



# UTG40N120FQ-S

## Insulated Gate Bipolar Transistor

### 1200V TRENCH GATE FIELD-STOP IGBT

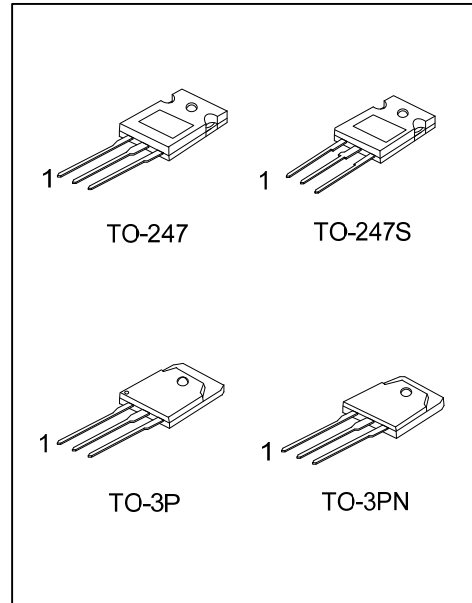
■ DESCRIPTION

The UTC **UTG40N120FQ-S** is an Trench Field-Stop Insulated Gate Bipolar Transistor. it uses UTC's advanced technology to provide customers with high switching speed, low saturation voltage and low switching loss, etc.

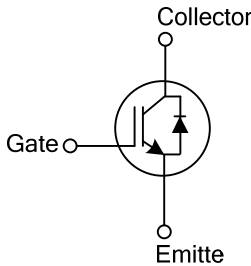
The UTC **UTG40N120FQ-S** is suitable for the resonant or soft switching applications.

■ FEATURES

- \* High switching speed
- \* High avalanche ruggedness
- \* Low saturation voltage:  $V_{CE(SAT), Typ.} = 1.85V @ I_C = 40A, V_{GE} = 15V$  ( $T_C = 25^\circ C$ )



■ SYMBOL



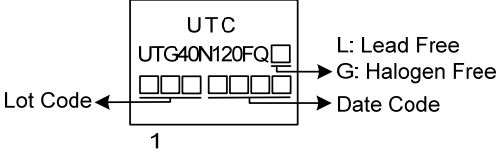
■ ORDERING INFORMATION

Ordering Number		Package	Pin Assignment			Packing
Lead Free	Halogen Free		1	2	3	
UTG40N120FQL-T47-T	UTG40N120FQG-T47-T	TO-247	G	C	E	Tube
UTG40N120FQL-T47S-T	UTG40N120FQG-T47S-T	TO-247S	G	C	E	Tube
UTG40N120FQL-T3P-T	UTG40N120FQG-T3P-T	TO-3P	G	C	E	Tube
UTG40N120FQL-T3N-T	UTG40N120FQG-T3N-T	TO-3PN	G	C	E	Tube

Note: Pin Assignment: G: Gate C: Collector E: Emitter

<p>UTG40N120FQG-T47-T</p>	<p>(1) T: Tube</p> <p>(2) T47: TO-247, T47S: TO-247S, T3P: TO-3P T3N: TO-3PN</p> <p>(3) G: Halogen Free and Lead Free, L: Lead Free</p>
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■ MARKING



# UTG40N120FQ-S

## Insulated Gate Bipolar Transistor

### ■ ABSOLUTE MAXIMUM RATINGS ( $T_A=25^{\circ}\text{C}$ , unless otherwise noted)

PARAMETER	SYMBOL	RATINGS	UNIT	
Collector-Emitter Voltage	$V_{CES}$	1200	V	
Gate-Emitter Voltage	$V_{GES}$	$\pm 20$	V	
Transient Gate-emitter voltage ( $t_p < 5$ ms)		$\pm 25$	V	
Continuous Collector Current	$I_C$	$T_C=25^{\circ}\text{C}$	80	A
		$T_C=100^{\circ}\text{C}$	40	A
Collector Current Pulsed (Note 1)	$I_{CM}$	160	A	
Diode Forward Current	$I_F$	$T_C=25^{\circ}\text{C}$	48	A
		$T_C=100^{\circ}\text{C}$	24	A
Short Circuit Withstand Time $V_{GE} = 15\text{V}$ , $V_{CC} \leq 200\text{V}$ Allowed number of short circuits < 1000 Time between short circuits: $\geq 1.0\text{s}$ $T_{VJ} = 25^{\circ}\text{C}$	$t_{SC}$	10	$\mu\text{s}$	
Power Dissipation ( $T_C=25^{\circ}\text{C}$ )	$P_D$	TO-3P/TO-3PN	310	W
		TO-247/TO-247S	285	W
Operating Junction Temperature	$T_J$	-40 ~ +175	$^{\circ}\text{C}$	
Storage Temperature Range	$T_{STG}$	-55 ~ +175	$^{\circ}\text{C}$	

Notes: 1. Absolute maximum ratings are stress ratings only and functional device operation is not implied.

Absolute maximum ratings are those values beyond which the device could be permanently damaged.

2. Pulse width limited by maximum junction temperature.

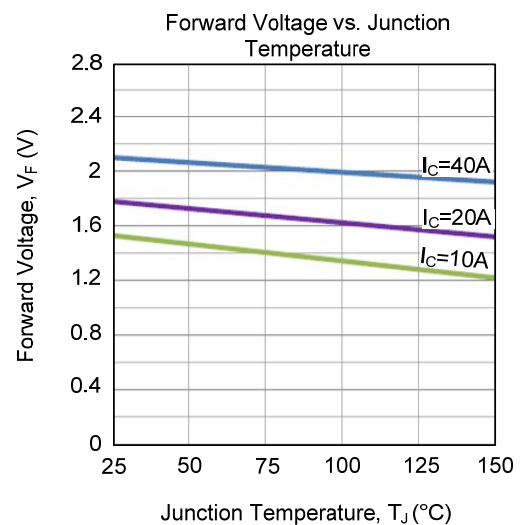
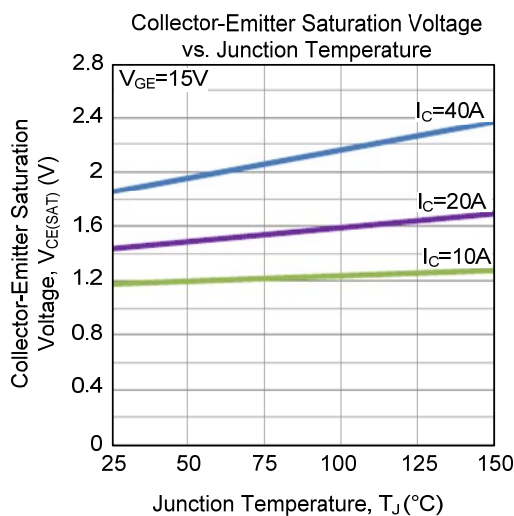
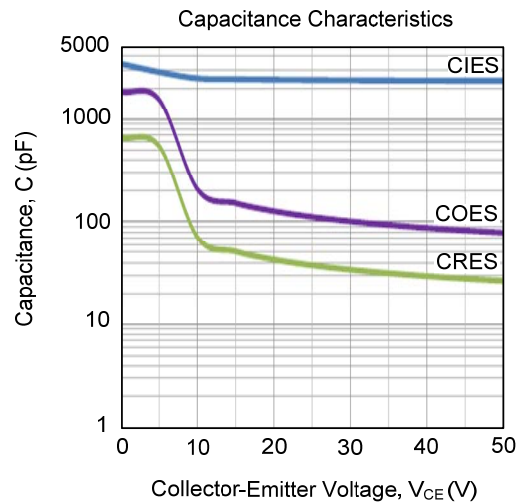
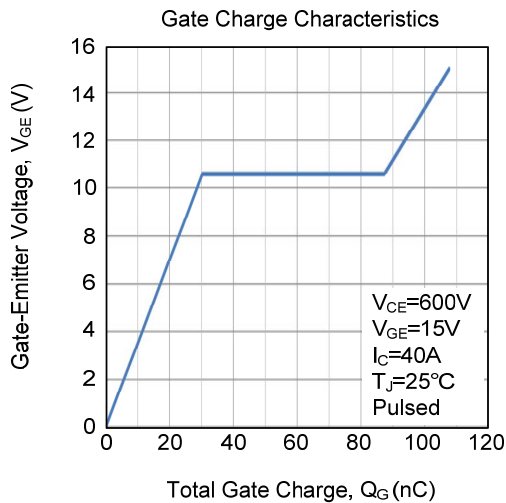
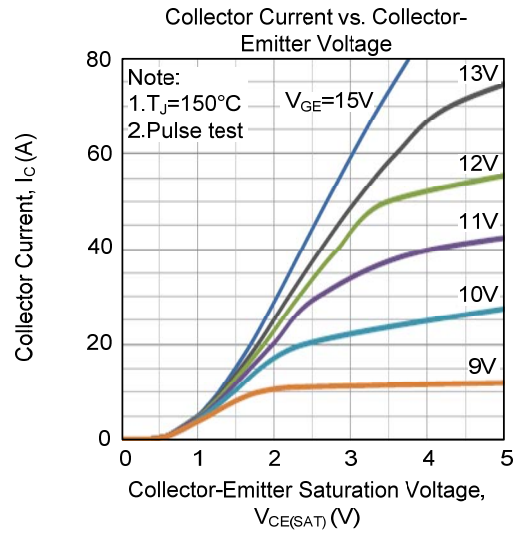
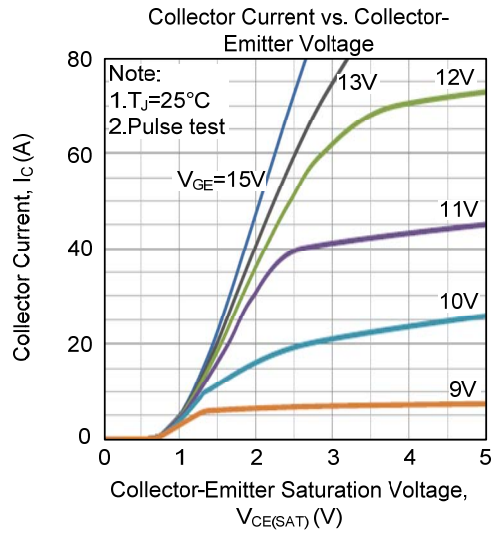
### ■ THERMAL DATA

PARAMETER	SYMBOL	RATING	UNIT	
Junction to Case	$\theta_{JC}$	TO-3P/TO-3PN	0.4	$^{\circ}\text{C/W}$
		TO-247/TO-247S	0.44	$^{\circ}\text{C/W}$

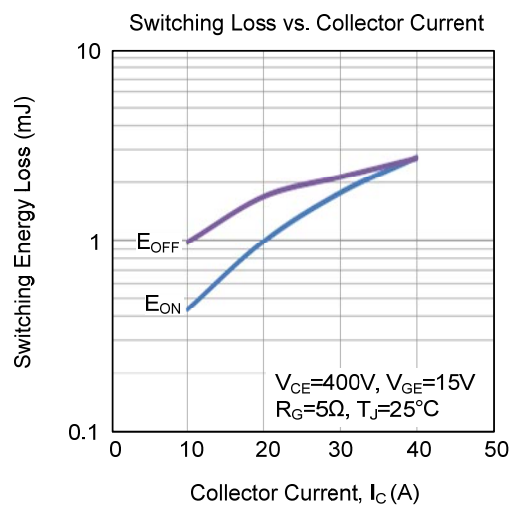
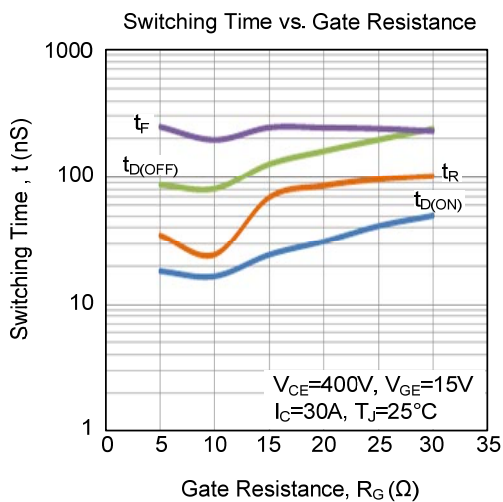
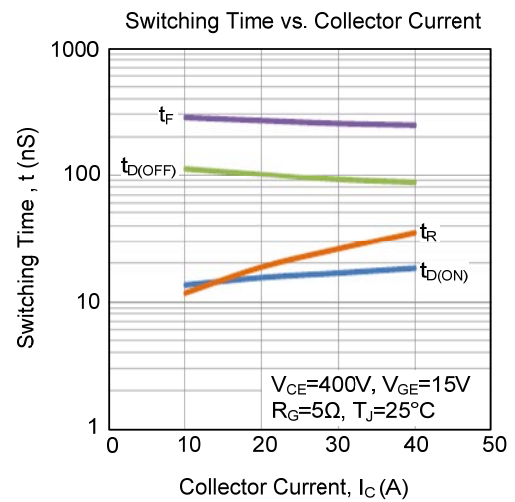
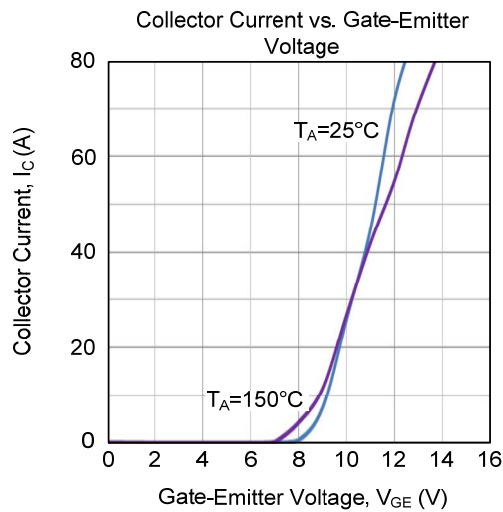
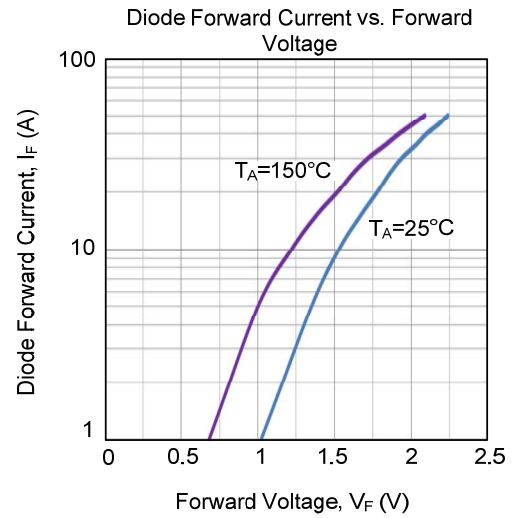
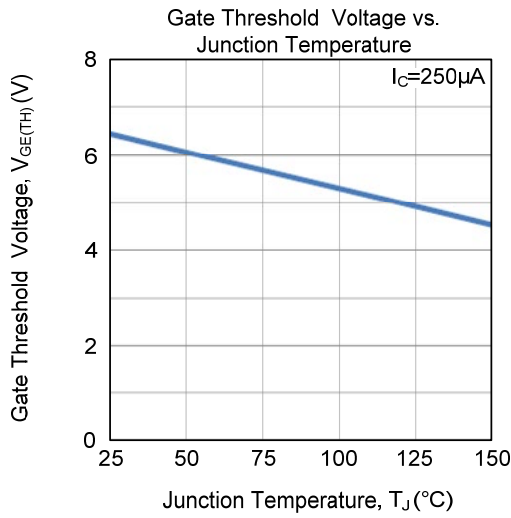
■ ELECTRICAL CHARACTERISTICS (T<sub>C</sub>=25°C, unless otherwise noted)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT	
<b>Off Characteristics</b>							
Collector-Emitter Breakdown Voltage	BV <sub>CES</sub>		1200			V	
Collector Cut-Off Current	I <sub>CES</sub>	V <sub>CE</sub> =1200V, V <sub>GE</sub> =0V			5	μA	
G-E Leakage Current	I <sub>GES</sub>	V <sub>CE</sub> =0V, V <sub>GE</sub> =±20V			±400	nA	
<b>On Characteristics</b>							
Gate to Emitter Threshold Voltage	V <sub>GE(TH)</sub>	I <sub>C</sub> =250μA, V <sub>CE</sub> =V <sub>GE</sub>	4.5		7.5	V	
Collector to Emitter Saturation Voltage	V <sub>CE(SAT)</sub>	I <sub>C</sub> =40A, V <sub>GE</sub> =15V	T <sub>C</sub> =25°C	1.85	2.2	V	
			T <sub>C</sub> =125°C	2.3		V	
<b>Dynamic Characteristics</b>							
Input Capacitance	C <sub>IES</sub>	V <sub>CE</sub> =25V, V <sub>GE</sub> =0V, f=1MHz		2370		pF	
Output Capacitance	C <sub>OES</sub>			106.2		pF	
Reverse Transfer Capacitance	C <sub>RES</sub>			34.4		pF	
<b>Switching Characteristics</b>							
Total Gate Charge	Q <sub>G</sub>	V <sub>CE</sub> =600V, I <sub>C</sub> =40A, V <sub>GE</sub> =15V		107.7		nC	
Gate-Emitter Charge	Q <sub>GE</sub>			30.6		nC	
Gate-Collector Charge	Q <sub>GC</sub>			57.2		nC	
Turn-On Delay Time	t <sub>DON)</sub>	V <sub>CC</sub> =600V, I <sub>C</sub> =40A, R <sub>G</sub> =5Ω, V <sub>GE</sub> =0~15V, L=500uH		18.1		ns	
Rise Time	t <sub>R</sub>			34.6		ns	
Turn-Off Delay Time	t <sub>DOFF)</sub>			100.1		ns	
Fall Time	t <sub>F</sub>			246.1		ns	
Turn-On Switching Loss	E <sub>ON</sub>			2.67		mJ	
Turn-Off Switching Loss	E <sub>OFF</sub>			2.99		mJ	
<b>SOURCE- DRAIN DIODE RATINGS AND CHARACTERISTICS</b>							
Forward Voltage Drop	V <sub>F</sub>		I <sub>F</sub> =40A			2.5	V
Reverse Recovery Time	t <sub>rr</sub>	I <sub>F</sub> =40A, dI/dt=100A/μS, V <sub>CC</sub> =600V		48.7		ns	
Reverse Recovery Charge	Q <sub>rr</sub>			1.59		uC	

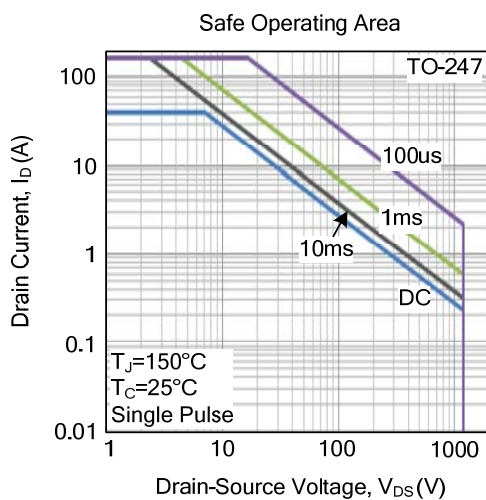
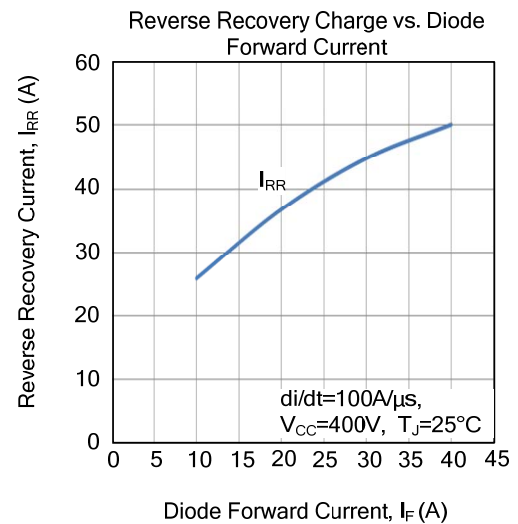
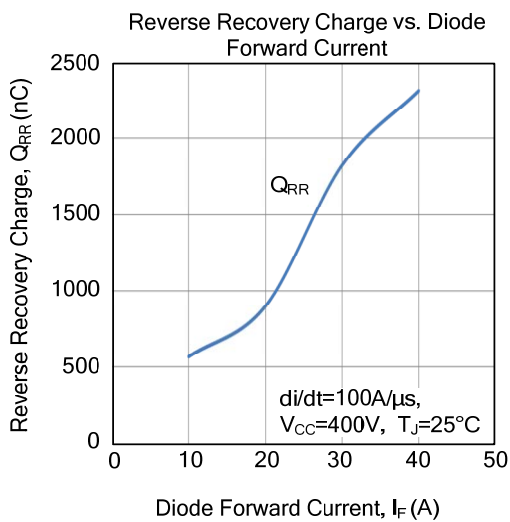
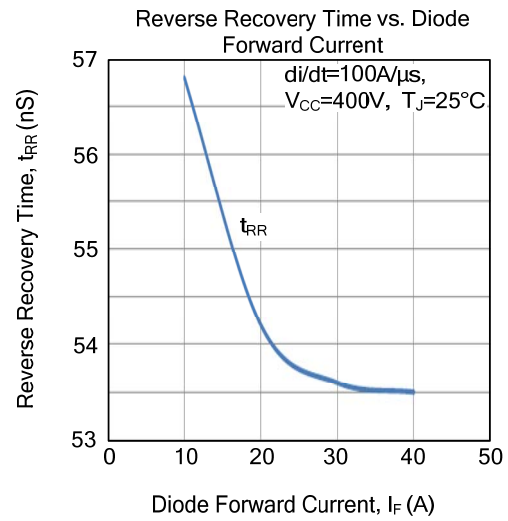
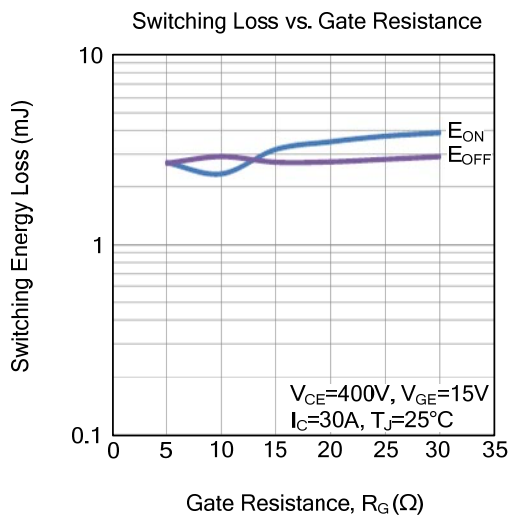
### TYPICAL CHARACTERISTICS



### TYPICAL CHARACTERISTICS (Cont.)



### ■ TYPICAL CHARACTERISTICS (Cont.)



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