



UPG20N60

Insulated Gate Bipolar Transistor

600V, SMPS N-CHANNEL IGBT

■ DESCRIPTION

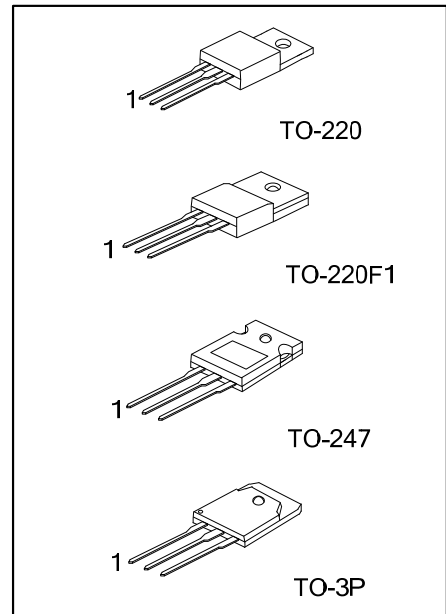
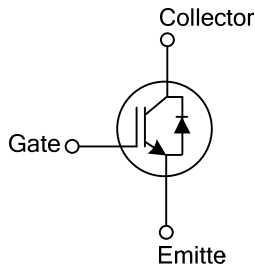
The UTC **UPG20N60** is a N-channel IGBT. it uses UTC's advanced technology to provide customers with high input impedance, high switching speed and low conduction loss, etc.

The UTC **UPG20N60** is suitable for high voltage switching, high frequency switch mode power supplies.

■ FEATURES

- * $V_{CE(SAT)} \leq 2.8V @ I_C=20A, V_{GE}=15V$
- * 600V Switching SOA Capability
- * High switching speed
- * High input impedance
- * Low conduction loss

■ SYMBOL



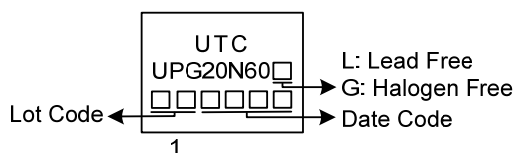
■ ORDERING INFORMATION

| Ordering Number | | Package | Pin Assignment | | | Packing |
|-----------------|-----------------|----------|----------------|---|---|---------|
| Lead Free | Halogen Free | | 1 | 2 | 3 | |
| UPG20N60L-TA3-T | UPG20N60G-TA3-T | TO-220 | G | C | E | Tube |
| UPG20N60L-TF1-T | UPG20N60G-TF1-T | TO-220F1 | G | C | E | Tube |
| UPG20N60L-T3P-T | UPG20N60G-T3P-T | TO-3P | G | C | E | Tube |
| UPG20N60L-T47-T | UPG20N60G-T47-T | TO-247 | G | C | E | Tube |

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

| | |
|--|--|
| <p>UPG20N60G-TA3-T</p> <p>(1)Packing Type (2)Package Type (3)Green Package</p> | <p>(1) T: Tube (2) TA3: TO-220, TF1: TO-220F1, T47: TO-247 (3) G: Halogen Free and Lead Free, L: Lead Free</p> |
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■ MARKING



■ ABSOLUTE MAXIMUM RATINGS ($T_C=25^{\circ}\text{C}$, unless otherwise specified)

| PARAMETER | SYMBOL | RATINGS | UNIT |
|--------------------------------------|---------------------------|-----------------|--------------------|
| Collector-Emitter Voltage | V_{CES} | 600 | V |
| Gate to Emitter Voltage Continuous | V_{GES} | ± 20 | V |
| Continuous Collector Current | $T_C=25^{\circ}\text{C}$ | 40 | A |
| | $T_C=100^{\circ}\text{C}$ | 20 | A |
| Collector Current Pulsed (Note 2) | I_{CM} | 80 | A |
| Peak Diode Recovery dv/dt (Note 3) | dv/dt | 6.4 | V/ns |
| Power Dissipation | TO-220 | 125 | W |
| | TO-220F1 | 41.6 | W |
| | TO-3P | 375 | W |
| | TO-247 | 300 | W |
| Junction Temperature | T_J | $-55 \sim +150$ | $^{\circ}\text{C}$ |
| Storage Temperature Range | T_{STG} | $-55 \sim +150$ | $^{\circ}\text{C}$ |

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. $L=10\text{mH}$, $PK_{IL}=3.5\text{A}$, $V_{CC}=50\text{V}$, $R_G=25\Omega$, Starting $T_J=25^{\circ}\text{C}$

4. $I_F \leq 8\text{A}$, $di/dt \leq 200\text{A}/\mu\text{s}$, $V_{CC} \leq BV_{CES}$, Starting $T_J=25^{\circ}\text{C}$

■ THERMAL CHARACTERISTICS

| PARAMETER | SYMBOL | RATINGS | UNIT |
|------------------|----------|---------|-----------------------------|
| Junction to Case | TO-220 | 1 | $^{\circ}\text{C}/\text{W}$ |
| | TO-220F1 | 3 | $^{\circ}\text{C}/\text{W}$ |
| | TO-3P | 0.33 | $^{\circ}\text{C}/\text{W}$ |
| | TO-247 | 0.38 | $^{\circ}\text{C}/\text{W}$ |

■ ELECTRICAL CHARACTERISTICS ($T_J=25^{\circ}\text{C}$, unless otherwise specified)

| PARAMETER | SYMBOL | TEST CONDITIONS | MIN | TYP | MAX | UNIT |
|--------------------------------------|---------------|--|---------------------------|-------|-----------|---------------|
| Collector-Emitter Breakdown Voltage | BV_{CES} | $I_C=250\mu\text{A}$, $V_{GE}=0\text{V}$ | 600 | | | V |
| Collector-Emitter Leakage Current | I_{CES} | $V_{CE}=600\text{V}$, $V_{GE}=0\text{V}$ | | | 10 | μA |
| Collector-Emitter Saturation Voltage | $V_{CE(SAT)}$ | $I_C=20\text{A}$, $V_{GE}=15\text{V}$ | $T_J=25^{\circ}\text{C}$ | 2.3 | 2.8 | V |
| | | | $T_J=150^{\circ}\text{C}$ | 2.64 | | V |
| Gate to Emitter Threshold Voltage | $V_{GE(TH)}$ | $I_C=250\mu\text{A}$, $V_{CE}=V_{GE}$ | 4.5 | | 6.5 | V |
| Gate to Emitter Leakage Current | I_{GES} | $V_{CE}=0\text{V}$, $V_{GE}=\pm 20\text{V}$ | | | ± 100 | nA |
| Input Capacitance | C_{IES} | $V_{CE}=25\text{V}$, $V_{GE}=0\text{V}$, $f=1\text{MHz}$ | | 1778 | | pF |
| Output Capacitance | C_{OES} | | | 246 | | pF |
| Reverse Transfer Capacitance | C_{RES} | | | 44 | | pF |
| Total Gate Charge | Q_G | | | | 79 | |
| Gate-Emitter Charge | Q_{GE} | $I_C=20\text{A}$, $V_{CE}=50\text{V}$, $V_{GE}=15\text{V}$ | | 12.7 | | nC |
| Gate-Collector Charge | Q_{GC} | | | 27.4 | | nC |
| Current Turn-On Delay Time | $t_{D(ON)}$ | | | 40 | | ns |
| Current Rise Time | t_R | $I_C=20\text{A}$, $V_{CE}=50\text{V}$, $V_{GE}=15\text{V}$, $R_G=10\Omega$ | | 27.75 | | ns |
| Current Turn-Off Delay Time | $t_{D(OFF)}$ | | | 160 | | ns |
| Current Fall Time | t_F | | | 42 | | ns |

SOURCE- DRAIN DIODE RATINGS AND CHARACTERISTICS

| | | | | | | |
|-------------------------|----------|--|--|------|--|---------------|
| Forward Voltage Drop | V_{FM} | $I_F=20\text{A}$ | | 1.5 | | V |
| Reverse Recovery Time | t_{rr} | $I_F=20\text{A}$, $di/dt=100\text{A}/\mu\text{s}$, $V_R=400\text{V}$ | | 170 | | ns |
| Reverse Recovery Charge | Q_{rr} | | | 0.82 | | μC |

Note: Pulse Test: Pulse width $\leq 50\mu\text{s}$.

■ TEST CIRCUIT AND WAVEFORMS

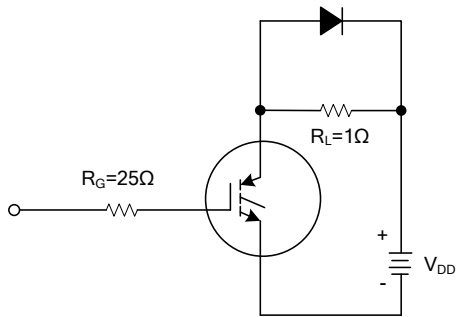


Fig 1. INDUCTIVE SWITCHING TEST CIRCUIT

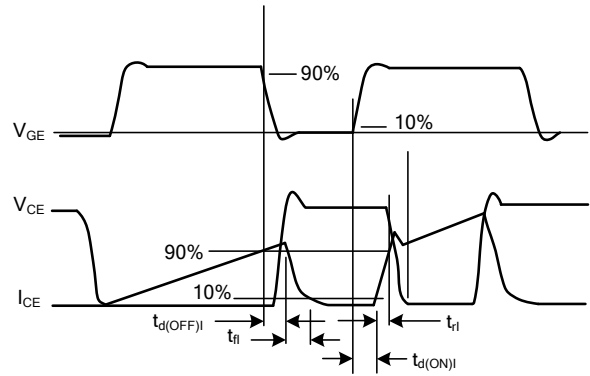
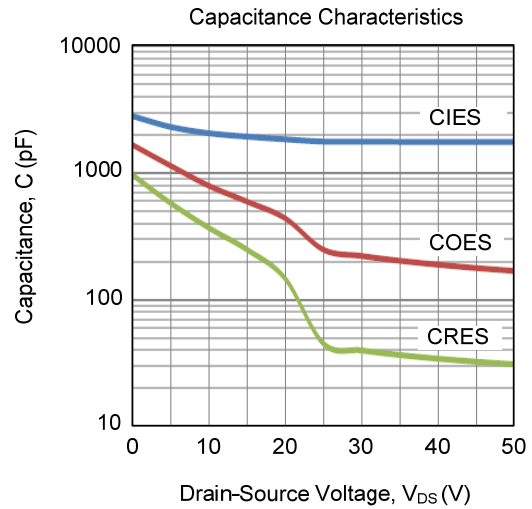
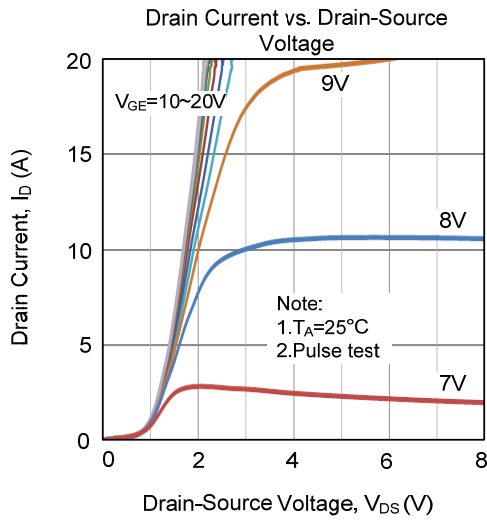


Fig 2. SWITCHING TEST WAVEFORMS

■ TYPICAL CHARACTERISTICS



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