

## Description

FGL60N120 is obtained by advanced Trench Field Stop (T-FS) technology which reduces the conduction loss, improves switching performance, and enhances the avalanche energy. The IGBT is suitable device for UPS, Welding, and high-speed switching.

## KEY CHARACTERISTICS

Parameter	Value	Unit
$V_{CES}$	1200	V
$I_c$	60	A
$V_{CE(sat).typ}$	2.0	V

## FEATURES

- ① Fast Switching
- ② Low  $V_{CE(sat)}$
- ③ Positive temperature coefficient
- ④ Very soft, fast recovery anti-parallel diode
- ⑤ RoHS product

## APPLICATIONS

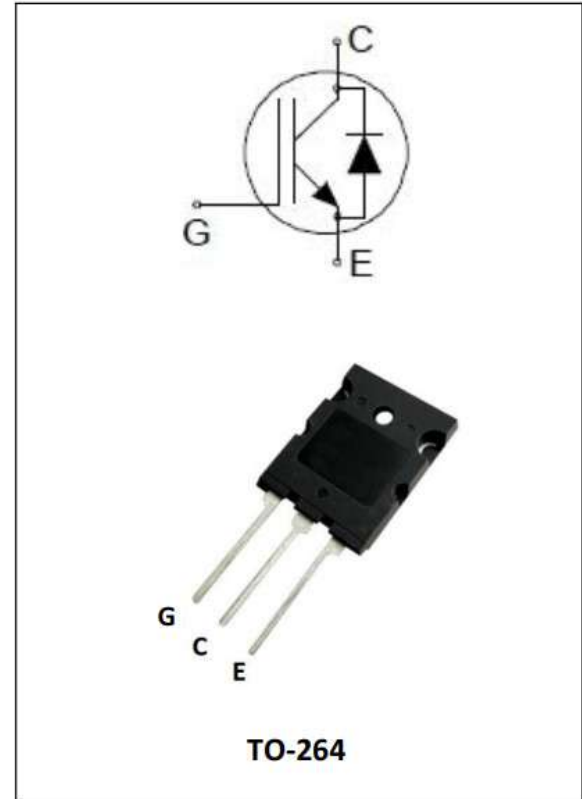
- ① UPS
- ② Welding Converters
- ③ Converters with high switching frequency

## ORDERING INFORMATION

Ordering Codes	Package	Product Code	Packing
FGL60N120AND	TO-264	FGL60N120AND	Tube

## ABSOLUTE RATINGS

Symbol	Parameter	Values	Units
$V_{CES}$	Collector-Emitter Voltage	1200	V
$I_c$	Collector Current @ $T_c=25^{\circ}C$	100	A
	Collector Current @ $T_c=100^{\circ}C$	60	A
$I_{CM}$	Pulsed Collector Current, tp limited by $T_{Jmax}$	160	A
$I_F$	Diode Continuous Forward Current @ $T_c=25^{\circ}C$	100	A
	Diode Continuous Forward Current @ $T_c=100^{\circ}C$	60	A
$I_{FM}$	Diode Maximum Forward Current, limited by $T_{Jmax}$	240	A
$V_{GES}$	Gate-Emitter Voltage	$\pm 20$	V





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$t_{SC}$	Short circuit withstand time $V_{GE}=15V, V_{CC}\leq 600V$ , Allowed number of short circuits $< 1000$ , Times between short circuits: $\geq 1.0s, T_J \leq 150^\circ C$	10.0	$\mu s$
$P_D$	Power Dissipation @ $T_C=25^\circ C$	367	W
$T_{Jmax}, T_{stg}$	Operating Junction and Storage Temperature Range	150, -55 to 150	$^\circ C$
$T_L$	Maximum Temperature for Soldering	260	$^\circ C$

### Thermal characteristics

Symbol	Parameter	Values	Units
$R_{\theta JC}$	Junction-to-Case (IGBT)	0.34	$^\circ C/W$
$R_{\theta JC}$	Junction-to-Case (Diode)	0.6	$^\circ C/W$
$R_{\theta JA}$	Junction-to-Ambient	40	$^\circ C/W$

### Electrical Characteristics (at $T_C = 25^\circ C$ , unless otherwise specified)

#### Static Characteristics

Symbol	Parameter	Test Conditions	Values			Units
			Min.	Typ.	Max.	
$V_{CES}$	Collector-Emitter Breakdown Voltage	$V_{GE} = 0V, I_C = 250\mu A$	1200	--	--	V
$V_{CE(sat)}$	Collector-Emitter Saturation Voltage	$V_{GE} = 15V, I_C = 60A$ $T_J = 25^\circ C$ $T_J = 100^\circ C \quad T_J = 150^\circ C$	-- -- --	2.0 2.25 2.35	2.4	V
$V_{GE(TH)}$	Gate Threshold Voltage	$V_{CE} = V_{GE}, I_C = 1mA$	5.0	5.8	6.5	V
$V_F$	Diode Forward Voltage	$I_F = 20A \quad T_J = 25^\circ C$ $T_J = 100^\circ C \quad T_J = 150^\circ C$	-- -- --	1.60 1.40 1.30	2.20 -- --	V
$V_F$	Diode Forward Voltage	$I_F = 40A \quad T_J = 25^\circ C$ $T_J = 100^\circ C \quad T_J = 150^\circ C$	-- -- --	1.85 1.75 1.65	2.45 -- --	V
$I_{CES}$	Collector-Emitter Leakage Current	$V_{CE} = 1200V,$ $V_{GE} = 0V$	--	--	10	$\mu A$
$I_{GES(F)}$	Gate-Emitter Forward Leakage Current	$V_{GE} = +20V$	--	--	600	nA
$I_{GES(R)}$	Gate-Emitter Reverse Leakage Current	$V_{GE} = -20V$	--	--	-600	nA

Pulse width  $t_p \leq 300\mu s, \delta \leq 2\%$



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### Dynamic Characteristics

Symbol	Parameter	Test Conditions	Values			Units
			Min.	Typ.	Max.	
$C_{iss}$	Input Capacitance	$V_{GE}=0V$ $V_{CE}=25V$ $f=1.0MHz$	--	3640	--	pF
$C_{oss}$	Output Capacitance		--	168	--	
$C_{rss}$	Reverse Transfer Capacitance		--	89	--	
$Q_G$	Gate charge	$V_{CC}=960V$ $I_{CE}=60A$ $V_{GE}=15V$	--	259	--	nC
$Q_{GE}$	Gate-emitter charge		--	19	--	
$Q_{GC}$	Gate-collector charge		--	181	--	
$I_{C(SC)}$	Short circuit collector current Max.1000 short circuits, Times between short circuits: $\geq 1.0s$	$V_{GE}=15.0V$ , $V_{CC}\leq 600V$ $t_{sc}\leq 10\mu s$ , $T_J\leq 150^\circ C$		160		A

### IGBT Switching Characteristics, at $T_J=25^\circ C$

Symbol	Parameter	Test Conditions	Values			Units
			Min.	Typ.	Max.	
$t_{d(on)}$	Turn-on Delay Time	$I_C=60A$ $V_{CC}=600V$ $V_{GE}=15V$ $R_G=5\Omega$ $T_J=25^\circ C$ Inductive Load	--	45	--	ns
$t_r$	Rise Time		--	81	--	
$t_{d(off)}$	Turn-Off Delay Time		--	295	--	
$t_f$	Fall Time		--	40	--	
$E_{on}$	Turn-On Switching Loss			--	3.5	--
$E_{off}$	Turn-Off Switching Loss		--	1.1	--	
$E_{ts}$	Total Switching Loss		--	4.6	--	

### IGBT Switching Characteristics, at $T_J=150^\circ C$

Symbol	Parameter	Test Conditions	Values			Units
			Min.	Typ.	Max.	
$t_{d(on)}$	Turn-on Delay Time	$I_C=60A$ $V_{CC}=600V$ $V_{GE}=15V$ $R_G=5\Omega$ $T_J=150^\circ C$ Inductive Load	--	42	--	ns
$t_r$	Rise Time		--	80	--	
$t_{d(off)}$	Turn-Off Delay Time		--	335	--	
$t_f$	Fall Time		--	86	--	
$E_{on}$	Turn-On Switching Loss			--	3.8	--
$E_{off}$	Turn-Off Switching Loss		--	1.7	--	
$E_{ts}$	Total Switching Loss		--	5.5	--	