

# JHK75N120FA

## *Product Preview*

**1200V/75A FIELD-STOP TRENCH IGBT WITH DIODE**

**Features**

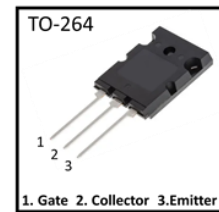
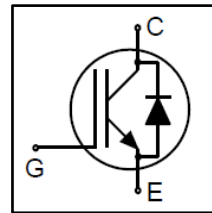
- Low  $V_{CE(sat)}$
- Fast Switching
- High Ruggedness
- Short-Circuit Rated


**Product Summary**

$V_{CES}$	1200V
$I_C$	75A <sup>(1)</sup>
$V_{CE(sat),typ}$	1.65V ( $T_J = 25^\circ\text{C}$ )
Package	TO-264

**Applications**

- Inverters
- Frequency Converters
- Industrial Motor Drives
- Uninterrupted Power Supply


**Ordering Information**

Part Number	Marking	Package	Packing
JHK75N120FA	HK75N120FA	TO-264	Tube

**Absolute Maximum Ratings**

Parameter	Symbol	Limit	Unit
Collector-to-Emitter Voltage	$V_{CES}$	1200	V
Gate-to-Emitter Voltage	$V_{GES}$	$\pm 20$	
DC Collector Current ( $T_c = 25^\circ\text{C}$ , $T_J = 150^\circ\text{C}$ )	$I_C$	120 <sup>(2)</sup>	A
DC Collector Current ( $T_c = 100^\circ\text{C}$ , $T_J = 150^\circ\text{C}$ )		78	
Pulsed Collector Current (pulse width limited by maximum $T_J$ )	$I_{CM}$	225	
Diode Forward Current ( $T_c = 25^\circ\text{C}$ , $T_J = 150^\circ\text{C}$ )	$I_F$	120 <sup>(2)</sup>	
Diode Forward Current ( $T_c = 100^\circ\text{C}$ , $T_J = 150^\circ\text{C}$ )		79	
Diode Pulsed Current (pulse width limited by maximum $T_J$ )	$I_{FM}$	225	
Short Circuit Withstand Time ( $V_{GE} = 15\text{V}$ , $V_{CC} \leq 600\text{V}$ , $T_{J\_start} \leq 150^\circ\text{C}$ )	$t_{SC}$	10	$\mu\text{s}$
Turn-off Safe Operating Area ( $V_{CE} \leq 1200\text{V}$ , $T_J \leq 150^\circ\text{C}$ )	-	225	A
Maximum Power Dissipation ( $T_c = 25^\circ\text{C}$ , $T_J = 150^\circ\text{C}$ )	$P_{D(max)}$	521	W
Operating Junction Temperature	$T_J$	-40 to +150	$^\circ\text{C}$
Storage Temperature	$T_{stg}$	-55 to +150	
Maximum Lead Temperature for Soldering (1/8" from case for 5 seconds)	$T_{slid}$	260	

**Static Electrical Characteristics** <sup>(3)</sup>

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
Collector-to-Emitter Breakdown Voltage	$BV_{CES}$	$V_{GE} = 0V, I_C = 250\mu A$	1200	-	-	V
Collector-to-Emitter Leakage Current	$I_{CES}$	$V_{CE} = 1200V, V_{GE} = 0V$	-	-	10	$\mu A$
		$V_{CE} = 1200V, V_{GE} = 0V,$ $T_J = 150^\circ C$	-	-	5	mA
Gate-to-Emitter Leakage Current	$I_{GES}$	$V_{CE} = 0V, V_{GE} = \pm 20V$	-	-	100	nA
Gate Threshold Voltage	$V_{GE(th)}$	$V_{CE} = V_{GE}, I_C = 1.5mA$	5.5	6.5	7.5	V
Collector-to-Emitter Saturation Voltage	$V_{CE(sat)}$	$V_{GE} = 15V, I_C = 75A$	-	1.65	2.0	
		$V_{GE} = 15V, I_C = 75A,$ $T_J = 150^\circ C$	-	2.2	-	
Diode Forward Voltage	$V_F$	$V_{GE} = 0V, I_F = 75A$	-	1.8	2.25	
		$V_{GE} = 0V, I_F = 75A$ $T_J = 150^\circ C$	-	1.6	-	

**Thermal Characteristics**

Parameter	Symbol	Min	Typ	Max	Unit
Junction-to-Ambient Thermal Resistance	$R_{\theta JA}$	-	-	25	$^\circ C/W$
Junction-to-Case Thermal Resistance, IGBT	$R_{\theta JC}$	-	-	0.24	
Junction-to-Case Thermal Resistance, Diode		-	-	0.33	

**Dynamic Electrical Characteristics** <sup>(3)</sup>

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
Total Gate Charge	$Q_g$	$V_{CC} = 600V,$ $V_{GE} = 15V,$ $I_C = 75A$	-	328	-	nC
Input Capacitance	$C_{iss}$	$V_{CE} = 25V,$ $V_{GE} = 0V,$ $f = 1MHz$	-	7334	-	pF
Output Capacitance	$C_{oss}$		-	292	-	
Reverse Transfer Capacitance	$C_{rss}$		-	97	-	

**Switching Characteristics, Inductive Load** <sup>(3), (4)</sup>

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
Turn-on Delay time	$t_{d(ON)}$	$V_{CC} = 600V,$ $V_{GE} = 0/15V,$ $R_G = 1\Omega,$ $I_C = 75A,$ $L_{load} = 0.82mH,$ Energy losses include "tail" and diode reverse recovery.	-	60	-	ns
Rise Time	$t_r$		-	84	-	
Turn-off Delay time	$t_{d(OFF)}$		-	230	-	
Fall Time	$t_f$		-	123	-	
Turn-On Switching Loss	$E_{on}$		-	6.94	-	mJ
Turn-Off Switching Loss	$E_{off}$		-	3.58	-	
IGBT Total Switching Loss	$E_{ts}$		-	10.52	-	
Diode Reverse-Recovery Time	$t_{rr}$	$V_R = 600V,$ $I_F = 75A,$ $di_F/dt = 720A/\mu s$	-	287	-	ns
Diode Reverse-Recovery Charge	$Q_{rr}$		-	3980	-	nC
Diode Peak Reverse-Recovery Current	$I_{rrm}$		-	27	-	A
Short Circuit Collector Current	$I_{C(SC)}$	$V_{GE} = 15V,$ $V_{CC} \leq 600V,$ $t_{SC} \leq 10\mu s$	-	310	-	A

(1) DC collector current,  $T_c = 102^\circ C$ ,  $T_j = 150^\circ C$ .

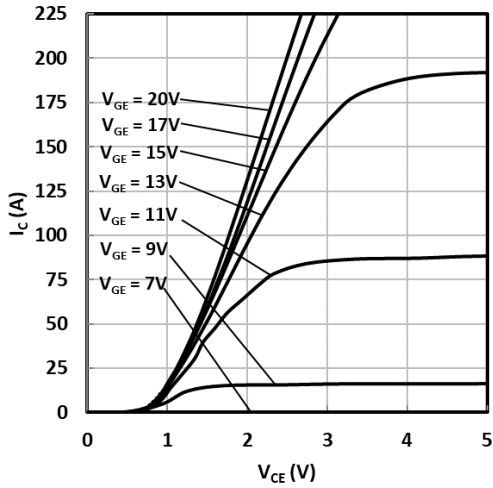
(2) Limited by bonding wire

(3)  $T_j = 25^\circ C$  unless otherwise specified

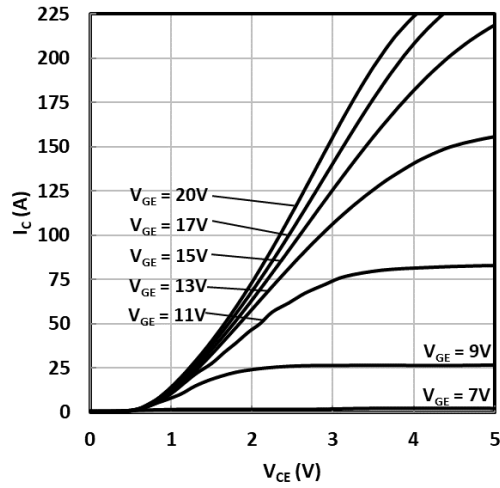
(4)  $t_r$ : from 10% of  $I_C$  to 90% of  $I_C$ ;  $t_f$ : from 90% of  $I_C$  to 10% of  $I_C$ ;

$E_{on}$ : from 10% of  $V_{GE}$  to 10% of  $V_{CE}$ ;  $E_{off}$ : from 90% of  $V_{GE}$  to 10% of  $I_C$ .

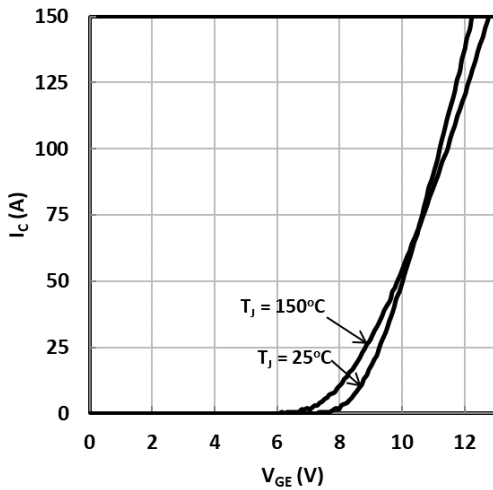
**Typical Electrical Characteristics**



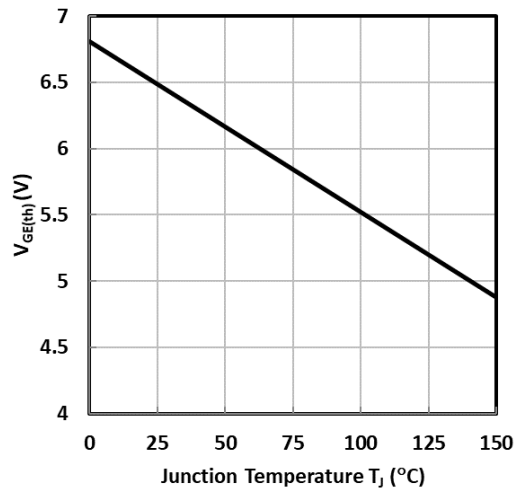
**Fig. 1 Typical output characteristics**  
( $T_J = 25^\circ\text{C}$ ,  $t_p = 250 \mu\text{s}$ )



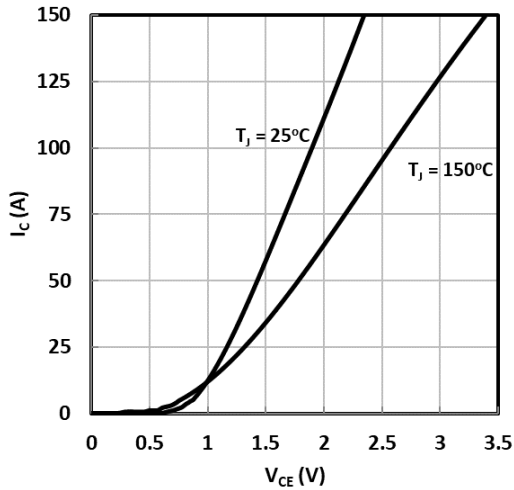
**Fig. 2 Typical output characteristics**  
( $T_J = 150^\circ\text{C}$ ,  $t_p = 250 \mu\text{s}$ )



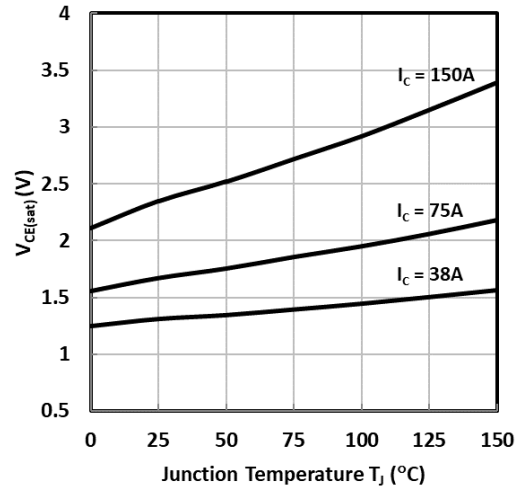
**Fig. 3 Typical transfer characteristics**  
( $V_{CE} = 20\text{V}$ ,  $t_p = 250 \mu\text{s}$ )



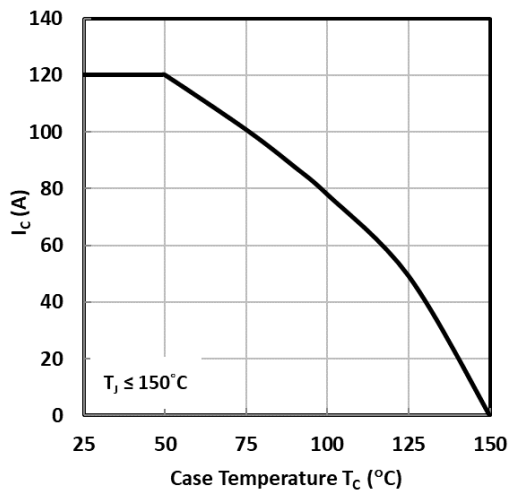
**Fig. 4 Typical gate threshold voltage as a function of junction temperature**  
( $V_{CE} = V_{GE}$ ,  $I_C = 1.5\text{mA}$ )



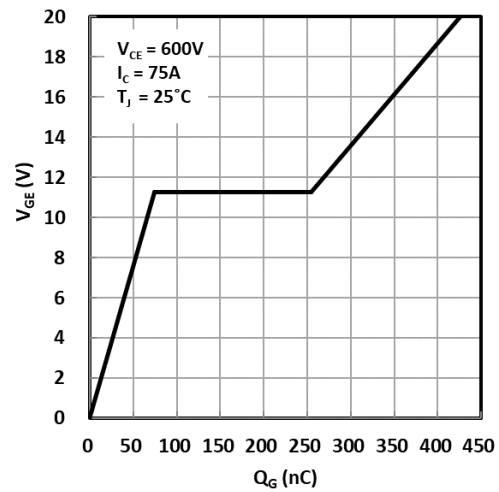
**Fig. 5 Typical saturation voltage characteristics**  
( $V_{GE} = 15\text{ V}$ ,  $t_p = 250\ \mu\text{s}$ )



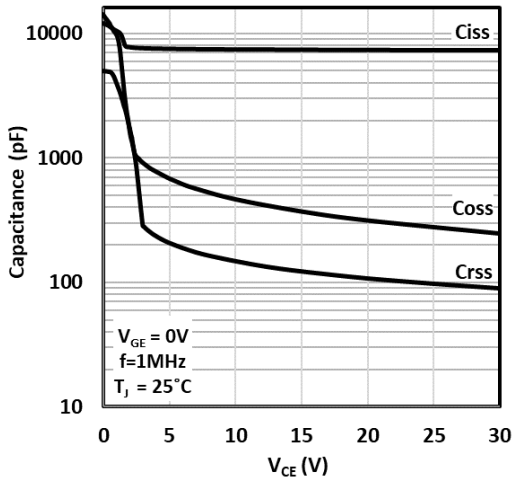
**Fig. 6 Typical saturation voltage as a function of junction temperature**  
( $V_{GE} = 15\text{ V}$ ,  $t_p = 250\ \mu\text{s}$ )



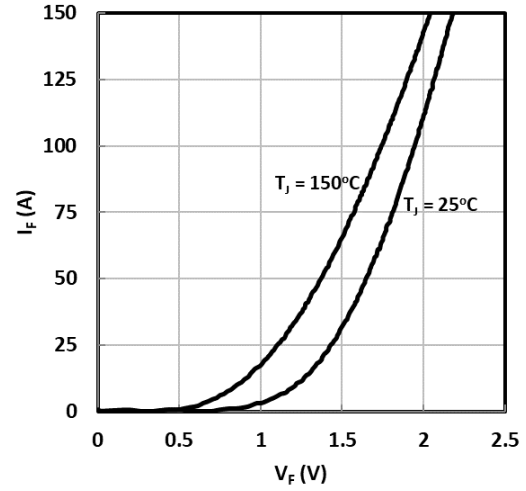
**Fig. 7 Maximum DC collector current as a function of case temperature**



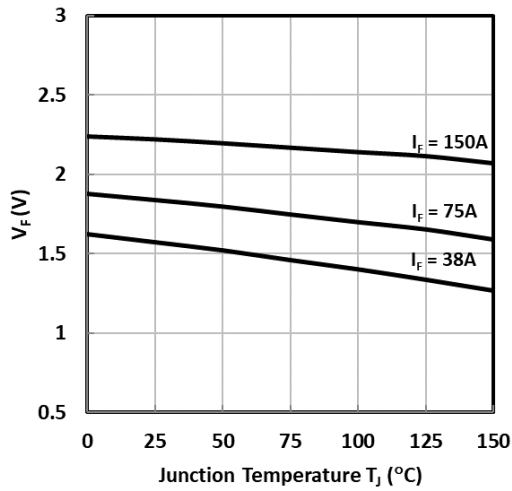
**Fig. 8 Typical gate charge characteristics**



**Fig. 9 Typical capacitance as a function of collector-to-emitter voltage**

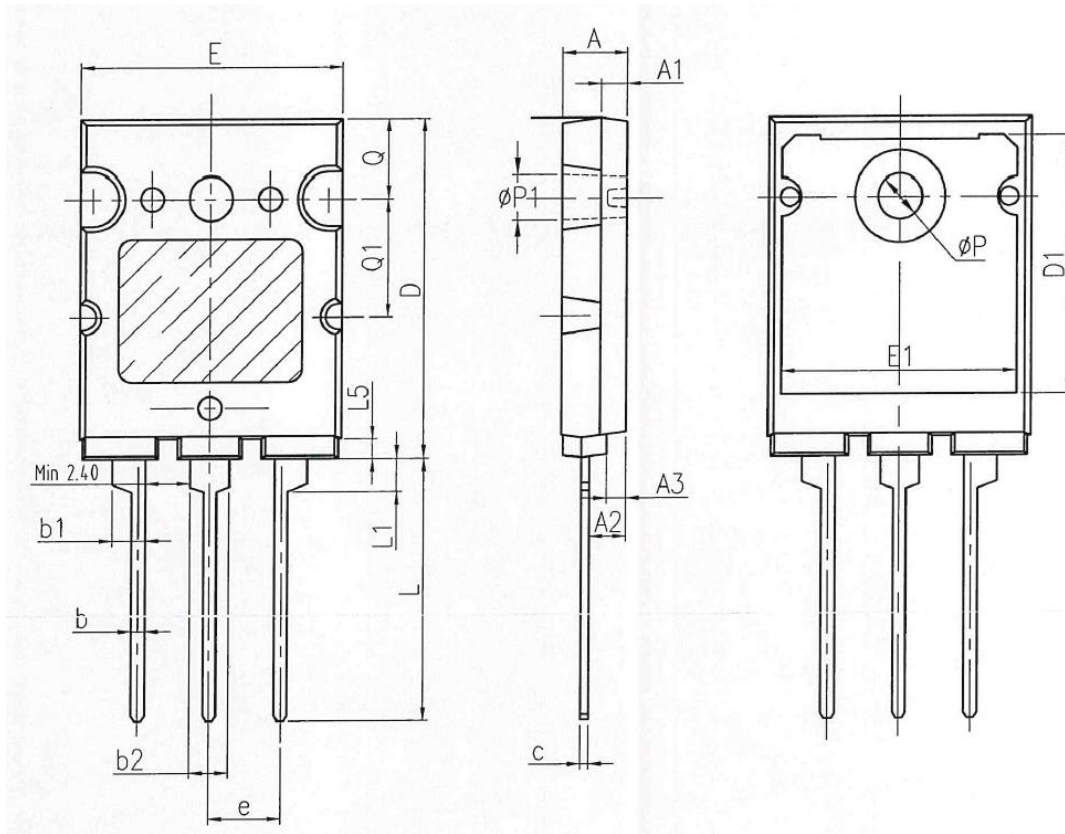


**Fig. 10 Typical diode forward current as a function of forward voltage**  
( $V_{GE} = 0V$ ,  $t_p = 250 \mu s$ )



**Fig. 11 Typical diode forward voltage as a function of junction temperature**

Package Drawing



SYMBOL	mm		
	MIN	NOM	MAX
A	4.80	5.00	5.20
A1	2.00		REF
A2	2.50	2.80	3.10
A3	1.50		REF
b	0.90	1.00	1.25
b1	2.30	2.50	2.75
b2	2.80	3.00	3.20
c	0.50	0.60	0.85
D	25.70	26.00	26.30
D1	19.00	-	-
E	19.50	20.00	20.50
E1	16.00	-	-
e	5.45 TYP		
L	19.50	20.00	20.50
L1	2.20	2.50	2.70
L5	1.35		REF
ΦP	3.00	3.20	3.40
ΦP1	3.20	3.40	3.60
Q	5.80	6.00	6.20
Q1	8.80	9.00	9.20

TO-264



**Revision history of JHK75N120FA Specification**

<b>Version</b>	<b>Change Items</b>	<b>Effective Date</b>
1.00	Initial Release	May-2021
1.01	DC spec. updates	Aug-2021

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