



## UPG20N60E

Insulated Gate Bipolar Transistor

### 600V, SMPS N-CHANNEL IGBT

#### DESCRIPTION

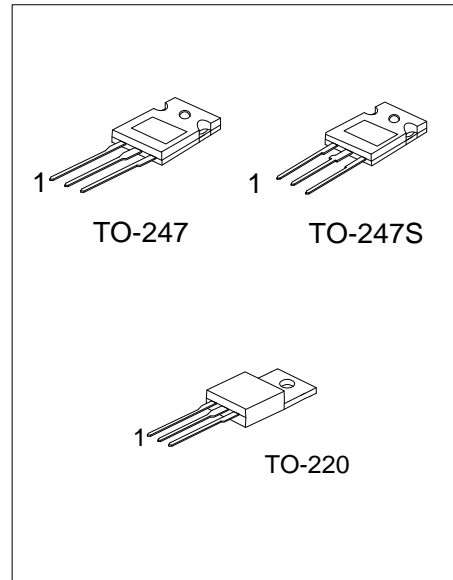
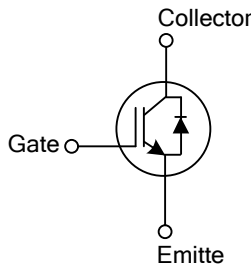
The UTC **UPG20N60E** is a N-channel IGBT. it uses UTC's advanced technology to provide customers with high input impedance, high switching speed and low conduction loss, etc.

The UTC **UPG20N60E** is suitable for high voltage switching, high frequency switch mode power supplies.

#### FEATURES

- \*  $V_{CE(SAT)} \leq 2.5V @ I_C=20A, V_{GE}=15V$
- \* High switching speed
- \* High input impedance
- \* Low conduction loss

#### SYMBOL



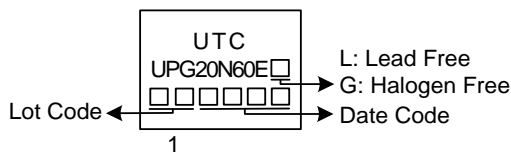
#### ORDERING INFORMATION

Ordering Number		Package	Pin Assignment			Packing
Lead Free	Halogen Free		1	2	3	
UPG20N60EL-TA3-T	UPG20N60EG-TA3-T	TO-220	G	C	E	Tube
UPG20N60EL-T47-T	UPG20N60EG-T47-T	TO-247	G	C	E	Tube
UPG20N60EL-T47S-T	UPG20N60EG-T47S-T	TO-247S	G	C	E	Tube

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

<p>UPG20N60EG-TA3-T</p>	<p>(1) T: Tube</p> <p>(2) TA3: TO-220, T47: TO-247, T47S: TO-247S</p> <p>(3) G: Halogen Free and Lead Free, L: Lead Free</p>
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#### MARKING



### ■ ABSOLUTE MAXIMUM RATINGS (T<sub>C</sub>=25°C, unless otherwise specified)

PARAMETER	SYMBOL	RATINGS	UNIT
Collector-Emitter Voltage	V <sub>CES</sub>	600	V
Gate to Emitter Voltage Continuous	V <sub>GES</sub>	±20	V
Continuous Collector Current	I <sub>C</sub>	T <sub>C</sub> =25°C	40
		T <sub>C</sub> =100°C	20
Collector Current Pulsed (Note 2)	I <sub>CM</sub>	100	A
Continuous Forward Current	I <sub>F</sub>	T <sub>C</sub> =25°C	20
		T <sub>C</sub> =100°C	10
Forward Current Pulsed	I <sub>FM</sub>	125	A
Peak Diode Recovery dv/dt (Note 3)	dv/dt	7	V/ns
Power Dissipation	P <sub>D</sub>	TO-220	95
		TO-247	200
		TO-247S	
Junction Temperature	T <sub>J</sub>	-55 ~ +150	°C
Storage Temperature Range	T <sub>STG</sub>	-55 ~ +150	°C

Notes: 1. Absolute maximum ratings are those values beyond which the device could be permanently damaged.

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

2. Repetitive Rating: Pulse width limited by maximum junction temperature.

3. I<sub>F</sub> ≤ 20A, di/dt ≤ 200A/μs, V<sub>CC</sub> ≤ BV<sub>CES</sub>, Starting T<sub>J</sub>=25°C

### ■ THERMAL DATA

PARAMETER	SYMBOL	RATINGS	UNIT
Junction to Case	θ <sub>JC</sub>	TO-220	1.32
		TO-247	0.625
		TO-247S	

# UPG20N60E

## Insulated Gate Bipolar Transistor

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

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
<b>OFF CHARACTERISTICS</b>						
Collector-Emitter Breakdown Voltage	BV <sub>CES</sub>	I <sub>C</sub> =250μA, V <sub>GE</sub> =0V	600			V
Collector-Emitter Leakage Current	I <sub>CES</sub>	V <sub>CE</sub> =600V, V <sub>GE</sub> =0V			10	μA
Gate to Emitter Leakage Current	I <sub>GES</sub>	V <sub>CE</sub> =0V, V <sub>GE</sub> =±20V			±400	nA
<b>ON CHARACTERISTICS</b>						
Collector-Emitter Saturation Voltage	V <sub>CE(SAT)</sub>	I <sub>C</sub> =20A, V <sub>GE</sub> =15V	T <sub>J</sub> =25°C	2.0	2.5	V
			T <sub>J</sub> =150°C	2.4		V
Gate to Emitter Threshold Voltage	V <sub>GE(TH)</sub>	I <sub>C</sub> =250μA, V <sub>CE</sub> =V <sub>GE</sub>	4.0		6.5	V
<b>DYNAMIC CHARACTERISTICS</b>						
Input Capacitance	C <sub>IES</sub>	V <sub>CE</sub> =30V, V <sub>GE</sub> =0V, f=1MHz		780		pF
Output Capacitance	C <sub>OES</sub>			101		pF
Reverse Transfer Capacitance	C <sub>RES</sub>			15.4		pF
<b>SWITCHING CHARACTERISTICS</b>						
Total Gate Charge	Q <sub>G</sub>	I <sub>C</sub> =20A, V <sub>CE</sub> =100V, V <sub>GE</sub> =10V		27		nC
Gate-Emitter Charge	Q <sub>GE</sub>			7		nC
Gate-Collector Charge	Q <sub>GC</sub>			11		nC
Current Turn-On Delay Time	t <sub>D(ON)</sub>	I <sub>C</sub> =20A, V <sub>CE</sub> =50V, V <sub>GE</sub> =15V, R <sub>G</sub> =10Ω		50.5		ns
Current Rise Time	t <sub>R</sub>			84		ns
Current Turn-Off Delay Time	t <sub>D(OFF)</sub>			73		ns
Current Fall Time	t <sub>F</sub>			119		ns
<b>DRAIN-SOURCE DIODE CHARACTERISTICS</b>						
Forward Voltage Drop	V <sub>FM</sub>	I <sub>F</sub> =10A			2.2	V
Reverse Recovery Time	t <sub>rr</sub>	I <sub>F</sub> =10A, dI/dt=100A/μS, V <sub>CC</sub> =400V		82		ns
Reverse Recovery Charge	Q <sub>rr</sub>			180		nC

Note: Pulse Test: Pulse width ≤ 50μs.

### ■ TEST CIRCUIT AND WAVEFORMS

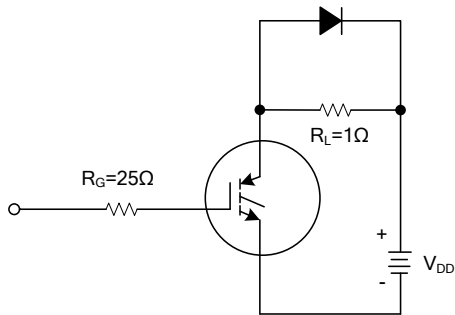


Fig 1. INDUCTIVE SWITCHING TEST CIRCUIT

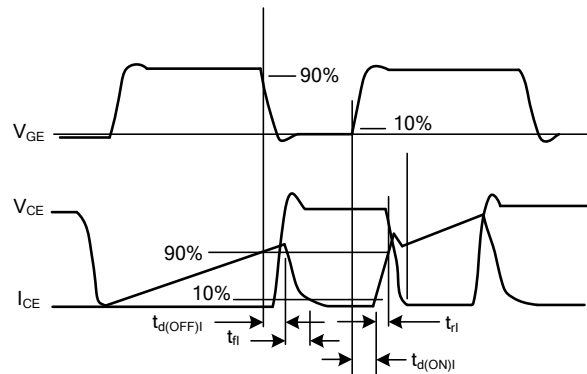
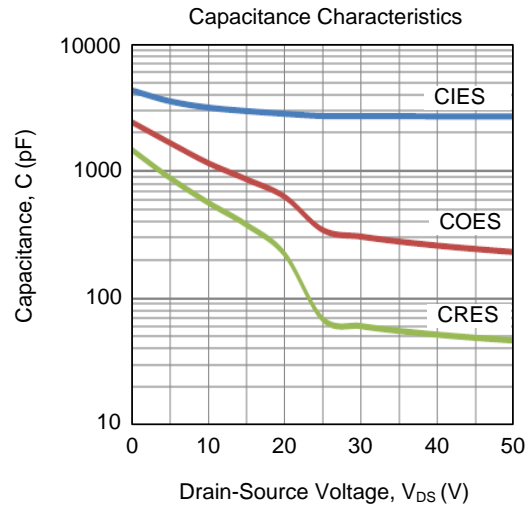
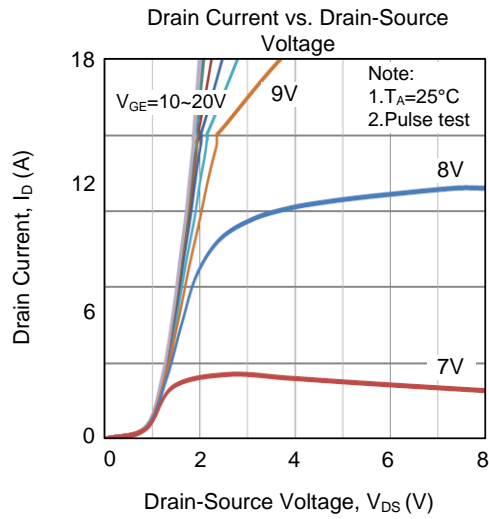


Fig 2. SWITCHING TEST WAVEFORMS

### ■ TYPICAL CHARACTERISTICS



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