



## UT150N06H

Preliminary

Power MOSFET

### 150A, 60V N-CHANNEL ENHANCEMENT MODE

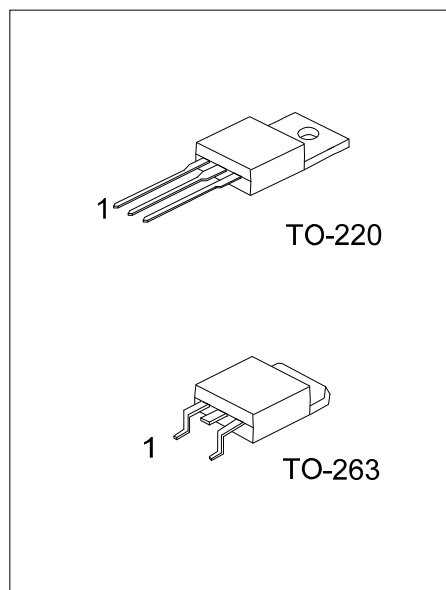
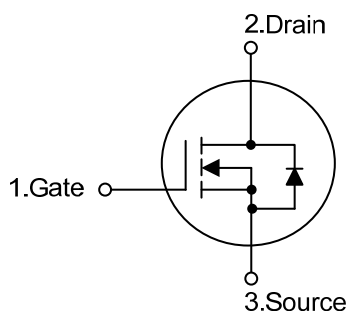
#### DESCRIPTION

The UTC **UT150N06H** uses UTC's advanced proprietary, planar stripe, DMOS technology to provide excellent  $R_{DS(ON)}$ , low gate charge and operation with low gate voltages. This device is suitable for use as high current switching applications.

#### FEATURES

- \*  $R_{DS(ON)} \leq 5.6 \text{ m}\Omega$  @  $V_{GS}=10\text{V}$ ,  $I_D=75\text{A}$
- \* Low capacitance
- \* Low gate charge
- \* Fast switching capability
- \* Avalanche energy specified

#### SYMBOL



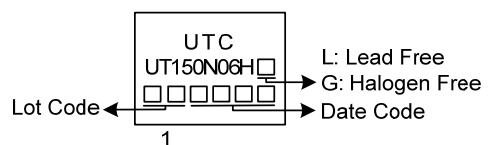
#### ORDERING INFORMATION

Ordering Number		Package	Pin Assignment			Packing
Lead Free	Halogen Free		1	2	3	
UT150N06HL-TA3-T	UT150N06HG-TA3-T	TO-220	G	D	S	Tube
UT150N06HL-TQ2-T	UT150N06HG-TQ2-T	TO-263	G	D	S	Tube
UT150N06HL-TQ2-R	UT150N06HG-TQ2-R	TO-263	G	D	S	Tape Reel

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

UT150N06HG-TA3-T		(1) Packing Type	(1) T: Tube, R: Tape Reel
		(2) Package Type	(2) TA3: TO-220, TQ2: TO-263
		(3) Green Package	(3) G: Halogen Free and Lead Free, L: Lead Free

### ■ MARKING



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

PARAMETER		SYMBOL	RATINGS	UNIT
Drain-Source Voltage		$V_{DS}$	60	V
Gate-Source Voltage		$V_{GS}$	$\pm 20$	V
Drain Current ( $T_C=25^{\circ}\text{C}$ )	Continuous	$I_D$	150	A
	Pulsed (Note 2)	$I_{DM}$	300	A
Avalanche Energy	Single Pulsed (Note 3)	$E_{AS}$	180	mJ
Peak Diode Recovery dv/dt (Note 4)		dv/dt	2.9	V/ns
Power Dissipation		$P_D$	180	W
Junction Temperature		$T_J$	+150	$^{\circ}\text{C}$
Storage Temperature Range		$T_{STG}$	-55 ~ +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.  $L=0.1\text{mH}$ ,  $I_{AS}=60\text{A}$ ,  $V_{DD}=50\text{V}$ ,  $R_G=25\Omega$ , Starting  $T_J=25^{\circ}\text{C}$

4.  $I_{SD} \leq 30\text{A}$ ,  $di/dt \leq 200\text{A}/\mu\text{s}$ ,  $V_{DD} \leq BV_{DSS}$ , Starting  $T_J = 25^{\circ}\text{C}$

■ THERMAL DATA

PARAMETER	SYMBOL	RATINGS	UNIT
Junction to Ambient	$\theta_{JA}$	62.5	$^{\circ}\text{C}/\text{W}$
Junction to Case (Note)	$\theta_{JC}$	0.69	$^{\circ}\text{C}/\text{W}$

Note: Device mounted on FR-4 substrate PC board, 2oz copper, with 1inch square copper plate.

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

PARAMETER		SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
OFF CHARACTERISTICS							
Drain-Source Breakdown Voltage		BV <sub>DSS</sub>	V <sub>GS</sub> =0V, I <sub>D</sub> =250μA	60			V
Drain-Source Leakage Current		I <sub>DSS</sub>	V <sub>DS</sub> =60V, V <sub>GS</sub> =0V			10	μA
Gate- Source Leakage Current	Forward	I <sub>GSS</sub>	V <sub>GS</sub> =20V, V <sub>DS</sub> =0V			100	nA
	Reverse		V <sub>GS</sub> =-20V, V <sub>DS</sub> =0V			-100	nA
ON CHARACTERISTICS							
Gate Threshold Voltage		V <sub>GS(TH)</sub>	V <sub>DS</sub> =V <sub>GS</sub> , I <sub>D</sub> =250μA	2.0		4.0	V
Static Drain-Source On-State Resistance		R <sub>DS(ON)</sub>	V <sub>GS</sub> =10V, I <sub>D</sub> =75A			5.6	mΩ
DYNAMIC CHARACTERISTICS							
Input Capacitance		C <sub>ISS</sub>	V <sub>DS</sub> =25V, V <sub>GS</sub> =0V, f=1.0MHz		6026		pF
Output Capacitance		C <sub>OSS</sub>			578		pF
Reverse Transfer Capacitance		C <sub>RSS</sub>			403		pF
SWITCHING CHARACTERISTICS							
Total Gate Charge (Note 1)		Q <sub>G</sub>	V <sub>DS</sub> =30V, V <sub>GS</sub> =10V, I <sub>D</sub> =150A (Note 1, 2)		127		nC
Gate-Source Charge		Q <sub>GS</sub>			31		nC
Gate-Drain Charge		Q <sub>GD</sub>			42		nC
Turn-On Delay Time (Note 1)		t <sub>D(ON)</sub>	V <sub>DS</sub> =30V, V <sub>GS</sub> =10V, I <sub>D</sub> =150A, R <sub>G</sub> =3.3Ω (Note 1, 2)		24		ns
Turn-On Rise Time		t <sub>R</sub>			22		ns
Turn-Off Delay Time		t <sub>D(OFF)</sub>			60		ns
Turn-Off Fall Time		t <sub>F</sub>			29		ns
DRAIN-SOURCE DIODE CHARACTERISTICS AND MAXIMUM RATINGS							
Maximum Body-Diode Continuous Current		I <sub>S</sub>				150	A
Maximum Body-Diode Pulsed Current		I <sub>SM</sub>				300	A
Drain-Source Diode Forward Voltage (Note 1)		V <sub>SD</sub>	I <sub>S</sub> =20A , V <sub>GS</sub> =0V			1.3	V
Body Diode Reverse Recovery Time (Note 1)		t <sub>rr</sub>	I <sub>S</sub> =30A, V <sub>GS</sub> =0V,		54		ns
Body Diode Reverse Recovery Charge		Q <sub>rr</sub>	dl <sub>F</sub> /dt=100A/μs		70		nC

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

2. Essentially independent of operating temperature.

[illegible]

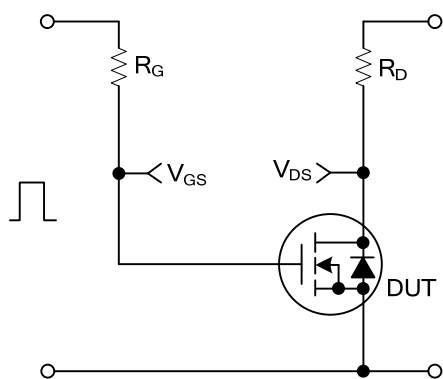
Timing diagram for a MOSFET switching a load inductor. The diagram shows three waveforms:  $V_{GS}$  (Driver),  $I_{SD}$  (D.U.T.), and  $V_{DS}$  (D.U.T.).

- $V_{GS}$  (Driver): A square wave with pulse width (P.W.) and period (Period). The duty cycle is  $D = \frac{P.W.}{Period}$ . The gate voltage is  $V_{GS} = 10V$ .
- $I_{SD}$  (D.U.T.): The MOSFET current during the pulse and the body diode current during the off-time. It shows the forward current  $I_{FM}$ , the reverse current  $I_{RM}$ , and the body diode recovery  $dv/dt$ .
- $V_{DS}$  (D.U.T.): The drain-source voltage, showing the forward voltage drop and the body diode recovery  $dv/dt$ .

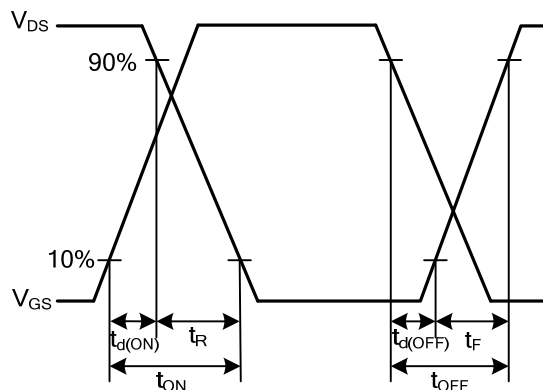
Labels in the diagram include:  $V_{GS}$  (Driver), P.W., Period,  $D = \frac{P.W.}{Period}$ ,  $V_{GS} = 10V$ ,  $I_{SD}$  (D.U.T.),  $I_{FM}$ , Body Diode Forward Current,  $di/dt$ ,  $I_{RM}$ , Body Diode Reverse Current, Body Diode Recovery  $dv/dt$ ,  $V_{DS}$  (D.U.T.),  $V_{DD}$ , Body Diode, and Forward Voltage Drop.

### Peak Diode Recovery dv/dt Waveforms

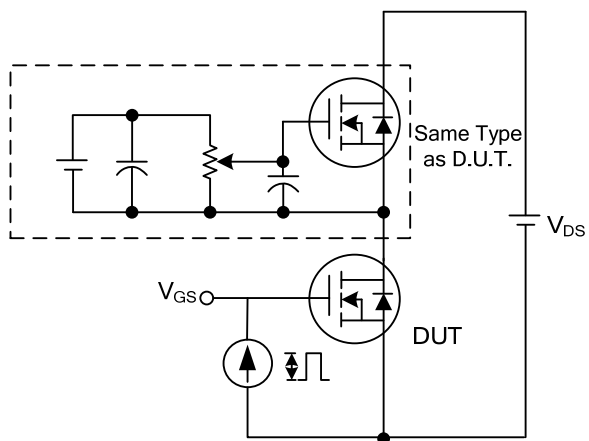
### ■ TEST CIRCUITS AND WAVEFORMS



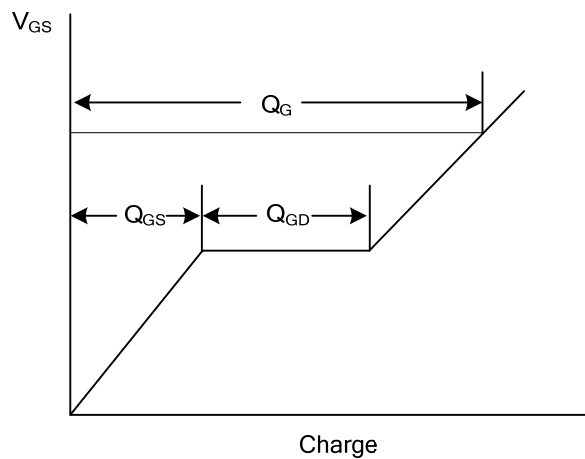
Switching Test Circuit



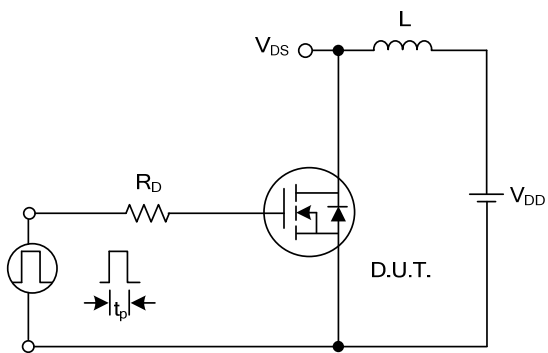
Switching Waveforms



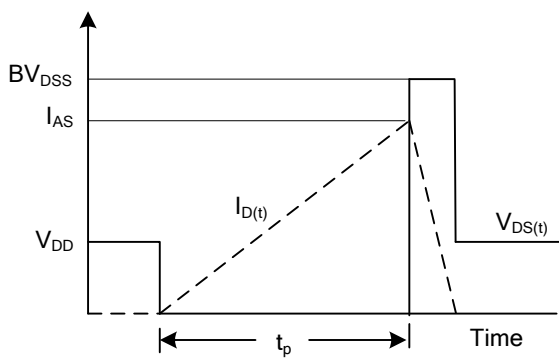
Gate Charge Test Circuit



Gate Charge Waveform



Unclamped Inductive Switching Test Circuit



Unclamped Inductive Switching Waveforms

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