

UNISONIC TECHNOLOGIES CO., LTD

2N80

Preliminary

2 Amps, 800 Volts N-CHANNEL POWER MOSFET

DESCRIPTION

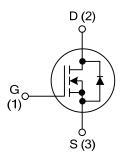
The UTC **2N80** is an N-channel mode Power FET using UTC's advanced technology to provide costumers planar stripe and DMOS technology. This technology is specialized in allowing a minimum on-state resistance and superior switching performance. It also can withstand high energy pulse in the avalanche and commutation mode.

The UTC **2N80** is universally applied in high efficiency switch mode power supply.

FEATURES

* 2.4A, 800V, $R_{DS(on)}$ = 6.3 Ω @V_{GS} = 10 V * High switching speed

SYMBOL

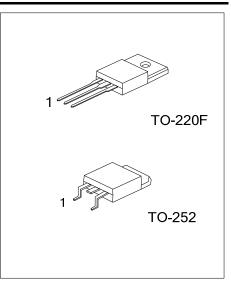


ORDERING INFORMATION

| Ordering Number | | Daakaga | Pin Assignment | | | Deaking | |
|-----------------|--------------|-----------|----------------|---|---|-----------|--|
| Lead Free | Halogen Free | - Package | 1 | 2 | 3 | Packing | |
| 2N80L-TF3-T | 2N80G-TF3-T | TO-220F | G | D | S | Tube | |
| 2N80L-TN3-R | 2N80G-TN3-R | TO-252 | G | D | S | Tape Reel | |

Note: Pin Assignment: G: Gate D: Drain S: Source

| 2N80L-TF3-T (1)Packing Type (2)Package Type (3)Lead Free | (1) T: Tube, R: Tape Reel (2) TF3: TO-220F, TN3: TO-252 (3) G: Halogen Free, L: Lead Free |
|---|---|
| | |



ABSOLUTE MAXIMUM RATINGS (Tc=25°C, unless otherwise specified)

| PARAMETER | | SYMBOL | RATINGS | UNIT |
|----------------------|------------------------|------------------|------------|------|
| Drain-Source Voltage | -Source Voltage | | 800 | V |
| Gate-Source Voltage |) | V _{GSS} | ±30 | V |
| Avalanche Current (N | Note 1) | I _{AR} | 2.4 | A |
| | Continuous | I _D | 2.4 | А |
| Drain Current | Pulsed (Note 1) | I _{DM} | 9.6 | А |
| Avelenska Francis | Single Pulsed (Note 2) | E _{AS} | 180 | mJ |
| Avalanche Energy | Repetitive (Note 1) | E _{AR} | 8.5 | mJ |
| Peak Diode Recover | y dv/dt (Note 3) | dv/dt 4.0 | | V/ns |
| Devue Die ein etien | TO-220F | D | 24 | W |
| Power Dissipation | TO-252 | P _D - | 24 43 V | W/°C |
| Junction Temperature | e | TJ | +150 | °C |
| Storage Temperature | | T _{STG} | -55~+150 | °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 | PACKAGE | SYMBOL | RATINGS | UNIT |
|---------------------|---------|-------------------|-----------------------------|------|
| lunction to Ambient | TO-220F | 0 | 62.5 | °C/W |
| Junction to Ambient | TO-252 | Αιθ | 62.5 °C 110 °C 5.2 °C | °C/W |
| lunction to Coop | TO-220F | 0 | 5.2 | °C/W |
| Junction to Case | TO-252 | $\theta_{\rm JC}$ | 2.85 | °C/W |



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

| PARAMETERSYMBOLTEST CONDITIONSMINTYPMAXOFF CHARACTERISTICSDrain-Source Breakdown Voltage BV_{DSS} $I_D=250\muA, V_{GS}=0V$ 800 0.9 V Breakdown Voltage Temperature Coefficient $\triangle BV_{DSS} / \triangle T_J$ Reference to 25°C, $I_D=250\muA$ 0.9 V Drain-Source Leakage Current I_{DSS} $V_{DS}=800V, V_{GS}=0V$ 100 V Gate- Source Leakage CurrentForward Reverse I_{GSS} $V_{GS}=+30V, V_{DS}=0V$ $+100$ r Gate- Source Leakage CurrentForward Reverse $V_{GS}=-30V, V_{DS}=0V$ $+100$ r Gate- Threshold Voltage $V_{GS}(TH)$ $V_{DS}=V_{GS}, I_D=250\muA$ 3.0 5.0 Static Drain-Source On-State Resistance $R_{DS(ON)}$ $V_{GS}=10V, I_D=1.2A$ 4.9 6.3 Forward Transconductance (Note 4) g_{FS} $V_{DS}=50V, I_D=1.2A$ 4.25 550 f DynAMIC PARAMETERSInput Capacitance C_{GSS} $V_{GS}=0V, V_{DS}=25V, f=1.0MHz$ 425 550 f SWITCHING PARAMETERS G_{GS} $V_{GS}=10V, V_{DS}=640V, I_D=2.4A$ 2.6 f f Gate to Source Charge (Note 4,5) Q_{GS} $V_{GS}=10V, V_{DS}=640V, I_D=2.4A$ 2.6 f Gate to Drain Charge (Note 4,5) Q_{GS} $V_{GS}=10V, V_{DS}=640V, I_D=2.4A$ 2.6 f Gate to Drain Charge (Note 4,5) Q_{GS} $V_{GS}=10V, V_{DS}=640V, I_D=2.4A$ 2.6 f Gate to Drain Charge (Note 4,5) Q_{GS} $V_{GS}=10V, V_{DS}$ | | | | | 1 | | | |
|---|----------------------------------|-------------------------|--------------------------------------|--|-----|------|------|----------|
| $\begin{array}{c c c c c c c c c c c c c c c c c c c $ | PARAMETER | | SYMBOL | TEST CONDITIONS | MIN | TYP | MAX | UNI T |
| Breakdown Voltage Temperature Coefficient $\triangle BV_{DSS} / \triangle T_J$ Reference to 25°C, I_p=250µA0.9VDrain-Source Leakage CurrentI I BoxI | OFF CHARACTERISTICS | | | | | | | |
| Coefficient $\Box BV_{DSS}/\Box I_J$ Reference to $25^{\circ}C$, $I_D=250\mu A$ 0.9 V Drain-Source Leakage Current I_{DSS} $V_{DS}=800V, V_{GS}=0V$ 10 I_{OD} Gate-Source Leakage CurrentForward Reverse I_{GSS} $V_{GS}=40V, T_C=125^{\circ}C$ 100 $V_{DS}=640V, T_C=125^{\circ}C$ ON CHARACTERISTICS I_{GSS} $V_{GS}=-30V, V_{DS}=0V$ -100 rGate Threshold Voltage $V_{GS(TH)}$ $V_{DS}=V_{GS}, I_D=250\mu A$ 3.0 5.0 Static Drain-Source On-State Resistance $R_{DS(ON)}$ $V_{GS}=10V, I_D=1.2A$ 4.9 6.3 Forward Transconductance (Note 4) g_{FS} $V_{DS}=50V, I_D=1.2A$ 2.65 D DYNAMIC PARAMETERSInput Capacitance C_{ISS} $V_{GS}=0V, V_{DS}=25V, f=1.0MHz$ 425 550 fSWITCHING PARAMETERS G_{GS} $V_{GS}=10V, V_{DS}=640V, I_D=2.4A$ 2.6 f 425 550 fGate to Source Charge (Note 4,5) Q_{GS} $Q_{GS}=10V, V_{DS}=640V, I_D=2.4A$ 2.6 f 12 15 rGate to Drain Charge (Note 4,5) Q_{GS} $V_{GS}=10V, V_{DS}=640V, I_D=2.4A$ 2.6 f 12 15 rGate to Drain Charge (Note 4,5) Q_{GS} $V_{GS}=10V, V_{DS}=640V, I_D=2.4A$ 2.6 f 12 35 rGate to Drain Charge (Note 4,5) Q_{GD} 12 35 r 12 35 rTotal Gate Charge (Note 4,5) Q_{GD} 12 35 rGate to Drain Charge (Note 4,5) Q_{GD} 12 35 rTurn-ON Delay Time (Note 4,5) $T_{D($ | Drain-Source Breakdown Voltage | e | BV _{DSS} | I _D =250μΑ, V _{GS} =0V | 800 | | | V |
| Drain-Source Leakage CurrentIDSS $V_{DS}=640V, T_C=125^{\circ}C$ 100IGate- Source Leakage CurrentForward ReverseIGSS $V_{GS}=+30V, V_{DS}=0V$ $+100$ rON CHARACTERISTICSGate Threshold Voltage $V_{GS}(TH)$ $V_{DS}=V_{GS}, I_D=250\muA$ 3.0 5.0 Static Drain-Source On-State Resistance $R_{DS(ON)}$ $V_{GS}=10V, I_D=1.2A$ 4.9 6.3 Forward Transconductance (Note 4) g_{FS} $V_{DS}=50V, I_D=1.2A$ 2.65 D DYNAMIC PARAMETERSInput Capacitance C_{ISS} $V_{GS}=0V, V_{DS}=25V, f=1.0MHz$ 425 550 f Output Capacitance C_{OSS} $V_{GS}=0V, V_{DS}=25V, f=1.0MHz$ 425 60 f SWITCHING PARAMETERSTotal Gate Charge (Note 4,5) Q_G Q_G 12 15 f Gate to Source Charge (Note 4,5) Q_{GD} Q_{GD} 6.0 f f Turn-ON Delay Time (Note 4,5) $U_{D(ON)}$ 12 35 12 30 70 Rise Time (Note 4,5) $t_{D(ON)}$ t_{D} 12 35 12 30 70 | | | $\triangle BV_{DSS} / \triangle T_J$ | Reference to 25°C, I _D =250µA | | 0.9 | | V/°C |
| Gate- Source Leakage CurrentForward ReverseIGSS $V_{GS}=+30V, V_{DS}=0V$ $+100$ rON CHARACTERISTICSGate Threshold Voltage $V_{GS}(TH)$ $V_{DS}=V_{GS}, I_D=250\mu A$ 3.0 5.0 Static Drain-Source On-State Resistance $R_{DS(ON)}$ $V_{GS}=10V, I_D=1.2A$ 4.9 6.3 Forward Transconductance (Note 4) g_{FS} $V_{DS}=50V, I_D=1.2A$ 2.65 $DYNAMIC PARAMETERS$ Input Capacitance C_{ISS} $V_{GS}=0V, V_{DS}=25V, f=1.0MHz$ 425 550 f Output Capacitance C_{OSS} $V_{GS}=0V, V_{DS}=25V, f=1.0MHz$ 45 60 f Reverse Transfer Capacitance C_{RSS} $V_{GS}=10V, V_{DS}=25V, f=1.0MHz$ 425 550 f SWITCHING PARAMETERS $Total Gate Charge (Note 4,5)$ Q_G Q_G 12 15 r Gate to Source Charge (Note 4,5) Q_{GD} $V_{GS}=10V, V_{DS}=640V, I_D=2.4A$ 2.6 r Gate to Drain Charge (Note 4,5) Q_{GD} $T_{D(ON)}$ 12 35 12 Rise Time (Note 4,5) $t_D(ON)$ $t_D(ON)$ 12 30 70 | Drain-Source Leakage Current | -Source Leakage Current | | | | | | μA |
| Gate-Source Leakage CurrentReverseIGSS $V_{GS}=-30V, V_{DS}=0V$ -100rON CHARACTERISTICSGate Threshold Voltage $V_{GS(TH)}$ $V_{DS}=V_{GS}, I_D=250\muA$ 3.05.0Static Drain-Source On-State Resistance $R_{DS(ON)}$ $V_{GS}=10V, I_D=1.2A$ 4.96.3Forward Transconductance (Note 4) g_{FS} $V_{DS}=50V, I_D=1.2A$ 2.650DYNAMIC PARAMETERSInput Capacitance C_{ISS} 425550gOutput Capacitance C_{OSS} $V_{GS}=0V, V_{DS}=25V, f=1.0MHz$ 4560gReverse Transfer Capacitance C_{RSS} $V_{GS}=0V, V_{DS}=25V, f=1.0MHz$ 4560gSWITCHING PARAMETERSTotal Gate Charge (Note 4,5) Q_G 1215rGate to Source Charge (Note 4,5) Q_{GS} $V_{GS}=10V, V_{DS}=640V, I_D=2.4A$ 2.6rGate to Drain Charge (Note 4,5) Q_{GD} 6.0r1235Turn-ON Delay Time (Note 4,5) $t_{D(ON)}$ 12307010Rise Time (Note 4,5) t_{D} t_{D} 307010 | | | | | | | | |
| Indext (Note 4,5)Indext (Note 4,5)I | Gate- Source Leakage Current | | I _{GSS} | | | | | nA |
| Gate Threshold Voltage $V_{GS(TH)}$ $V_{DS}=V_{GS}$, $I_D=250\muA$ 3.05.0Static Drain-Source On-State Resistance $R_{DS(ON)}$ $V_{GS}=10V$, $I_D=1.2A$ 4.96.3Forward Transconductance (Note 4) g_{FS} $V_{DS}=50V$, $I_D=1.2A$ 2.65DYNAMIC PARAMETERSInput Capacitance C_{ISS} Output Capacitance C_{OSS} $V_{GS}=0V$, $V_{DS}=25V$, f=1.0MHz425550Reverse Transfer Capacitance C_{RSS} $V_{GS}=0V$, $V_{DS}=25V$, f=1.0MHz4560gSWITCHING PARAMETERSTotal Gate Charge (Note 4,5) Q_G 1215rGate to Source Charge (Note 4,5) Q_{GS} $V_{GS}=10V$, $V_{DS}=640V$, $I_D=2.4A$ 2.6rGate to Drain Charge (Note 4,5) Q_{GD} 6.0r1235Turn-ON Delay Time (Note 4,5) $t_{D(ON)}$ 12351Rise Time (Note 4,5) $t_{D(ON)}$ t_{D} 30701 | | Reverse | | V _{GS} =-30V, V _{DS} =0V | | | -100 | nA |
| Static Drain-Source On-State Resistance $R_{DS(ON)}$ $V_{GS}=10V$, $I_D=1.2A$ 4.96.3Forward Transconductance (Note 4) g_{FS} $V_{DS}=50V$, $I_D=1.2A$ 2.65DYNAMIC PARAMETERSInput Capacitance C_{ISS} 425550 f Output Capacitance C_{OSS} $V_{GS}=0V$, $V_{DS}=25V$, $f=1.0MHz$ 4560 f Reverse Transfer Capacitance C_{RSS} $V_{GS}=0V$, $V_{DS}=25V$, $f=1.0MHz$ 4560 f SWITCHING PARAMETERS $Total Gate Charge (Note 4,5)$ Q_G 1215 r Gate to Source Charge (Note 4,5) Q_{GD} $C_{SS}=10V$, $V_{DS}=640V$, $I_D=2.4A$ 2.6 r Gate to Drain Charge (Note 4,5) Q_{GD} $f_{D(ON)}$ 1235 r Rise Time (Note 4,5) $t_{D(ON)}$ t_{D} 3070 r | | | 1 | | 1 | i | | |
| Forward Transconductance (Note 4) g_{FS} $V_{DS}=50V$, $I_D=1.2A$ 2.65DYNAMIC PARAMETERSInput Capacitance C_{ISS} 425 550 rOutput Capacitance C_{OSS} $V_{GS}=0V$, $V_{DS}=25V$, f=1.0MHz4560 rReverse Transfer Capacitance C_{RSS} 5.5 7.0 rSWITCHING PARAMETERS $I12$ 15 rGate to Source Charge (Note 4,5) Q_{GS} $V_{GS}=10V$, $V_{DS}=640V$, $I_D=2.4A$ 2.6 rGate to Drain Charge (Note 4,5) Q_{GD} 6.0 r 112 35 rTurn-ON Delay Time (Note 4,5) $t_{D(ON)}$ 12 35 rRise Time (Note 4,5) t_{D} t_{D} 30 70 | | | | | 3.0 | | | V |
| DYNAMIC PARAMETERSInput Capacitance C_{ISS} Output Capacitance C_{OSS} VGS=0V, VDS=25V, f=1.0MHz425425550Reverse Transfer Capacitance C_{RSS} SWITCHING PARAMETERSTotal Gate Charge (Note 4,5) Q_G Gate to Source Charge (Note 4,5) Q_{GS} Gate to Drain Charge (Note 4,5) Q_{GD} Turn-ON Delay Time (Note 4,5) $t_{D(ON)}$ Rise Time (Note 4,5) t_{D} Rise Time (Note 4,5) t_{D} | | | R _{DS(ON)} | | | | 6.3 | Ω |
| Input Capacitance C_{ISS} 425 550 425 Output Capacitance C_{OSS} $V_{GS}=0V, V_{DS}=25V, f=1.0MHz$ 45 60 g Reverse Transfer Capacitance C_{RSS} 5.5 7.0 g SWITCHING PARAMETERSTotal Gate Charge (Note 4,5) Q_{GS} $V_{GS}=10V, V_{DS}=640V, I_{D}=2.4A$ 12 15 r Gate to Drain Charge (Note 4,5) Q_{GD} 6.0 r 6.0 r Turn-ON Delay Time (Note 4,5) $t_{D(ON)}$ 12 35 12 35 Rise Time (Note 4,5) t_{D} t_{D} 30 70 | · · · · · | e 4) | g fs | V _{DS} =50V, I _D =1.2A | | 2.65 | | S |
| Output Capacitance C_{OSS} $V_{GS}=0V, V_{DS}=25V, f=1.0MHz$ 456045Reverse Transfer Capacitance C_{RSS} 5.57.0 g SWITCHING PARAMETERS Q_G Q_G 1215 r Total Gate Charge (Note 4,5) Q_{GS} $V_{GS}=10V, V_{DS}=640V, I_D=2.4A$ 2.6 r Gate to Drain Charge (Note 4,5) Q_{GD} G_{OD} G_{OD} G_{OD} G_{OD} G_{OD} Turn-ON Delay Time (Note 4,5) $t_{D(ON)}$ t_{D} G_{OD} G_{OD} G_{OD} G_{OD} Rise Time (Note 4,5) t_{D} t_{D} G_{OD} G_{OD} G_{OD} G_{OD} | DYNAMIC PARAMETERS | | i | | | | | |
| Reverse Transfer Capacitance C_{RSS} 5.57.0pSWITCHING PARAMETERSTotal Gate Charge (Note 4,5) Q_G 1215rGate to Source Charge (Note 4,5) Q_{GS} V_{GS} =10V, V_{DS} =640V, I_D =2.4A2.6rGate to Drain Charge (Note 4,5) Q_{GD} 6.0rTurn-ON Delay Time (Note 4,5) $t_{D(ON)}$ 1235rRise Time (Note 4,5) t_D t_D 3070 | Input Capacitance | | CISS | | | 425 | 550 | рF |
| SWITCHING PARAMETERSTotal Gate Charge (Note 4,5) Q_G 1215rGate to Source Charge (Note 4,5) Q_{GS} V_{GS} =10V, V_{DS} =640V, I_D =2.4A2.6rGate to Drain Charge (Note 4,5) Q_{GD} 6.0rTurn-ON Delay Time (Note 4,5) $t_{D(ON)}$ 12351Bise Time (Note 4,5) t_D t_D 3070 | Output Capacitance | | C _{OSS} | V _{GS} =0V, V _{DS} =25V, f=1.0MHz | | 45 | 60 | рF |
| Total Gate Charge (Note 4,5) Q_G 1215rGate to Source Charge (Note 4,5) Q_{GS} V_{GS} =10V, V_{DS} =640V, I_D =2.4A2.6rGate to Drain Charge (Note 4,5) Q_{GD} 6.0rTurn-ON Delay Time (Note 4,5) $t_{D(ON)}$ 1235Bise Time (Note 4,5) t_D t_D | Reverse Transfer Capacitance | | C _{RSS} | | | 5.5 | 7.0 | рF |
| Gate to Source Charge (Note 4,5) Q _{GS} V _{GS} =10V, V _{DS} =640V, I _D =2.4A 2.6 r Gate to Drain Charge (Note 4,5) Q _{GD} 6.0 r Turn-ON Delay Time (Note 4,5) t _{D(ON)} 12 35 1 Bise Time (Note 4,5) t _D t _D 30 70 1 | SWITCHING PARAMETERS | | | | ÷ | - | | _ |
| Gate to Drain Charge (Note 4,5) Q _{GD} 6.0 r Turn-ON Delay Time (Note 4,5) t _{D(ON)} 12 35 1 Bise Time (Note 4,5) t _D 30 70 1 | Total Gate Charge (Note 4,5) | | Q _G | V _{GS} =10V, V _{DS} =640V, I _D =2.4A | | 12 | 15 | nC |
| Turn-ON Delay Time (Note 4,5) t _{D(ON)} 12 35 1 Rise Time (Note 4,5) tp 30 70 1 | Gate to Source Charge (Note 4,5) | | Q _{GS} | | | 2.6 | | nC |
| Rise Time (Note 4.5) t ₂ 30 70 1 | ate to Drain Charge (Note 4,5) | | Q _{GD} | | | 6.0 | | nC |
| Rise Time (Note 4.5) to 30 70 | | | t _{D(ON)} | - V _{DD} =400V, I _D =2.4A, R _G =25Ω | | 12 | 35 | ns |
| | | | | | | 30 | 70 | ns |
| Turn-OFF Delay Time (Note 4,5) t _{D(OFF)} | | | | | | 25 | 60 | ns |
| | Fall-Time (Note 4,5) | | | 1 | | 28 | 65 | ns |
| SOURCE- DRAIN DIODE RATINGS AND CHARACTERISTICS | 1 1 | IGS AND C | HARACTERI | STICS | • | | | |
| Maximum Continuous Drain-Source Diode | | | Is | | | | | |
| Forward Current Is 2.4 | | | | | | | 2.4 | A |
| Maximum Pulsed Drain-Source Diode | | | I _{SM} | | | | 0.0 | • |
| Forward Current 9.6 | | | | | | | 9.6 | A |
| | | | V _{SD} | I _S =2.4A, V _{GS} =0V | | | 1.4 | V |
| Peyerse Pecovery Time (Note 4) | | | | | | 480 | | ns |
| | • ` ` ' | | | I _S =2.4A, V _{GS} =0V, dI _F /dt=100A/µs | | | | μC |

Note: 1. Repetitive Rating: Pulse width limited by maximum junction temperature

2. L = 59mH, I_{AS} = 2.4A, V_{DD} = 50V, R_G = 25 $\Omega,$ Starting T_J = 25°C

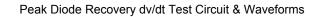
3. I_{SD} \leq 2.4A, di/dt \leq 200A/µs, V_{DD} \leq BV_{DSS}, Starting T_J = 25°C

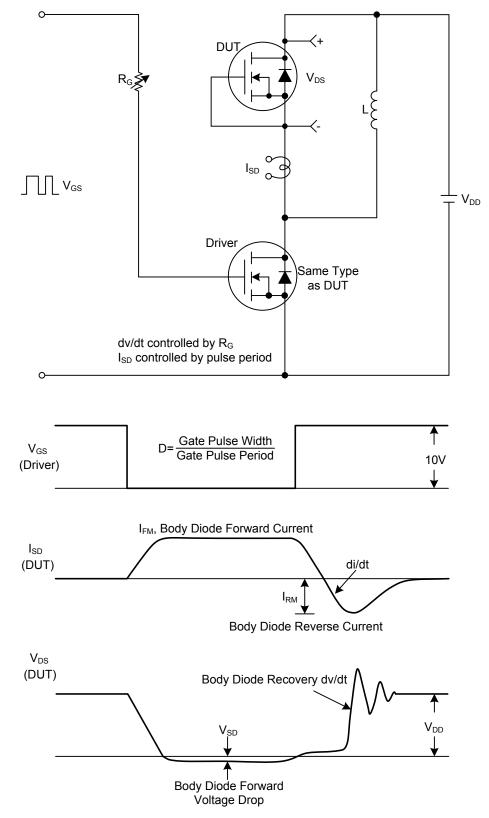
4. Pulse Test: Pulse width ≤ 300 μ s, Duty cycle ≤ 2%

5. Essentially independent of operating temperature

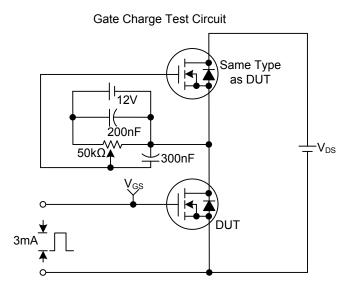


■ TEST CIRCUITS AND WAVEFORMS

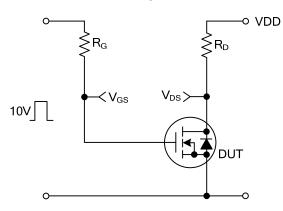




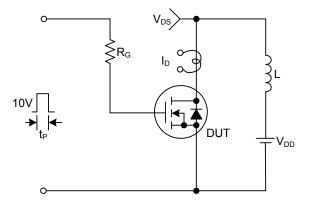


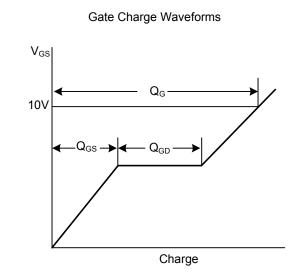


Resistive Switching Test Circuit

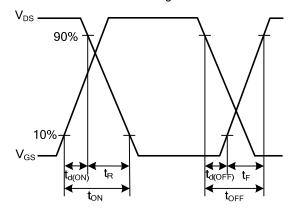


Unclamped Inductive Switching Test Circuit

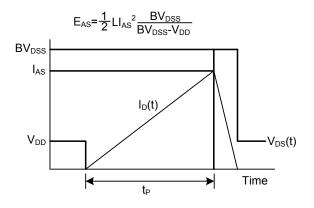




Resistive Switching Waveforms



Unclamped Inductive Switching 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.

