



2N40

Preliminary

Power MOSFET

2 Amps, 400 Volts N-CHANNEL POWER MOSFET

DESCRIPTION

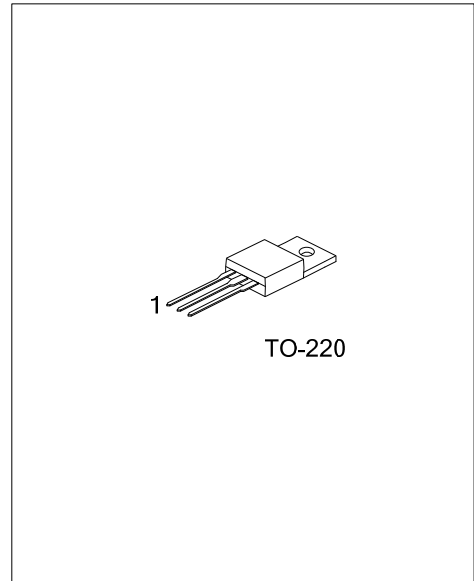
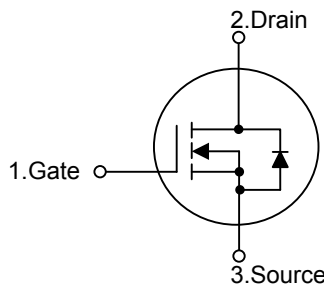
The UTC **2N40** is an N-channel mode power MOSFET using UTC's advanced technology to provide customers with a minimum on-state resistance, stable off-state characteristics and superior switching performance. It also can withstand high energy pulse in the avalanche.

The UTC **2N40** is usually used in general purpose switching applications, motor control circuits and switched mode power supply.

FEATURES

- * High switching speed
- * 2A, 400V, $R_{DS(ON)}=3.5\Omega @ V_{GS}=10V$
- * 100% avalanche tested

SYMBOL



ORDERING INFORMATION

| Ordering Number | | Package | Pin Assignment | | | Packing |
|-----------------|--------------|---------|----------------|---|---|---------|
| Lead Free | Halogen Free | | 1 | 2 | 3 | |
| 2N40L-TA3-T | 2N40G-TA3-T | TO-220 | G | D | S | Tube |

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

| | |
|--|--|
| <p>2N40L-TA3-T</p> <p>(1)Packing Type</p> <p>(2)Package Type</p> <p>(3)Lead Free</p> | <p>(1) T: Tube</p> <p>(2) TA3: TO-220</p> <p>(3) G: Halogen Free, L: Lead Free</p> |
|--|--|

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

| PARAMETER | SYMBOL | RATINGS | UNIT |
|--------------------------------|------------------------------|----------|---------------------|
| Drain-Source Voltage | V_{DSS} | 400 | V |
| Gate-Source Voltage | V_{GSS} | ± 30 | V |
| Drain Current | Continuous | I_D | 2 |
| | Pulsed | I_{DM} | 7 |
| Avalanche Current | I_{AR} | 2.5 | A |
| Single Pulsed Avalanche Energy | E_{AS} | 100 | mJ |
| Power Dissipation | P_D | 25 | W |
| Linear Derating Factor | $\Delta P_D / \Delta T_{mb}$ | 0.2 | W/ $^\circ\text{C}$ |
| Junction Temperature | T_J | 150 | $^\circ\text{C}$ |
| Storage Temperature Range | T_{STG} | -55~150 | $^\circ\text{C}$ |

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

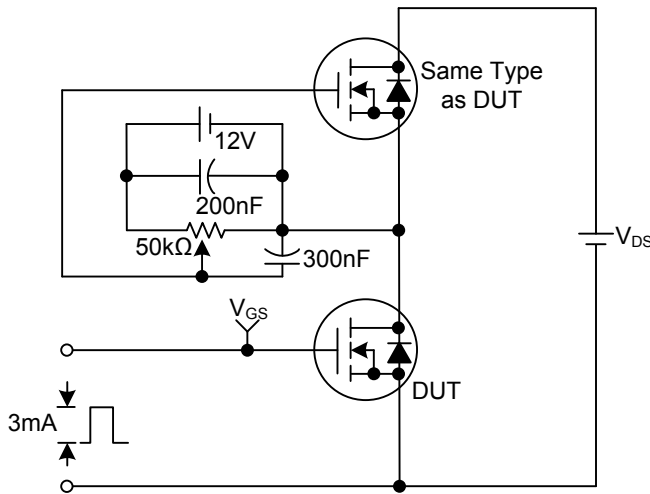
| PARAMETER | SYMBOL | RATINGS | UNIT |
|---------------------|---------------|---------|---------------------------|
| Junction to Ambient | θ_{JA} | 62.5 | $^\circ\text{C}/\text{W}$ |
| Junction to Case | θ_{JC} | 5 | $^\circ\text{C}/\text{W}$ |

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

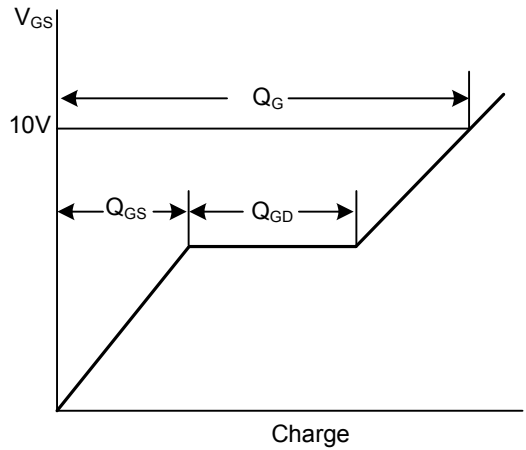
| PARAMETER | SYMBOL | TEST CONDITIONS | MIN | TYP | MAX | UNIT |
|--|-------------------------------------|---|-----|------|------|------|
| OFF CHARACTERISTICS | | | | | | |
| Drain-Source Breakdown Voltage | BV _{DSS} | I _D =250μA, V _{GS} =0V | 400 | | | V |
| Breakdown Voltage Temperature Coefficient | ΔBV _{DSS} /ΔT _J | V _{DS} =V _{GS} , I _D =250μA | | 0.45 | | V/°C |
| Drain-Source Leakage Current | I _{DSS} | V _{DS} =400V, V _{GS} =0V | | 1 | 25 | μA |
| Gate- Source Leakage Current | Forward | V _{GS} =+30V, V _{DS} =0V | | +10 | +200 | nA |
| | Reverse | V _{GS} =-30V, V _{DS} =0V | | -10 | -200 | nA |
| ON CHARACTERISTICS | | | | | | |
| Gate Threshold Voltage | V _{GS(TH)} | V _{DS} =V _{GS} , I _D =250μA | 2.0 | 3.0 | 4.0 | V |
| Static Drain-Source On-State Resistance | R _{DS(ON)} | V _{GS} =10V, I _D =1.25A | | 2.0 | 3.5 | Ω |
| DYNAMIC PARAMETERS | | | | | | |
| Input Capacitance | C _{ISS} | V _{GS} =0V, V _{DS} =25V, f=1.0MHz | | 240 | | pF |
| Output Capacitance | C _{OSS} | | | 44 | | pF |
| Reverse Transfer Capacitance | C _{RSS} | | | 26 | | pF |
| SWITCHING PARAMETERS | | | | | | |
| Total Gate Charge | Q _{G(TOT)} | V _{GS} =10V, V _{DS} =320V, I _D =2.5A | | 20 | 25 | nC |
| Gate to Source Charge | Q _{GS} | | | 2 | 3 | nC |
| Gate to Drain Charge | Q _{GD} | | | 8 | 12 | nC |
| Turn-ON Delay Time | t _{D(ON)} | V _{DD} =200V, I _D =2.5A, R _G =24Ω, R _D =78 Ω | | 10 | | ns |
| Rise Time | t _R | | | 25 | | ns |
| Turn-OFF Delay Time | t _{D(OFF)} | | | 46 | | ns |
| Fall-Time | t _F | | | 25 | | ns |
| Internal Drain Inductance | L _D | Measured from drain lead 6 mm from package to centre of die | | 4.5 | | nH |
| Internal Source Inductance | L _S | Measured from source lead 6 mm from package to source bond pad | | 7.5 | | nH |
| SOURCE- DRAIN DIODE RATINGS AND CHARACTERISTICS | | | | | | |
| Maximum Body-Diode Continuous Current | I _S | T _C =25°C | | | 2.5 | A |
| Maximum Body-Diode Pulsed Current | I _{SM} | | | | 10 | A |
| Drain-Source Diode Forward Voltage | V _{SD} | I _S =2.5A, V _{GS} =0V | | | 1.2 | V |
| Body Diode Reverse Recovery Time | t _{RR} | I _S =2.5A, V _{GS} =0V, di/dt=100A/μs | | 200 | | ns |
| Body Diode Reverse Recovery Charge | Q _{RR} | | | | 2.0 | |

■ TEST CIRCUITS AND WAVEFORMS

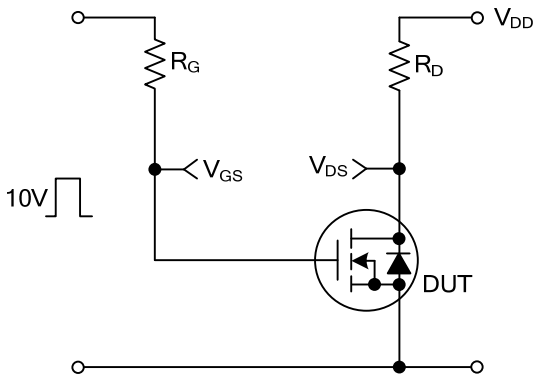
Gate Charge Test Circuit



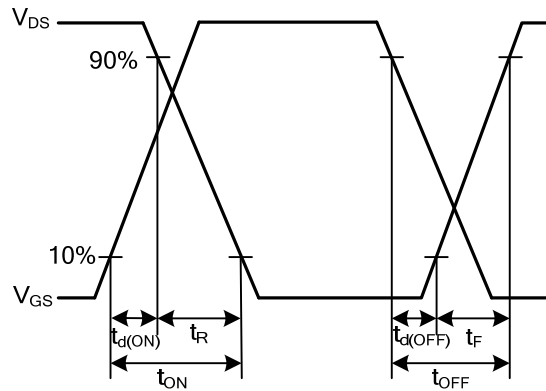
Gate Charge Waveforms



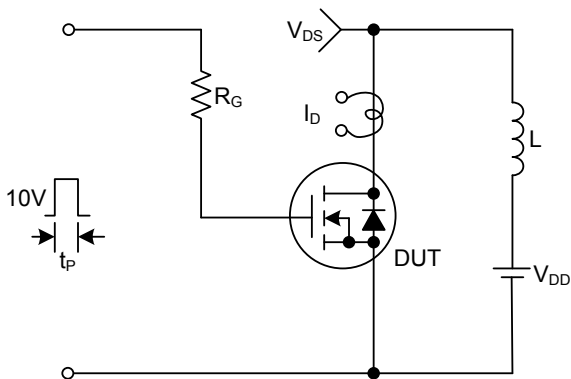
Resistive Switching Test Circuit



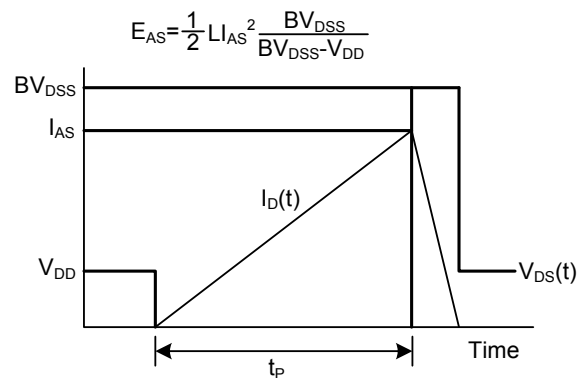
Resistive Switching Waveforms



Unclamped Inductive Switching Test Circuit

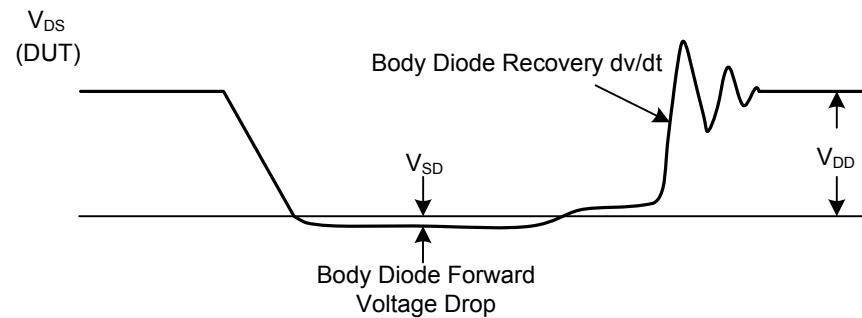
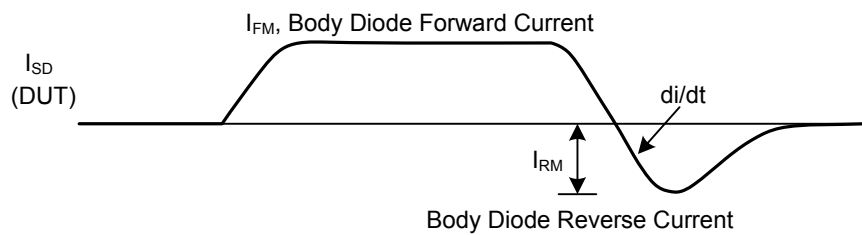
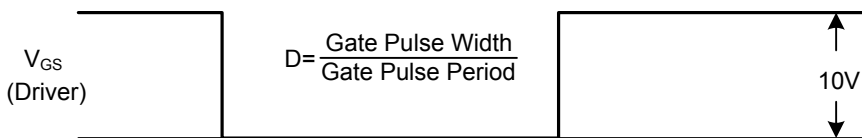
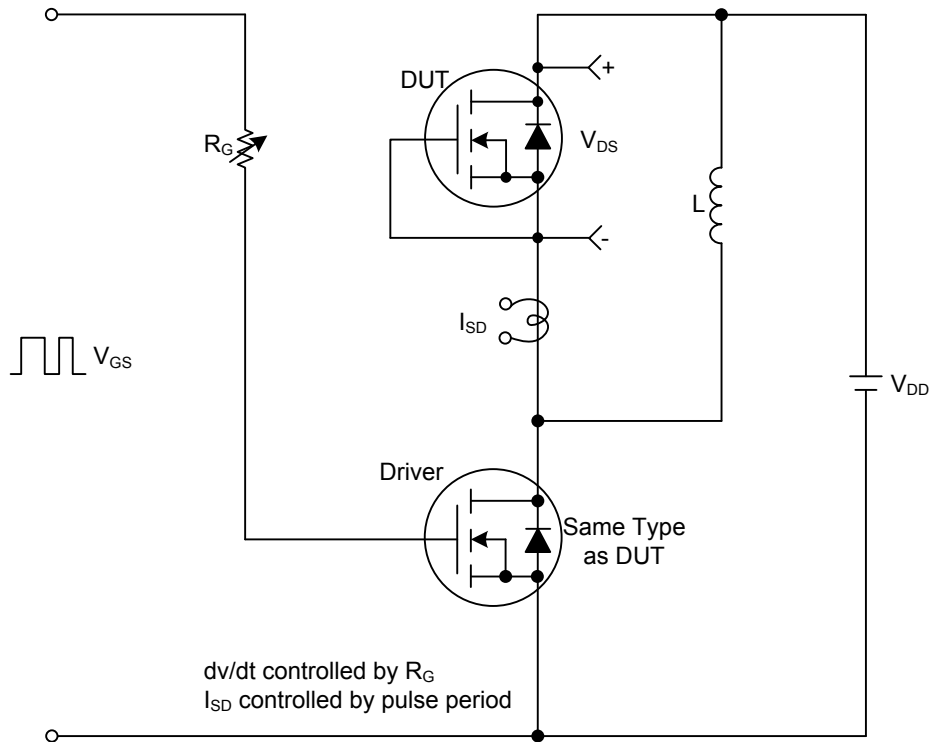


Unclamped Inductive Switching Waveforms



■ TEST CIRCUITS AND WAVEFORMS(Cont.)

Peak Diode Recovery dv/dt Test Circuit & Waveforms



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