

# High Voltage IGBT Phase-Leg

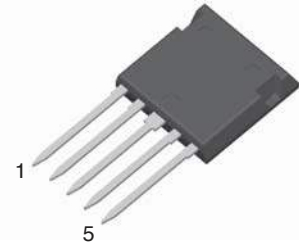
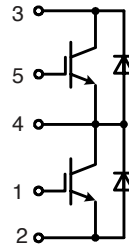
**FII24N170AH1**

$$I_{C25} = 18 \text{ A}$$

$$V_{CES} = 1700 \text{ V}$$

$$V_{CE(sat)} = 6.0 \text{ V}$$

ISOPLUS i4-PAC™ Package


**IGBT**

Symbol	Conditions	Maximum Ratings	
$V_{CES}$	$T_{VJ} = 25^{\circ}\text{C to } 150^{\circ}\text{C}$	1700	V
$V_{GES}$	Continuous	$\pm 20$	V
$V_{GEM}$	Transient	$\pm 30$	V
$I_{C25}$	$T_C = 25^{\circ}\text{C}$	18	A
$I_{C90}$	$T_C = 90^{\circ}\text{C}$	11	A
$I_{CM}$		75	A
<b>RBSOA</b>	$V_{GE} = +15 \text{ V}; R_G = 5 \Omega; T_{VJ} = 125^{\circ}\text{C}$ Clamped inductive load; $V_{clamp} = 1360\text{V}$	50	A
$P_C$	$T_C = 25^{\circ}\text{C}$	140	W

**Features**

- NPT<sup>3</sup> IGBT
  - low saturation voltage
  - positive temperature coefficient for easy paralleling
  - fast switching
  - short tail current for optimized performance in resonant circuits
- SONIC-FRD™ diode
  - fast reverse recovery
  - low operating forward voltage
  - low leakage current
- ISOPLUS i4-PAC™ package
  - isolated back surface
  - low coupling capacity between pins and heatsink
  - enlarged creepage towards heatsink
  - application friendly pinout
  - low inductive current path
  - high reliability
  - industry standard outline
  - UL registered, E 72873

**Applications**

- Single phaseleg
  - buck-boost chopper
- H-bridge
  - power supplies
  - induction heating
  - four quadrant DC drives
  - controlled rectifier
- Three phase bridge
  - AC drives
  - controlled rectifier

Symbol	Conditions	Characteristic Values ( $T_{VJ} = 25^{\circ}\text{C}$ unless otherwise specified)		
		min.	typ.	max.
$V_{CE(sat)}$	$I_C = 16 \text{ A}; V_{GE} = 15 \text{ V}$ $T_{VJ} = 125^{\circ}\text{C}$	4.5	6.0	V
		4.8		V
$V_{GE(th)}$	$I_C = 250 \mu\text{A}; V_{GE} = V_{CE}$	3.0		5.0 V
$I_{CES}$	$V_{CE} = 0.8 V_{CES}; V_{GE} = 0 \text{ V}$ $T_{VJ} = 125^{\circ}\text{C}$		100	$\mu\text{A}$
			1.5	mA
$I_{GES}$	$V_{CE} = 0 \text{ V}; V_{GE} = \pm 20 \text{ V}$		$\pm 100$	nA
$t_{d(on)}$	Inductive load $V_{CE} = 600 \text{ V}; I_C = 24 \text{ A}$	48		ns
$t_r$		60		ns
$t_{d(off)}$	$V_{GE} = \pm 15 \text{ V}; R_G = 39 \Omega$	200		ns
$t_f$		45		ns
$E_{off}$		1.1		mJ
$t_{d(on)}$	Inductive load, $T_{VJ} = 125^{\circ}\text{C}$	40		ns
$t_r$		60		ns
$t_{d(off)}$	$V_{CE} = 600 \text{ V}; I_C = 24 \text{ A}$	220		ns
$t_f$		55		ns
$E_{on}$	$V_{GE} = \pm 15 \text{ V}; R_G = 39 \Omega$	2.5		mJ
$E_{off}$		1.7		mJ

Note: All characteristic values and ratings refer to a single IGBT or diode except  $V_{CES}$ ,  $I_{CES}$  and  $C_{oes}$ .

### IGBT

Symbol	Conditions	Characteristic Values		
		min.	typ.	max.
$g_{fs}$	$I_C = 24 \text{ A}$ , $V_{CE} = 10 \text{ V}$ , Note 2	10	16	S
$Q_g$	$I_C = 16 \text{ A}$ , $V_{GE} = 15 \text{ V}$ , $V_{CE} = 0.5 V_{CES}$		105	nC
$Q_{ge}$			17	nC
$Q_{gc}$			30	nC
$C_{ies}$	$V_{CE} = 25 \text{ V}$ , $V_{GE} = 0 \text{ V}$ , $f = 1 \text{ MHz}$		2400	pF
$C_{oes}$			150	pF
$C_{res}$			30	pF
$R_{thJC}$ $R_{thCK}$		0.6	0.9	K/W K/W

### Diode

Symbol	Conditions	Maximum Ratings	
$I_{F25}$	$T_C = 25^\circ\text{C}$	24	A
$I_{F90}$	$T_C = 90^\circ\text{C}$	14	A

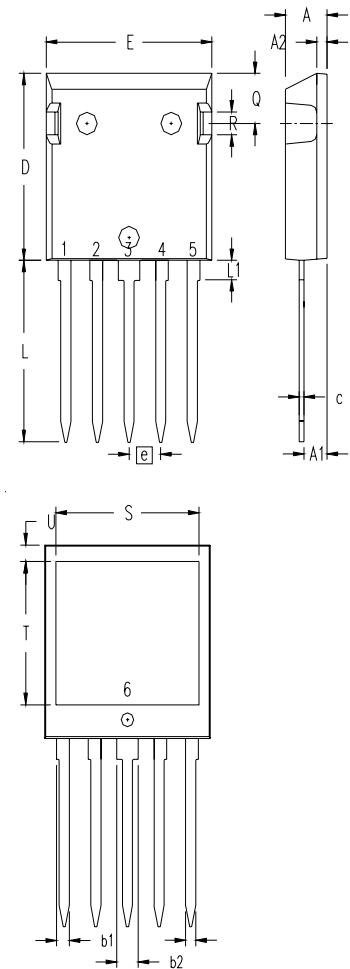
Symbol	Conditions	Characteristic Values		
		min.	typ.	max.
$V_F$	$I_F = 20 \text{ A}$ $T_{VJ} = 125^\circ\text{C}$		2.5	2.95
			2.5	V
$I_{RM}$	$I_F = 20 \text{ A}$ ; $di_F/dt = -450 \text{ A}/\mu\text{s}$ ; $T_{VJ} = 125^\circ\text{C}$		23	A
$t_{rr}$	$V_R = 1200 \text{ V}$ ; $V_{GE} = 0 \text{ V}$		230	ns
$R_{thJC}$		1.6		K/W
$R_{thCS}$		0.6		K/W

### Component

Symbol	Conditions	Maximum Ratings	
$T_{VJ}$		-55...+150	$^\circ\text{C}$
$T_{stg}$		-55...+125	$^\circ\text{C}$
$V_{ISOL}$	$I_{ISOL} \leq 1 \text{ mA}$ ; 50/60 Hz	2500	V~
$F_C$	mounting force with clip	20...120	N

Symbol	Conditions	Characteristic Values		
		min.	typ.	max.
$C_p$	coupling capacity between shorted pins and mounting tab in the case		40	pF
$d_{S^*d_A}$	pin - pin	1.7		mm
$d_{S^*d_A}$	pin - backside metal	5.5		mm
<b>Weight</b>			9	g

### Outline Drawing



SYM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	.190	.205	4.83	5.21
A1	.102	.118	2.59	3.00
A2	.046	.085	1.17	2.16
b	.045	.055	1.14	1.40
b1	.058	.068	1.47	1.73
b2	.100	.110	2.54	2.79
C	.020	.029	0.51	0.74
D	.819	.840	20.80	21.34
E	.770	.799	19.56	20.29
e	.150 BSC		3.81 BSC	
L	.780	.840	19.81	21.34
L1	.083	.102	2.11	2.59
Q	.210	.244	5.33	6.20
R	.100	.180	2.54	4.57
S	.660	.690	16.76	17.53
T	.590	.620	14.99	15.75
U	.065	.080	1.65	2.03

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