\Omega$ 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
$t_{d(off)}$			110	200 ns
t_{fi}			120	200 ns
E_{off}			1.8	2.6 mJ
$t_{d(on)}$			50	ns
t_{ri}	Inductive load, $T_J = 125^\circ\text{C}$ $I_C = I_{C90}$, $V_{GE} = 15\text{ V}$, $L = 100\text{ }\mu\text{H}$ $V_{CE} = 0.8 V_{CES}$, $R_G = 2.7\text{ }\Omega$ Remarks: Switching times may increase for $V_{CE}(\text{Clamp}) > 0.8 \cdot V_{CES}$, higher T_J or increased R_G		50	ns
E_{on}			2.2	mJ
$t_{d(off)}$			190	ns
t_{fi}			180	ns
E_{off}			2.6	mJ
R_{thJC}				0.48 K/W
R_{thCK}			0.15	K/W

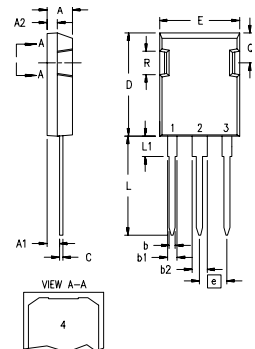
Reverse Diode (FRED)		Characteristic Values ($T_J = 25^\circ\text{C}$, unless otherwise specified)		
Symbol	Test Conditions	min.	typ.	max.
V_F	$I_F = I_{C90}$, $V_{GE} = 0\text{ V}$, Pulse test, $t \leq 300\text{ }\mu\text{s}$, duty cycle $d \leq 2\%$			1.8 V
I_{RM}	$I_F = I_{C90}$, $V_{GE} = 0\text{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