



# UGV3040

## Insulated Gate Bipolar Transistor

### 300mJ, 400V N-CHANNEL IGNITION IGBT

■ DESCRIPTION

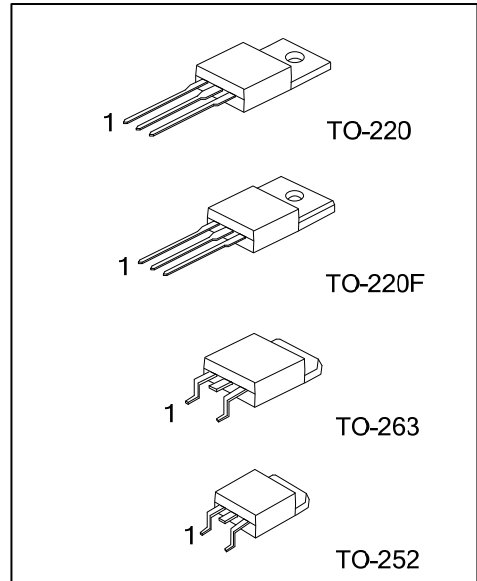
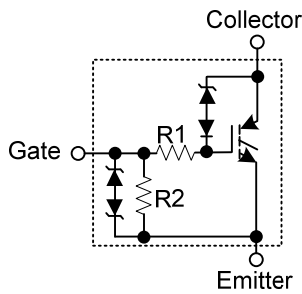
The UTC **UGV3040** is an N-channel ignition Insulated Gate Bipolar Transistor. It uses UTC's advanced technology to provide customers with outstanding SCIS capability.

The UTC **UGV3040** is suitable for Coil -On plug applications and Automotive Ignition Coil driver circuits, etc.

■ FEATURES

- \* Outstanding SCIS capability
- \* Logic level gate drive

■ SYMBOL



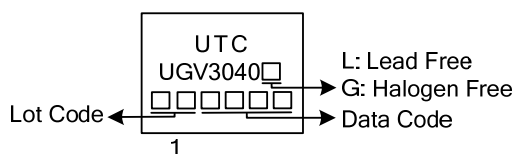
■ ORDERING INFORMATION

| Ordering Number |                | Package | Pin Assignment |   |   | Packing   |
|-----------------|----------------|---------|----------------|---|---|-----------|
| Lead Free       | Halogen Free   |         | 1              | 2 | 3 |           |
| UGV3040L-TA3-T  | UGV3040G-TA3-T | TO-220  | G              | C | E | Tube      |
| UGV3040L-TF3-T  | UGV3040G-TF3-T | TO-220F | G              | C | E | Tube      |
| UGV3040L-TN3-R  | UGV3040G-TN3-R | TO-252  | G              | C | E | Tape Reel |
| UGV3040L-TQ2-T  | UGV3040G-TQ2-T | TO-263  | G              | C | E | Tube      |
| UGV3040L-TQ2-R  | UGV3040G-TQ2-R | TO-263  | G              | C | E | Tape Reel |

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

|                       |  |
|-----------------------|--|
| <p>UGV3040L-TA3-T</p> | <p>(1) T: Tube, R: Tape Reel<br/>                 (2) TA3: TO-220, TF3: TO-220F, TN3: TO-252<br/>                 TQ2: TO-263<br/>                 (3) L: Lead Free, G: Halogen Free and Lead Free</p> |
|-----------------------|--|

■ MARKING



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

| PARAMETER   |  | SYMBOL            | RATINGS    | UNIT                |
|---|--|-------------------|------------|---------------------|
| Collector to Emitter Breakdown Voltage                  |  | $BV_{\text{CER}}$ | 450        | V                   |
| Emitter to Collector Voltage Reverse Battery Condition  |  | $BV_{\text{ECS}}$ | 30         | V                   |
| At Starting   | $T_J=25^\circ\text{C}$ , $I_{\text{SCIS}}=14.2\text{A}$ , $L=3.0\text{mHy}$  | $E_{\text{SCIS}}$ | 300        | mJ                  |
|   | $T_J=150^\circ\text{C}$ , $I_{\text{SCIS}}=10.6\text{A}$ , $L=3.0\text{mHy}$ |                   | 170        | mJ                  |
| Continuous Collector Current                            | $T_C=25^\circ\text{C}$   | $I_C$             | 21         | A                   |
|   | $T_C=110^\circ\text{C}$  |                   | 17         | A                   |
| Gate to Emitter Voltage Continuous                      |  | $V_{\text{GEM}}$  | $\pm 10$   | V                   |
| Power Dissipation Total at $T_C=25^\circ\text{C}$       | TO-220/TO-263  | $P_D$             | 125        | W                   |
|   | TO-220F  |                   | 41.6       |                     |
|   | TO-252   |                   | 125        |                     |
| Power Dissipation Derating $T_C>25^\circ\text{C}$       | TO-220/TO-263  |                   | 1          | W/ $^\circ\text{C}$ |
|   | TO-220F  |                   | 0.332      |                     |
|   | TO-252   |                   | 1          |                     |
| Electrostatic Discharge Voltage at 100pF, 1500 $\Omega$ |  | ESD               | 4          | kV                  |
| Junction Temperature                                    |  | $T_J$             | -40 ~ +175 | $^\circ\text{C}$    |
| Storage Temperature Range                               |  | $T_{\text{STG}}$  | -40 ~ +175 | $^\circ\text{C}$    |

Note: 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.

■ THERMAL CHARACTERISTICS

| PARAMETER        |               | SYMBOL               | RATINGS | UNIT               |
|------------------|---------------|----------------------|---------|--------------------|
| Junction to Case | TO-220/TO-252 | $\theta_{\text{JC}}$ | 1.0     | $^\circ\text{C/W}$ |
|                  | TO-263        |                      |         |                    |
|                  | TO-220F       |                      | 3.0     |                    |

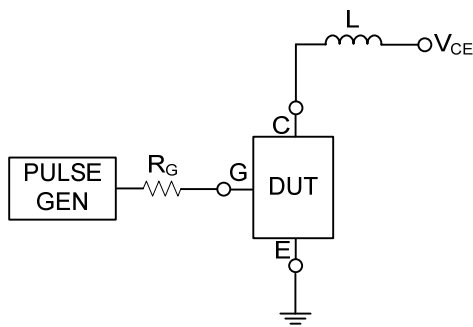
■ ELECTRICAL CHARACTERISTICS ( $T_A=25^\circ\text{C}$ , unless otherwise specified)

| PARAMETER                                 | SYMBOL        | TEST CONDITIONS  | MIN                     | TYP      | MAX  | UNIT          |   |
|---|---------------|--|-------------------------|----------|------|---------------|---|
| <b>Off State Characteristics</b>          |               |  |                         |          |      |               |   |
| Collector to Emitter Breakdown Voltage    | $BV_{CER}$    | $I_C=2\text{mA}$ , $V_{GE}=0\text{V}$ , $R_G=1\text{K}\Omega$ ,<br>$T_J=-40\sim 150^\circ\text{C}$           | 350                     | 400      | 450  | V             |   |
| Collector to Emitter to Breakdown Voltage | $BV_{CES}$    | $I_C=10\text{mA}$ , $V_{GE}=0\text{V}$ , $R_G=0$ ,<br>$T_J=-40\sim 150^\circ\text{C}$                        | 400                     | 450      | 500  | V             |   |
| Emitter to Collector Breakdown Voltage    | $BV_{ECS}$    | $I_C=-75\text{mA}$ , $V_{GE}=0\text{V}$ , $T_C=25^\circ\text{C}$   | 30                      |          |      | V             |   |
| Gate to Emitter Breakdown Voltage         | $BV_{GES}$    | $I_{GES}=\pm 2\text{mA}$   | $\pm 12$                | $\pm 14$ |      | V             |   |
| Collector to Emitter Leakage Current      | $I_{CER}$     | $V_{CER}=250\text{V}$ ,<br>$R_G=1\text{K}\Omega$   | $T_C=25^\circ\text{C}$  |          | 25   | $\mu\text{A}$ |   |
|   |               |  | $T_C=150^\circ\text{C}$ |          | 1    | mA            |   |
| Emitter to Collector Leakage Current      | $I_{ECS}$     | $V_{EC}=24\text{V}$  | $T_C=25^\circ\text{C}$  |          | 1    | mA            |   |
|   |               |  | $T_C=150^\circ\text{C}$ |          | 40   | mA            |   |
| Series Gate Resistance                    | $R_1$         |  |                         | 70       |      | $\Omega$      |   |
| Gate to Emitter Resistance                | $R_2$         |  | 10K                     |          | 26K  | $\Omega$      |   |
| <b>On State Characteristics</b>           |               |  |                         |          |      |               |   |
| Collector to Emitter Saturation Voltage   | $V_{CE(SAT)}$ | $I_C=6\text{A}$ , $V_{GE}=4\text{V}$   | $T_C=25^\circ\text{C}$  |          | 1.25 | 1.60          | V |
|   |               | $I_C=10\text{A}$ , $V_{GE}=4.5\text{V}$  | $T_C=150^\circ\text{C}$ |          | 1.40 | 1.80          | V |
|   |               | $I_C=15\text{A}$ , $V_{GE}=4.5\text{V}$  | $T_C=150^\circ\text{C}$ |          | 1.90 | 2.20          | V |
| <b>Dynamic Characteristics</b>            |               |  |                         |          |      |               |   |
| Gate Charge                               | $Q_{G(ON)}$   | $I_C=10\text{A}$ , $V_{CE}=12\text{V}$ , $V_{GE}=5\text{V}$  |                         | 17       |      | nC            |   |
| Gate to Emitter Threshold Voltage         | $V_{GE(TH)}$  | $I_C=1.0\text{mA}$ , $V_{CE}=V_{GE}$   | 1.3                     |          | 2.2  | V             |   |
| Gate to Emitter Plateau Voltage           | $V_{GEP}$     | $I_C=10\text{A}$ , $V_{CE}=12\text{V}$   |                         | 3.0      |      | V             |   |
| <b>Switching Characteristics</b>          |               |  |                         |          |      |               |   |
| Current Turn-On Delay Time-Resistive      | $t_{d(ON)R}$  | $V_{CE}=14\text{V}$ , $R_L=1\Omega$ , $V_{GE}=5\text{V}$ ,<br>$R_G=1\text{K}\Omega$ , $T_J=25^\circ\text{C}$ |                         | 0.48     | 4    | $\mu\text{s}$ |   |
| Current Rise Time-Resistive               | $t_{rR}$      |  |                         | 2.1      | 7    | $\mu\text{s}$ |   |
| Current Turn-Off Delay Time-Inductive     | $t_{d(OFF)L}$ |  |                         | 1.4      | 15   | $\mu\text{s}$ |   |
| Current Fall Time Inductive               | $t_{fL}$      |  |                         | 2.2      | 15   | $\mu\text{s}$ |   |
| Self Clamped Inductive Switching          | SCIS          | $T_J=25^\circ\text{C}$ , $L=3.0\text{mH}$ , $R_G=1\text{K}\Omega$ ,<br>$V_{GE}=5\text{V}$                    |                         |          | 300  | mJ            |   |

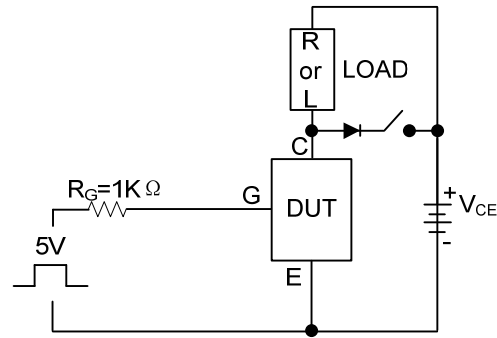
Notes: 1. Pulse Test: Pulse width  $\leq 300\mu\text{s}$ , Duty cycle  $\leq 2\%$

2. Essentially independent of operating temperature

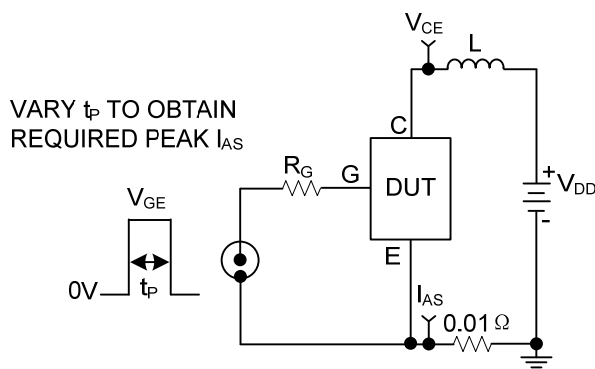
### ■ TEST CIRCUIT AND WAVEFORMS



Inductive Switching Test Circuit

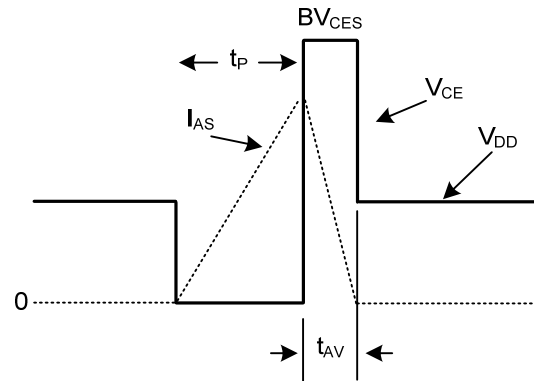


$t_{ON}$  and  $t_{OFF}$  Switching Test Circuit



VARY  $t_p$  TO OBTAIN  
REQUIRED PEAK  $I_{AS}$

Energy Test Circuit



Energy Waveforms

UTC assumes no responsibility for equipment failures that result from using products at values that exceed, even momentarily, rated values (such as maximum ratings, operating condition ranges, or other parameters) listed in products specifications of any and all UTC products described or contained herein. UTC products are not designed for use in life support appliances, devices or systems where malfunction of these products can be reasonably expected to result in personal injury. Reproduction in whole or in part is prohibited without the prior written consent of the copyright owner. The information presented in this document does not form part of any quotation or contract, is believed to be accurate and reliable and may be changed without notice.