



UPG16N60E

Insulated Gate Bipolar Transistor

600V, SMPS N-CHANNEL IGBT

DESCRIPTION

The UTC **UPG16N60E** 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 **UPG16N60E** is suitable for high voltage switching, high frequency switch mode power supplies.

FEATURES

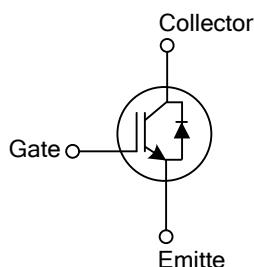
* $V_{CE(SAT)} \leq 2.0V$ @ $I_C=16A$, $V_{GE}=15V$

* High switching speed

* High input impedance

* Low conduction loss

SYMBOL



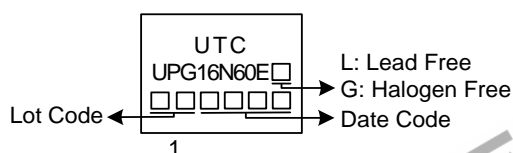
ORDERING INFORMATION

| Ordering Number | | Package | Pin Assignment | | | Packing |
|-------------------|-------------------|----------|----------------|---|---|---------|
| Lead Free | Halogen Free | | 1 | 2 | 3 | |
| UPG16N60EL-TA3-T | UPG16N60EG-TA3-T | TO-220 | G | C | E | Tube |
| UPG16N60EL-TF1-T | UPG16N60EG-TF1-T | TO-220F1 | G | C | E | Tube |
| UPG16N60EL-T3P-T | UPG16N60EG-T3P-T | TO-3P | G | C | E | Tube |
| UPG16N60EL-T47-T | UPG16N60EG-T47-T | TO-247 | G | C | E | Tube |
| UPG16N60EL-T47S-T | UPG16N60EG-T47S-T | TO-247S | G | C | E | Tube |

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

| | | |
|------------------|--|--|
| UPG16N60EG-TA3-T | (1)Packing Type (2)Package Type (3)Green Package | (1) T: Tube (2) TA3: TO-220, TF3: TO-220F1, T3P: TO-3P T47: TO-247, T47S: TO-247S (3) G: Halogen Free and Lead Free, L: Lead Free |
|------------------|--|--|

MARKING



■ ABSOLUTE MAXIMUM RATINGS (T_C=25°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°C | I _C | 32 | A |
| | T _C =100°C | | 16 | A |
| Collector Current Pulsed (Note 2) | | I _{CM} | 80 | A |
| Continuous Forward Current | T _C =25°C | I _F | 16 | A |
| | T _C =100°C | | 8 | A |
| Forward Current Pulsed | | I _{FM} | 124 | A |
| Peak Diode Recovery dv/dt (Note 3) | | dv/dt | 6.9 | V/ns |
| Power Dissipation | TO-220 | P _D | 90 | W |
| | TO-220F1 | | 32 | W |
| | TO-3P | | 180 | W |
| | TO-247 | | 170 | W |
| | TO-247S | | | |
| Junction Temperature | | T _J | -55 ~ +150 | °C |
| Storage Temperature Range | | T _{STG} | -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_F ≤ 16A, di/dt ≤ 200A/μs, V_{CC} ≤ BV_{CES}, Starting T_J=25°C

■ THERMAL DATA

| PARAMETER | | SYMBOL | RATINGS | UNIT |
|------------------|----------|-----------------|---------|------|
| Junction to Case | TO-220 | θ _{JC} | 1.38 | °C/W |
| | TO-220F1 | | 3.9 | °C/W |
| | TO-3P | | 0.69 | °C/W |
| | TO-247 | | 0.73 | °C/W |
| | TO-247S | | | |

■ ELECTRICAL CHARACTERISTICS (T_J=25°C, unless otherwise specified)

| PARAMETER | SYMBOL | TEST CONDITIONS | | MIN | TYP | MAX | UNIT |
|---|---------------|---|--------------------|-----|-------|-----------|---------|
| Collector-Emitter Breakdown Voltage | BV_{CES} | $I_C=250\mu A, V_{GE}=0V$ | | 600 | | | V |
| Collector-Emitter Leakage Current | I_{CES} | $V_{CE}=600V, V_{GE}=0V$ | | | | 10 | μA |
| Collector-Emitter Saturation Voltage | $V_{CE(SAT)}$ | $I_C=16A, V_{GE}=15V$ | $T_J=25^{\circ}C$ | | 1.6 | 2.0 | V |
| | | | $T_J=150^{\circ}C$ | | 1.8 | | V |
| Gate to Emitter Threshold Voltage | $V_{GE(TH)}$ | $I_C=250\mu A, V_{CE}=V_{GE}$ | | 4.0 | | 6.5 | V |
| Gate to Emitter Leakage Current | I_{GES} | $V_{CE}=0V, V_{GE}=\pm 20V$ | | | | ± 100 | nA |
| Input Capacitance | C_{IES} | $V_{CE}=30V, V_{GE}=0V, f=1MHz$ | | | 638 | | pF |
| Output Capacitance | C_{OES} | | | | 90 | | pF |
| Reverse Transfer Capacitance | C_{RES} | | | | 13 | | pF |
| Total Gate Charge | Q_G | $I_C=16A, V_{CE}=100V, V_{GE}=10V$ | | | 22 | | nC |
| Gate-Emitter Charge | Q_{GE} | | | | 5.8 | | nC |
| Gate-Collector Charge | Q_{GC} | | | | 8.8 | | nC |
| Current Turn-On Delay Time | $t_{D(ON)}$ | | | | 54.7 | | ns |
| Current Rise Time | t_R | $I_C=16A, V_{CE}=50V, V_{GE}=15V, R_G=10\Omega$ | | | 75.9 | | ns |
| Current Turn-Off Delay Time | $t_{D(OFF)}$ | | | | 65.3 | | ns |
| Current Fall Time | t_F | | | | 116.7 | | ns |
| SOURCE- DRAIN DIODE RATINGS AND CHARACTERISTICS | | | | | | | |
| Forward Voltage Drop | V_{FM} | $I_F=10A$ | | | | 2.2 | V |
| Reverse Recovery Time | t_{rr} | $I_F=10A, dI/dt=100A/\mu S, V_R=400V$ | | | 78 | | ns |
| Reverse Recovery Charge | Q_{rr} | | | | 0.82 | | μC |

Note: Pulse Test: Pulse width ≤ 50μs.

■ TEST CIRCUIT AND WAVEFORMS

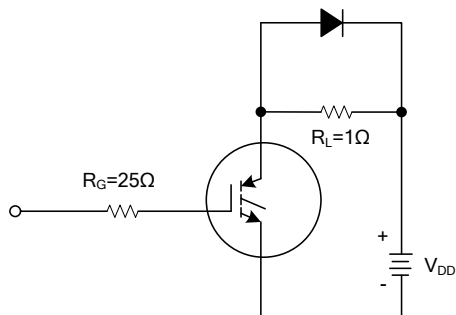


Fig 1. INDUCTIVE SWITCHING TEST CIRCUIT

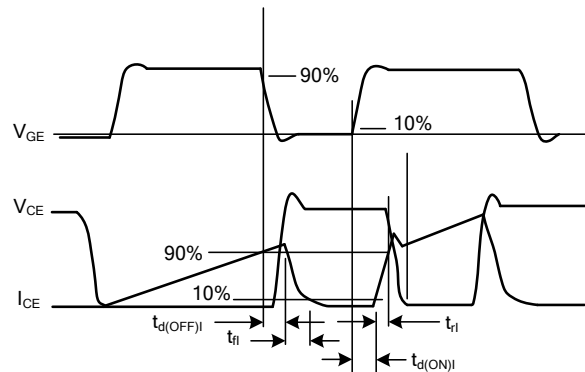
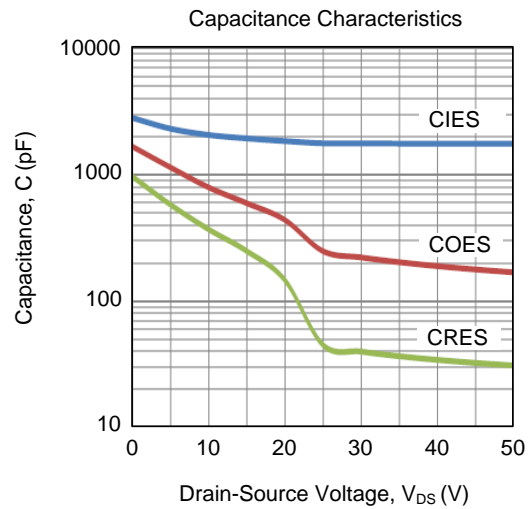
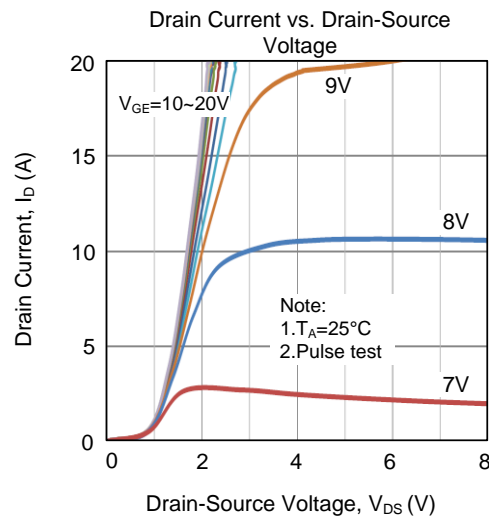


Fig 2. SWITCHING TEST WAVEFORMS

■ TYPICAL CHARACTERISTICS



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