

UNISONIC TECHNOLOGIES CO., LTD

UTT16P10

Preliminary

1 of 5

-100V, -16A P-CHANNEL **POWER MOSFET**

DESCRIPTION

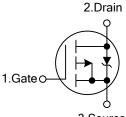
The UTC UTT16P10 is a P-channel power MOSFET using UTC's advanced technology to provide the customers with high switching speed, cost-effectiveness and a minimum on-state resistance. It can also withstand high energy in the avalanche.

FEATURES

* R_{DS(ON)}<0.21Ω @ V_{GS}=-10V, I_D=-16A

* High Switching Speed

SYMBOL



3.Source

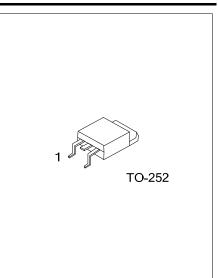
ORDERING INFORMATION

Ordering	Daakaga	Pin	Assignr	Deaking			
Lead Free	Halogen Free	Package	1	2	3	Packing	
UTT16P10L-TN3-R	TO-252	G	D	S	Tape Reel		
Note: Pin Assignment: G: C	Gate D: Drain S: Source						
UTT16P10L-TN3-R							

	ļL	—— (1)Packing Type	(1) R: Tape Reel
		—— (2)Package Type	(2) TN3: TO-252
		(3)Green Package	(3) L: Lead Free, G: Halogen Free and Lead Free

MARKING





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

PARAMETER		SYMBOL	RATINGS	UNIT	
Drain-Source Voltage		V _{DSS}	-100	V	
Gate-Source Voltage		V _{GSS}	±20	V	
	Continuous, T _C =25°C		-16	А	
Drain Current	V _{GSS} @-10V T _C =100°C	l _D	-9.8	А	
	Pulsed (Note 2)	I _{DM}	-64	А	
Avalanche Current (Note 2)		I _{AR}	-16	А	
Avalanaha Enargy	Repetitive (Note 3)	E _{AS}	345	mJ	
Avalanche Energy	Single Pulsed (Note 2)	E _{AR}	15	mJ	
Peak Diode Recovery dv/dt		dv/dt	-5.5	V/ns	
Power Dissipation (T _C =25°C)		PD	150	W	
Junction Temperature		TJ	-55 ~ +150	°C	
Storage Temperature		T _{STG}	-55 ~ +150	°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 max. junction temperature.

3. V_DD=-25V, starting T_J=25°C, L=2.7mH, R_G=25\Omega, I_{AS}=-16A.

THERMAL DATA

PARAMETER	SYMBOL	RATINGS	UNIT
Junction to Case	θ _{JC}	1.0	°C/W

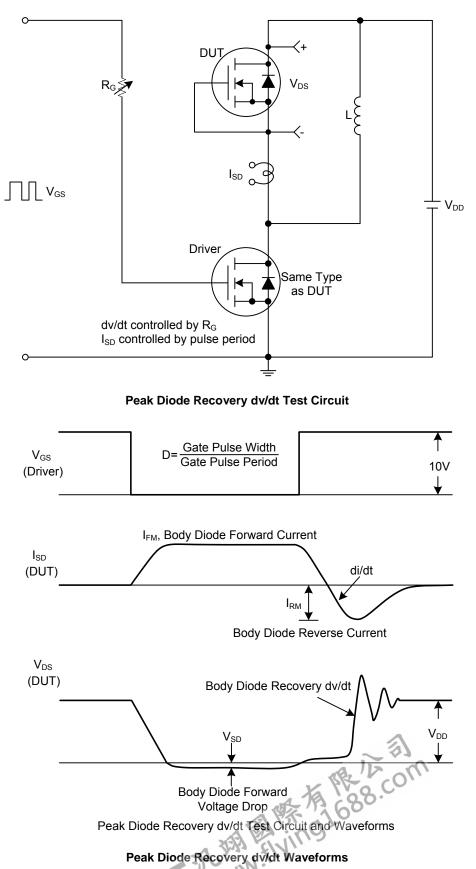
■ ELECTRICAL CHARACTERISTICS (T_J=25°C, unless otherwise specified)

$\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	UNIT	
Breakdown Voltage Temperature Coefficient $\Delta BV_{DSS}/\Delta T_J$ Reference to 25°C, I_p=-1mA -0.1 $V/°C$ Drain-Source Leakage Current I_DSS $V_{DS}=-100V, V_{GS}=0V, T_J=150°C$ -100 μA Gate- Source Leakage Current Forward I_GSS $V_{DS}=-80V, V_{GS}=0V, T_J=150°C$ -100 μA ON CHARACTERISTICS IGSS $V_{GS}=+20V$ +100 nA Gate Threshold Voltage $V_{GS}(TH)$ $V_{DS}=-250\mu A$ -1.0 -3.0 V Static Drain-Source On-State Resistance $R_{DS(ON)}$ $V_{DS}=-25V, V_{GS}=0V, f=1.0MHz$ 250 pF Reverse Transfer Capacitance C_{ISS} $V_{DS}=-25V, V_{GS}=0V, f=1.0MHz$ 250 pF SWITCHING PARAMETERS Cage $V_{DS}=-25V, V_{GS}=0V, f=1.0MHz$ 250 pF SWITCHING PARAMETERS Cage $V_{DS}=-25V, V_{GS}=0V, f=1.0MHz$ 250 pF Surp-Onder Charge Q_{GS} $V_{DS}=-25V, V_{GS}=0V, f_{D}=-16A, N_{D}=-16A, S_{D}=0$ 5 nC Gate to Source Charge Q_{GS} $V_{DS}=-80V, V_{GS}=-10V, I_{D}=-16A, R_{G}=9.10$ 15 nC Gate to Source Charge Q_{GS} V	OFF CHARACTERISTICS								
$\begin{array}{c c c c c c c c c c c c c c c c c c c $	Drain-Source Breakdown Voltage		BV _{DSS}	I _D =-250μA, V _{GS} =0V	-100			V	
$\begin{array}{c c c c c c c c c c c c c c c c c c c $	Breakdown Voltage Temperature Coefficient		$\Delta BV_{DSS}/\Delta T_{J}$	Reference to 25°C, I _D =-1mA		-0.1		V/°C	
$\begin{array}{ c c c c c } \hline V_{DS}=-80V, V_{GS}=0V, I_{J}=150^{\circ}C & -100 & \mu A \\ \hline V_{GS}=-80V, V_{GS}=0V, I_{J}=150^{\circ}C & +100 & nA \\ \hline V_{GS}=+20V & -100 & nA \\ \hline V_{GS}=-20V & -100 & nA \\ \hline V_{GS}=-10V, I_{D}=-16A & (Note 2) & 0.21 & \Omega \\ \hline DYNAMIC PARAMETERS & & \\ \hline Dutput Capacitance & C_{ISS} & \\ \hline Output Capacitance & C_{GSS} & \\ \hline V_{DS}=-25V, V_{GS}=0V, f=1.0MHz & 250 & pF \\ \hline SWITCHING PARAMETERS & & \\ \hline Total Gate Charge & Q_G & \\ \hline Cate to Drain ("Miller") Charge & Q_{GS} & \\ \hline Cate to Drain ("Miller") Charge & Q_{GS} & \\ \hline Turn-ON Delay Time & I_{D(ON)} & \\ \hline Rise Time & I_R & \\ \hline Turn-OFF Delay Time & I_{D(OFF)} & \\ \hline Fall-Time & I_{C} & \\ \hline SOURCE- DRAIN DIODE RATINGS AND CHARACTERSTICS & \\ \hline Maximum Body-Diode Continuous Current & I_S & \\ \hline Maximum Body-Diode Pulsed Current & I_{SM} & (Note 1) & -64 & A \\ \hline Drain-Source Diode Forward Voltage & V_{SD} & I_{S}=-6A, V_{SS}=0V (Note 2) & -1.3 & V \\ \hline \end{array}$	Drain Source Leakage Current			V _{DS} =-100V, V _{GS} =0V,			-25	μA	
Gate-Source Leakage CurrentReverseIGSS V_{GS} =-20V-100nAON CHARACTERISTICSGate Threshold VoltageV _{GS} (TH)V _{DS} =V _{GS} , I _D =-250µA-1.0-3.0VStatic Drain-Source On-State ResistanceR _{DS(ON)} V _{GS} =-10V, I _D =-16A (Note 2)0.21 Ω DYNAMIC PARAMETERSInput CapacitanceC _{ISS} Output CapacitanceC _{OSS} V _{DS} =-25V, V _{GS} =0V, f=1.0MHz250pFReverse Transfer CapacitanceC _{RSS} V _{DS} =-25V, V _{GS} =0V, f=1.0MHz250pFSWITCHING PARAMETERSTotal Gate ChargeQ _G V _{DS} =-80V, V _{GS} =-10V, I _D =-16A,5nCGate to Source ChargeQ _{GS} V _{DS} =-80V, V _{GS} =-10V, I _D =-16A,5nCGate to Drain ("Miller") ChargeQ _{GD} 11nsRise Timet _R V _{DD} =-50V, I _D =-16A, R _G =9.10,25nsTurn-ON Delay Timet _{D(OFF)} R _D = 2.4Ω56nsFall-Timet _F 36nssSOURCE- DRAIN DIODE RATINGS AND CHARACTERISTICSMaximum Body-Diode Continuous CurrentI _S (Note 1)-64ADrain-Source Diode Forward VoltageV _{SD} I _S =16A, V _{GS} =0V (Note 2)-1.3V			IDSS	V _{DS} =-80V, V _{GS} =0V, T _J =150°C			-100	μA	
Index <th inde<="" index<th="" td=""><td>Cate. Source Leakage Current</td><td>Forward</td><td></td><td>V_{GS}=+20V</td><td></td><td></td><td>+100</td><td>nA</td></th>	<td>Cate. Source Leakage Current</td> <td>Forward</td> <td></td> <td>V_{GS}=+20V</td> <td></td> <td></td> <td>+100</td> <td>nA</td>	Cate. Source Leakage Current	Forward		V _{GS} =+20V			+100	nA
Gate Threshold Voltage $V_{GS(TH)}$ $V_{DS}=V_{GS}$, $I_D=-250\mu$ A-1.0-3.0VStatic Drain-Source On-State Resistance $R_{DS(ON)}$ $V_{GS}=-10V$, $I_D=-16A$ (Note 2)0.21 Ω DYNAMIC PARAMETERSInput Capacitance C_{ISS} $V_{DS}=-25V$, $V_{GS}=0V$, f=1.0MHz11801900pFOutput Capacitance C_{OSS} $V_{DS}=-25V$, $V_{GS}=0V$, f=1.0MHz250pFReverse Transfer Capacitance C_{RSS} $V_{DS}=-25V$, $V_{GS}=0V$, f=1.0MHz3760nCSWITCHING PARAMETERS Q_G Q_G 37 60nCGate to Source Charge Q_{GS} $V_{DS}=-80V$, $V_{GS}=-10V$, $I_D=-16A$,5nCGate to Drain ("Miller") Charge Q_{GD} 11nsTurn-ON Delay Time $t_{D(ON)}$ $V_{DD}=-50V$, $I_D=-16A$, $R_G=9.10$,25nsTurn-OFF Delay Time $t_{D(OFF)}$ $R_D=2.4\Omega$ 56nsFall-Time t_F 36nssource Continuous Current I_S Maximum Body-Diode Continuous Current I_S (Note 1)-64ADrain-Source Diode Forward Voltage V_{SD} $I_S=-16A, V_{GS}=0V$ (Note 2)-1.3V		Reverse	IGSS	V _{GS} =-20V			-100	nA	
Static Drain-Source On-State Resistance $R_{DS(ON)}$ V_{GS} =-10V, I_D =-16A (Note 2)0.21 Ω DYNAMIC PARAMETERSInput Capacitance C_{ISS} $I180$ 1900pFOutput Capacitance C_{OSS} V_{DS} =-25V, V_{GS} =0V, f=1.0MHz250pFReverse Transfer Capacitance C_{RSS} V_{DS} =-25V, V_{GS} =0V, f=1.0MHz250pFSWITCHING PARAMETERS $Total Gate Charge$ Q_G 37 60 nCGate to Source Charge Q_{GS} V_{DS} =-80V, V_{GS} =-10V, I_D =-16A, 5 nCGate to Drain ("Miller") Charge Q_{GD} 15nCTurn-ON Delay Time $t_{D(ON)}$ R_D =2.4025nsTurn-OFF Delay Time $t_{D(OFF)}$ R_D =2.4056nsSOURCE- DRAIN DIODE RATINGS AND CHARACTERISTICS-16AMaximum Body-Diode Continuous Current I_S (Note 1)-64Maximum Body-Diode Pulsed Current I_{SM} (Note 1)-64ADrain-Source Diode Forward Voltage V_{SD} I_S =16A, V_{GS} =0V (Note 2)-1.3V	ON CHARACTERISTICS		•						
DYNAMIC PARAMETERSInput Capacitance C_{ISS} $V_{DS}=-25V$, $V_{GS}=0V$, $f=1.0MHz$ 1180 1900 pF Output Capacitance C_{OSS} $V_{DS}=-25V$, $V_{GS}=0V$, $f=1.0MHz$ 250 pF Reverse Transfer Capacitance C_{RSS} $V_{DS}=-25V$, $V_{GS}=0V$, $f=1.0MHz$ 250 pF SWITCHING PARAMETERSTotal Gate Charge Q_G 75 pF Total Gate Charge Q_{GS} $V_{DS}=-80V$, $V_{GS}=-10V$, $I_D=-16A$, 5 nC Gate to Drain ("Miller") Charge Q_{GD} $V_{DD}=-50V$, $I_D=-16A$, $R_G=9.1Q$, 11 ns Turn-ON Delay Time t_R $V_{DD}=-50V$, $I_D=-16A$, $R_G=9.1Q$, 25 ns Fall-Time t_F 36 ns SOURCE- DRAIN DIODE RATINGS AND CHARACTERISTICS -16 AMaximum Body-Diode Continuous Current I_S $(Note 1)$ -64 Maximum Body-Diode Pulsed Current I_{SM} $(Note 1)$ -64 Drain-Source Diode Forward Voltage V_{SD} $I_S=-16A, V_{GS}=0V$ (Note 2) -1.3 V	Gate Threshold Voltage		V _{GS(TH)}	V _{DS} =V _{GS} , I _D =-250µA	-1.0		-3.0	V	
Input Capacitance C_{ISS} $V_{DS}=-25V, V_{GS}=0V, f=1.0MHz$ 11801900pFOutput Capacitance C_{OSS} $V_{DS}=-25V, V_{GS}=0V, f=1.0MHz$ 250pFReverse Transfer Capacitance C_{RSS} $T5$ pFSWITCHING PARAMETERS $T5$ pF Total Gate Charge Q_G Q_{GS} $V_{DS}=-80V, V_{GS}=-10V, I_D=-16A,$ 5 nC Gate to Source Charge Q_{GD} $V_{DS}=-80V, V_{GS}=-10V, I_D=-16A,$ 5 nC Gate to Drain ("Miller") Charge Q_{GD} $V_{DD}=-50V, I_D=-16A, R_G=9.10,$ 15 nC Turn-ON Delay Time t_R $V_{DD}=-50V, I_D=-16A, R_G=9.10,$ 25 ns Fall-Time t_F $R_D = 2.4\Omega$ 56 ns SOURCE- DRAIN DIODE RATINGS AND CHARACTERISTICS -16 AMaximum Body-Diode Continuous Current I_S -16 AMaximum Body-Diode Pulsed Current I_{SM} $(Note 1)$ -64 ADrain-Source Diode Forward Voltage V_{SD} $I_S=16A, V_{GS}=0V$ (Note 2) -1.3 V	Static Drain-Source On-State Res	sistance	R _{DS(ON)}	V _{GS} =-10V, I _D =-16A (Note 2)			0.21	Ω	
Output Capacitance C_{OSS} Q_{SS} V_{DS} =-25V, V_{GS} =0V, f=1.0MHz250pFReverse Transfer Capacitance C_{RSS} V_{DS} =-25V, V_{GS} =0V, f=1.0MHz250pFSWITCHING PARAMETERSTotal Gate Charge Q_G $Gate to Source ChargeQ_GQ_{GD}V_{DS}=-80V, V_{GS}=-10V, I_D=-16A,5nCGate to Drain ("Miller") ChargeQ_{GD}V_{DS}=-80V, V_{GS}=-10V, I_D=-16A,5nCTurn-ON Delay Timet_D(ON)Turn-OFF Delay Timet_RT_EV_{DD}=-50V, I_D=-16A, R_G=9.10,25nsSOURCE- DRAIN DIODE RATINGS AND CHARACTERISTICSs_D-16AMaximum Body-Diode Continuous CurrentI_S-16AMaximum Body-Diode Pulsed CurrentI_{SM}(Note 1)-64ADrain-Source Diode Forward VoltageV_{SD}I_S=£16A, V_{GS}=0V (Note 2)-1.3V$	DYNAMIC PARAMETERS						-	-	
Reverse Transfer Capacitance C_{RSS} 75pFSWITCHING PARAMETERSTotal Gate Charge Q_G Q_G 3760nCGate to Source Charge Q_{GS} V_{DS} =-80V, V_{GS} =-10V, I_D =-16A,5nCGate to Drain ("Miller") Charge Q_{GD} 15nCTurn-ON Delay Time $t_{D(ON)}$ 11nsRise Time t_R V_{DD} =-50V, I_D =-16A, R_G =9.10,25nsTurn-OFF Delay Time $t_{D(OFF)}$ R_D = 2.4 Ω 56nsFall-Time t_F 36nssSOURCE- DRAIN DIODE RATINGS AND CHARACTERISTICSMaximum Body-Diode Continuous Current I_S (Note 1)-16Maximum Body-Diode Pulsed Current I_{SM} (Note 1)-64ADrain-Source Diode Forward Voltage V_{SD} I_S =-16A, V_{GS} =0V (Note 2)-1.3V	Input Capacitance		C _{ISS}	-		1180	1900	рF	
SWITCHING PARAMETERSTotal Gate Charge Q_G Q_G 37 60 nC Gate to Source Charge Q_{GS} V_{DS} =-80V, V_{GS} =-10V, I_D =-16A, 5 nC Gate to Drain ("Miller") Charge Q_{GD} 15 nC Turn-ON Delay Time $t_{D(ON)}$ 11 ns Rise Time t_R V_{DD} =-50V, I_D =-16A, R_G =9.1Q,25 ns Turn-OFF Delay Time $t_D(OFF)$ R_D = 2.4 Ω 56 ns Fall-Time t_F 36 ns SOURCE- DRAIN DIODE RATINGS AND CHARACTERISTICSMaximum Body-Diode Continuous Current I_S -16 AMaximum Body-Diode Pulsed Current I_{SM} $(Note 1)$ -64 ADrain-Source Diode Forward Voltage V_{SD} I_S =-16A, V_{GS} =0V (Note 2) -1.3 V	Output Capacitance		C _{OSS}	/ _{DS} =-25V, V _{GS} =0V, f=1.0MHz		250		pF	
Total Gate Charge Q_G Q_G 37 60 nC Gate to Source Charge Q_{GS} Q_{GS} V_{DS} =-80V, V_{GS} =-10V, I_D =-16A, 5 nC Gate to Drain ("Miller") Charge Q_{GD} 15 nC Turn-ON Delay Time $t_{D(ON)}$ t_R V_{DD} =-50V, I_D =-16A, R_G =9.1Q, 25 ns Turn-OFF Delay Time t_R V_{DD} =-50V, I_D =-16A, R_G =9.1Q, 25 ns Fall-Time t_F 36 ns SOURCE- DRAIN DIODE RATINGS AND CHARACTERISTICSMaximum Body-Diode Continuous Current I_S -16 AMaximum Body-Diode Pulsed Current I_{SM} $(Note 1)$ -64 ADrain-Source Diode Forward Voltage V_{SD} I_S =-16A, V_{GS} =0V (Note 2) -1.3 V	Reverse Transfer Capacitance		C _{RSS}			75		рF	
Gate to Source Charge Q_{GS} V_{DS} =-80V, V_{GS} =-10V, I_D =-16A,5nCGate to Drain ("Miller") Charge Q_{GD} 15nCTurn-ON Delay Time $t_{D(ON)}$ 11nsRise Time t_R V_{DD} =-50V, I_D =-16A, R_G =9.10,25nsTurn-OFF Delay Time $t_{D(OFF)}$ R_D = 2.4 Ω 56nsFall-Time t_F 36nsSOURCE- DRAIN DIODE RATINGS AND CHARACTERISTICSMaximum Body-Diode Continuous Current I_S -16AMaximum Body-Diode Pulsed Current I_{SM} (Note 1)-64ADrain-Source Diode Forward Voltage V_{SD} I_S =-16A, V_{GS} =0V (Note 2)-1.3V	SWITCHING PARAMETERS						-	-	
Gate to Drain ("Miller") Charge Q_{GD} 15nCTurn-ON Delay Time $t_{D(ON)}$ $t_{D(ON)}$ 11nsRise Time t_R V_{DD} =-50V, I_D =-16A, R_G =9.1Q,25nsTurn-OFF Delay Time $t_D(OFF)$ R_D = 2.4Q56nsFall-Time t_F 36nsSOURCE- DRAIN DIODE RATINGS AND CHARACTERISTICSMaximum Body-Diode Continuous Current I_S -16AMaximum Body-Diode Pulsed Current I_{SM} (Note 1)-64ADrain-Source Diode Forward Voltage V_{SD} I_S =-16A, V_{GS} =0V (Note 2)-1.3V	Total Gate Charge		Q_{G}			37	60	nC	
Turn-ON Delay Time $t_{D(ON)}$ 11nsRise Time t_R V_{DD} =-50V, I_D =-16A, R_G =9.1Q,25nsTurn-OFF Delay Time $t_{D(OFF)}$ R_D = 2.4Q56nsFall-Time t_F 36nsSOURCE- DRAIN DIODE RATINGS AND CHARACTERISTICSMaximum Body-Diode Continuous Current I_S -16AMaximum Body-Diode Pulsed Current I_{SM} (Note 1)-64ADrain-Source Diode Forward Voltage V_{SD} I_S =-16A, V_{GS} =0V (Note 2)-1.3V	Gate to Source Charge		Q _{GS}	V_{DS} =-80V, V_{GS} =-10V, I_{D} =-16A,		5		nC	
Rise Time t_R V_{DD} =-50V, I_D =-16A, R_G =9.10,25nsTurn-OFF Delay Time $t_{D(OFF)}$ R_D = 2.4056nsFall-Time t_F 36nsSOURCE- DRAIN DIODE RATINGS AND CHARACTERISTICSMaximum Body-Diode Continuous Current I_S -16AMaximum Body-Diode Pulsed Current I_{SM} (Note 1)-64ADrain-Source Diode Forward Voltage V_{SD} I_S =-16A, V_{GS} =0V (Note 2)-1.3V	Gate to Drain ("Miller") Charge		Q _{GD}			15		nC	
$\begin{tabular}{ c c c c c c c c c c c c c c c c c c c$	Turn-ON Delay Time		t _{D(ON)}			11		ns	
Fall-Time t _F 36 ns SOURCE- DRAIN DIODE RATINGS AND CHARACTERISTICS 36 ns Maximum Body-Diode Continuous Current Is -16 A Maximum Body-Diode Pulsed Current Is -64 A Drain-Source Diode Forward Voltage V _{SD} I _S =16A, V _{GS} =0V (Note 2) -1.3 V	Rise Time		t _R	V _{DD} =-50V, I _D =-16A, R _G =9.1Q,		25		ns	
SOURCE- DRAIN DIODE RATINGS AND CHARACTERISTICS Maximum Body-Diode Continuous Current Is -16 A Maximum Body-Diode Pulsed Current Ism (Note 1) -64 A Drain-Source Diode Forward Voltage Vsp Is=16A, Vgs=0V (Note 2) -1.3 V	Turn-OFF Delay Time		t _{D(OFF)}	$R_D = 2.4\Omega$	0	56		ns	
Maximum Body-Diode Continuous Current Is -16 A Maximum Body-Diode Pulsed Current Ism (Note 1) -64 A Drain-Source Diode Forward Voltage Vsp Is=-16A, Vgs=0V (Note 2) -1.3 V	Fall-Time		t⊨	SR OI		36		ns	
Maximum Body-Diode Pulsed Current I _{SM} (Note 1) -64 A Drain-Source Diode Forward Voltage V _{SD} I _S =-16A, V _{GS} =0V (Note 2) -1.3 V	SOURCE- DRAIN DIODE RATINGS AND CHARACTERISTICS								
Drain-Source Diode Forward Voltage V _{SD} I _S =-16A, V _{GS} =0V (Note 2) -1.3 V	Maximum Body-Diode Continuous Current		Is	1 60°			-16	Α	
Drain-Source Diode Forward Voltage V _{SD} I _S =16A, V _{GS} =0V (Note 2) -1.3 V	Maximum Body-Diode Pulsed Current		I _{SM}	(Note 1)			-64	Α	
	Drain-Source Diode Forward Volt	age					-1.3	V	

Notes: 1. Pulse test; pulse width $\leq 300 \ \mu$ s, duty cycle $\leq 2 \ \%$.

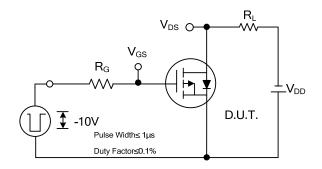
2. Repetitive rating; pulse width limited by max. junction temperature.

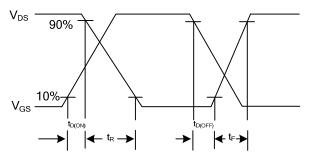
■ TEST CIRCUITS AND WAVEFORMS



UTT16P10

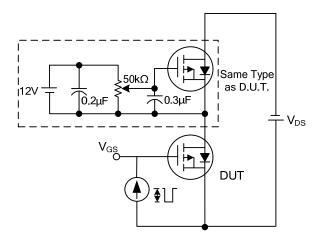
TEST CIRCUITS AND WAVEFORMS

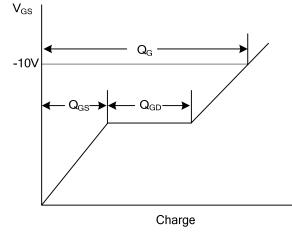




Switching Test Circuit

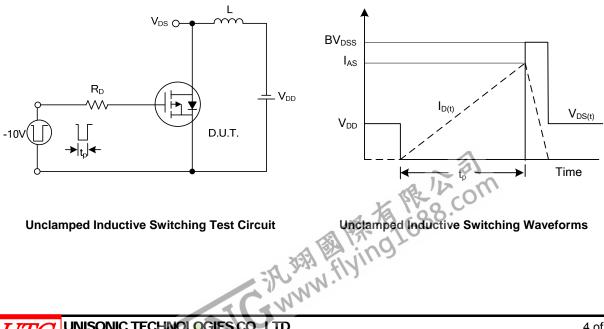






Gate Charge Test Circuit

Gate Charge Waveform



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