



# UTD405

*Power MOSFET*

## P-CHANNEL ENHANCEMENT MODE

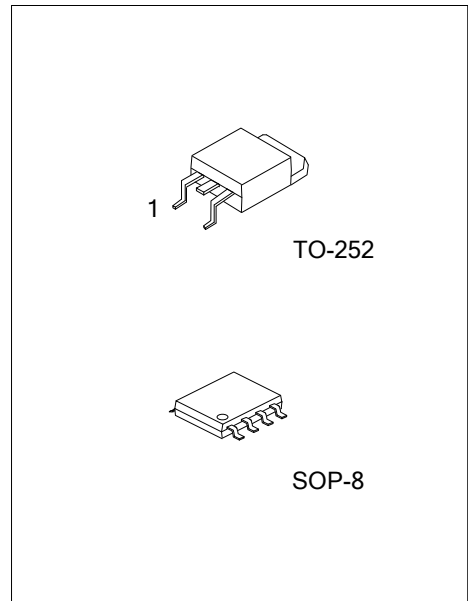
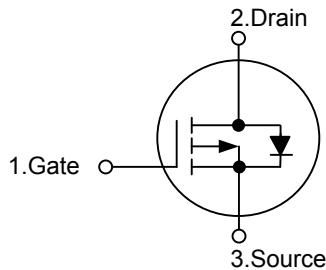
■ DESCRIPTION

The **UTD405** can provide excellent  $R_{DS(ON)}$ , low gate charge and low gate resistance by using advanced trench technology. This device is well suited for high current load applications with the excellent thermal resistance.

■ FEATURES

- \*  $R_{DS(ON)} = 32m\Omega @V_{GS} = -10 V$
- \* 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	4	5	6		7	8
UTD405L-TN3-R	UTD405G-TN3-R	TO-252	G	D	S	-	-	-	-	-	Tape Reel
UTD405L-S08-R	UTD405G-S08-R	SOP-8	S	S	S	G	D	D	D	D	Tape Reel

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

<p>UTD405G-TN3-R</p>	<p>(1) R: Tape Reel</p> <p>(2) TN3: TO-252, S08: SOP-8</p> <p>(3) G: Halogen Free and Lead Free, L: Lead Free</p>
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■ MARKING

TO-252	SOP-8

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

PARAMETER		SYMBOL	RATINGS	UNIT	
Drain-Source Voltage		$V_{DSS}$	-30	V	
Gate-Source Voltage		$V_{GSS}$	$\pm 20$	V	
Continuous Drain Current ( $T_A=25^{\circ}\text{C}$ ) (Note2,4)		$I_D$	-18	A	
Pulsed Drain Current		$I_{DM}$	-40	A	
Avalanche Current (Note3)		$I_{AR}$	-18	A	
Repetitive Avalanche Energy ( $L=0.1\text{mH}$ ) (Note3)		$E_{AR}$	40	mJ	
Power Dissipation	$T_A=25^{\circ}\text{C}$ (Note2)	TO-252	$P_D$	2.5	W
		SOP-8		1	W
	$T_C=25^{\circ}\text{C}$ (Note2)	TO-252		60	W
		SOP-8		5.2	W
Junction Temperature		$T_J$	+150	$^{\circ}\text{C}$	
Storage Temperature		$T_{STG}$	-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 DATA

PARAMETER	SYMBOL	RATING	UNIT	
Junction to Ambient (Note 1)	TO-252	$\theta_{JA}$	50	$^{\circ}\text{C}/\text{W}$
	SOP-8		125	$^{\circ}\text{C}/\text{W}$
Junction to Case (Note 3)	TO-252	$\theta_{JC}$	2.08	$^{\circ}\text{C}/\text{W}$
	SOP-8		24	$^{\circ}\text{C}/\text{W}$

Note 1: The value of  $R_{\theta_{JA}}$  is measured with the device mounted on  $1\text{in}^2$  FR-4 board with 2oz. Copper and the maximum temperature of  $150^{\circ}\text{C}$  may be used if the PCB or heat-sink allows it.

- The power dissipation  $P_D$  is based on  $T_{J(\text{MAX})}=150^{\circ}\text{C}$ , using junction-to-case thermal resistance, and is more useful in setting the upper dissipation limit for cases where additional heat-sinking is used. It is used to determine the current rating, when this rating falls below the package limit.
- Repetitive rating, pulse width limited by junction temperature  $T_{J(\text{MAX})}=150^{\circ}\text{C}$ .
- The maximum current rating is limited by the package current capability.

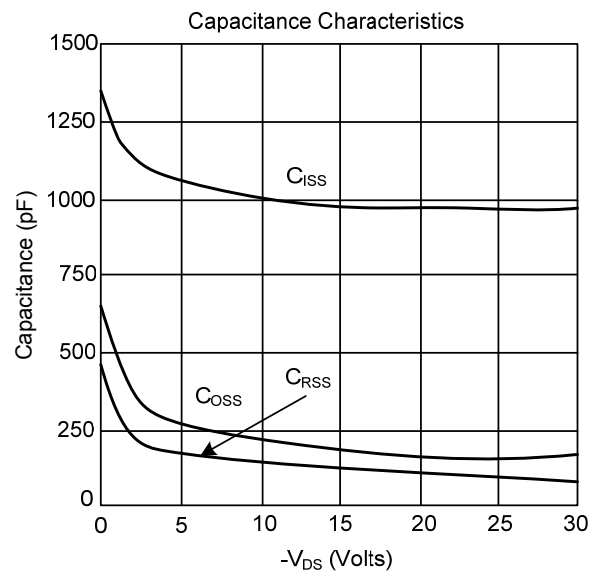
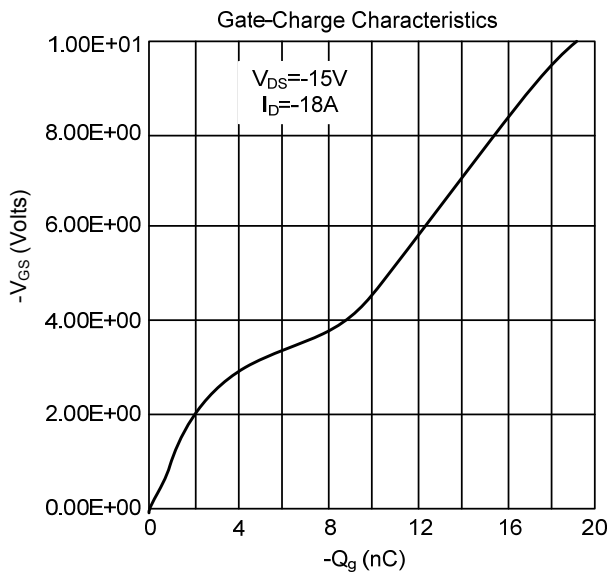
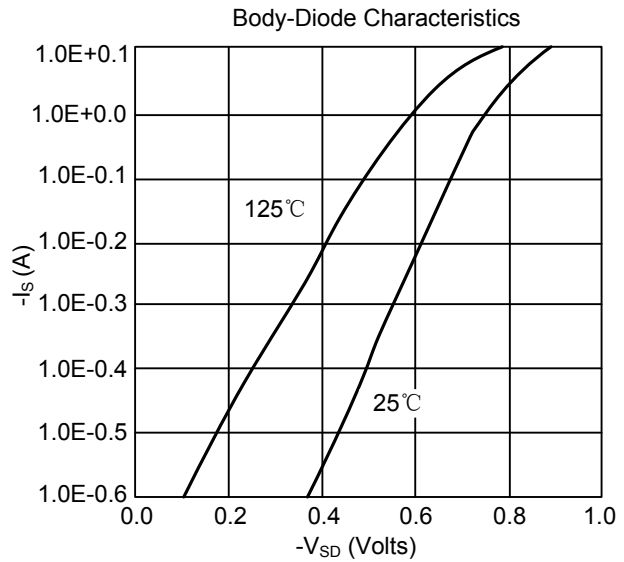
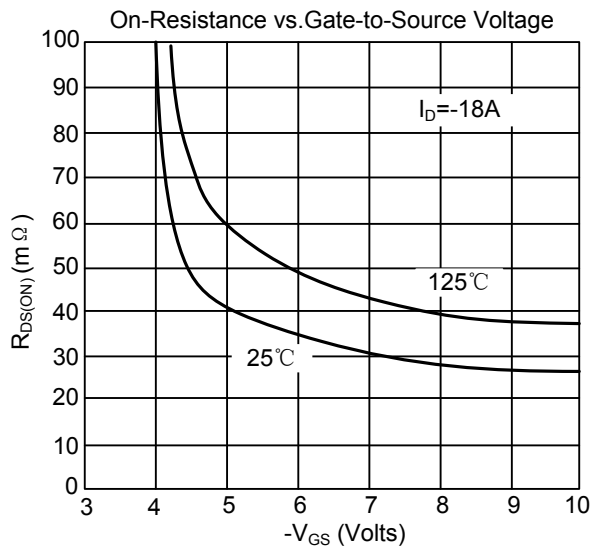
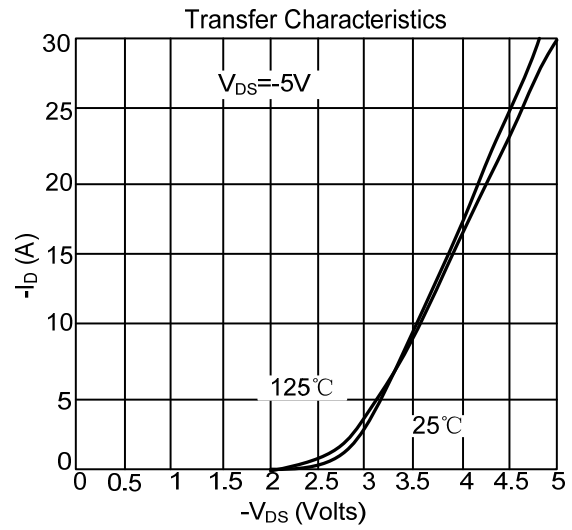
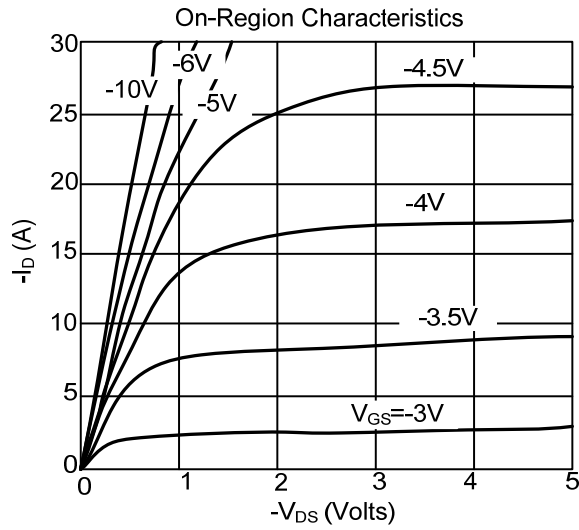
■ ELECTRICAL CHARACTERISTICS (T<sub>J</sub> =25°C, unless otherwise specified)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
<b>OFF CHARACTERISTICS</b>						
Drain-Source Breakdown Voltage	BV <sub>DSS</sub>	V <sub>GS</sub> =0 V, I <sub>D</sub> =-250 μA	-30			V
Drain-Source Leakage Current	I <sub>DSS</sub>	V <sub>DS</sub> =-24 V, V <sub>GS</sub> =0 V		-0.003	-1	μA
Gate-Body Leakage Current	I <sub>GSS</sub>	V <sub>DS</sub> =0 V, V <sub>GS</sub> = ±20V			±100	nA
<b>ON CHARACTERISTICS</b>						
Gate-Threshold Voltage	V <sub>GS(TH)</sub>	V <sub>DS</sub> =V <sub>GS</sub> , I <sub>D</sub> =-250 μA	-1.2	-2	-2.4	V
On state drain current	I <sub>D(ON)</sub>	V <sub>GS</sub> =-10V, V <sub>DS</sub> =-5V	-40			A
Static Drain-Source On-Resistance	R <sub>DS(ON)</sub>	V <sub>GS</sub> =-10 V, I <sub>D</sub> =-18A		24.5	32	mΩ
		V <sub>GS</sub> =-4.5 V, I <sub>D</sub> =-10A		41	60	mΩ
<b>DYNAMIC PARAMETERS</b>						
Input Capacitance	C <sub>ISS</sub>	V <sub>DS</sub> =-15 V, V <sub>GS</sub> =0V, f=1MHz		920	1100	pF
Output Capacitance	C <sub>OSS</sub>			190		pF
Reverse Transfer Capacitance	C <sub>RSS</sub>			122		pF
<b>SWITCHING PARAMETERS</b>						
Total Gate Charge	Q <sub>G</sub>	V <sub>DS</sub> =-15V, V <sub>GS</sub> =-10V, I <sub>D</sub> =-18A		18.7	23	nC
Gate-Source Charge	Q <sub>GS</sub>			2.54		nC
Gate-Drain Charge	Q <sub>GD</sub>			5.4		nC
Turn-ON Delay Time	t <sub>D(ON)</sub>	V <sub>GS</sub> =-10V, V <sub>DS</sub> =-15V, R <sub>L</sub> =0.82Ω, R <sub>G</sub> =3Ω		9	13	ns
Turn-ON Rise Time	t <sub>R</sub>			25	35	ns
Turn-OFF Delay Time	t <sub>D(OFF)</sub>			20	30	ns
Turn-OFF Fall-Time	t <sub>F</sub>			12	18	ns
<b>SOURCE- DRAIN DIODE RATINGS AND CHARACTERISTICS</b>						
Maximum Continuous Drain-Source Diode Forward Current	I <sub>S</sub>				-18	A
Drain-Source Diode Forward Voltage	V <sub>SD</sub>	I <sub>S</sub> =-1A, V <sub>GS</sub> =0V		-0.76	-1	V
Body Diode Reverse Recovery Time	T <sub>rr</sub>	I <sub>F</sub> =-18A, dI/dt=100A/μs		21.4	26	ns
Body Diode Reverse Recovery Charge	Q <sub>rr</sub>	I <sub>F</sub> =-18A, dI/dt=100A/μs		13	16	nC

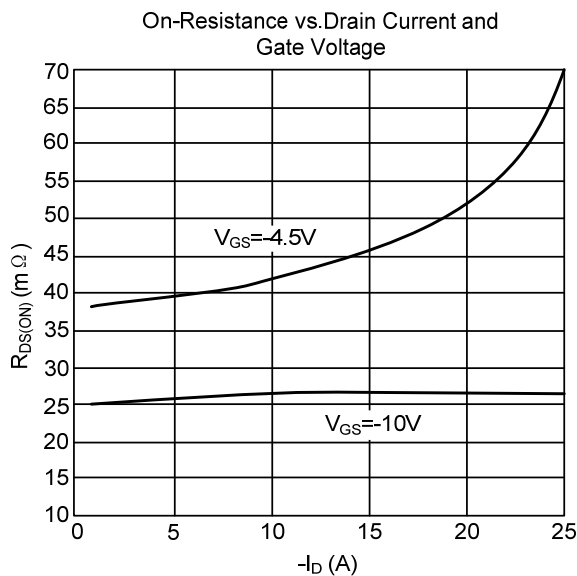
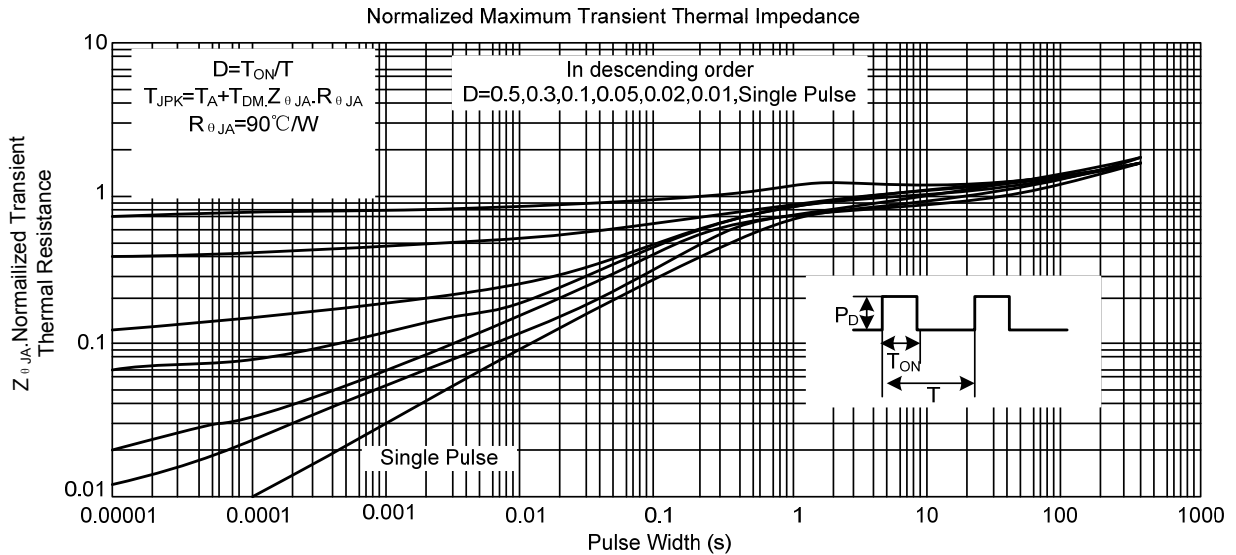
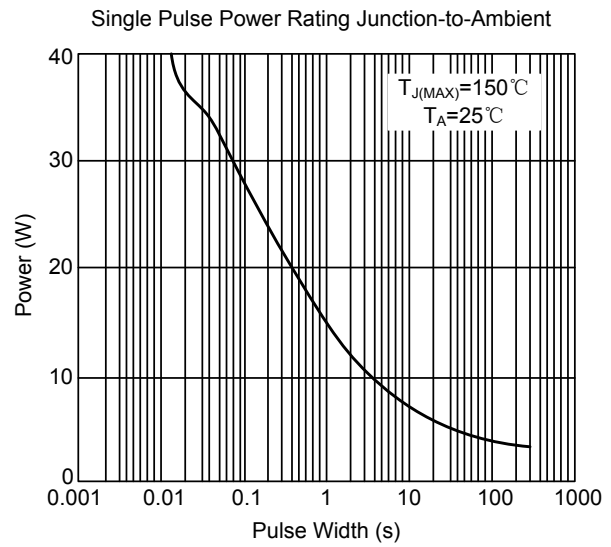
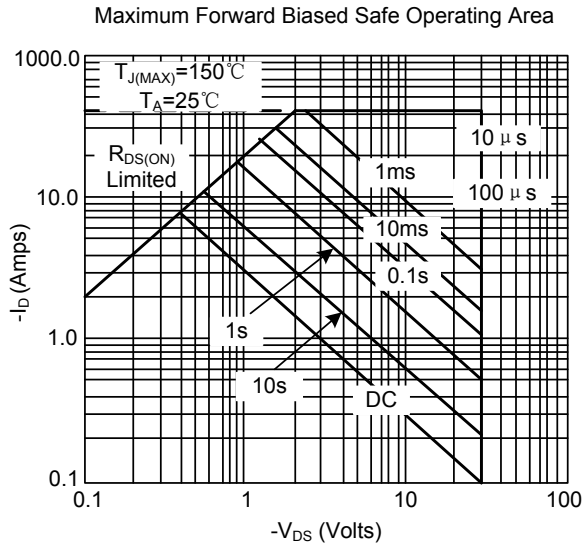
Notes: 5. Pulse width limited by T<sub>J(MAX)</sub>

6. Pulse width ≤300us, duty cycle 0.5% max.

## ■ TYPICAL CHARACTERISTICS



## TYPICAL CHARACTERISTICS (Cont.)



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