Wuxi Unigroup Microelectronics CO.,LTD.

40V N-Channel Trench MOSFET(Preliminary)

General Description

- Trench Power technology
- Low $R_{DS(ON)}$
- Low Gate Charge
- Optimized for fast-switching applications

Applications

- Synchronous Rectification in DC/DC and AC/DC Converters
- Isolated DC/DC Converters in Telecom and Industrial

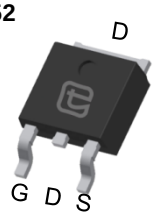
Product Summary

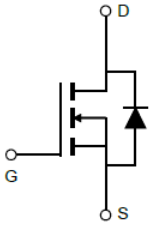
V_{DS}	40V
I_D (at V_{GS}=10V)	20A
$R_{DS(ON)}$ (at V_{GS}=10V)	<23mΩ
$R_{DS(ON)}$ (at V_{GS}=4.5V)	<28mΩ

100% UIS Tested

RoHS

TO-252





Part Number	Package Type	Form	Marking
TTD20N04AT	TO-252	Tape&Reel	TTD20N04AT

Absolute Maximum Ratings (T_A =25°C unless otherwise noted)

Parameter		Symbol	Maximum	Units
Drain-Source Voltage		V_{DS}	40	V
Gate-Source Voltage		V_{GS}	±20	V
Continuous Drain Current [B]	T_C =25°C	I_D	20	A
	T_C =100°C		17	
Pulsed Drain Current [A]		I_{DM}	60	A
Avalanche Current [A]		I_{AS}	13	A
Single Pulse Avalanche Energy L =0.3mH [A]		E_{AS}	25	mJ
Power Dissipation [C]	T_C =25°C	P_D	28.8	W
	T_C =100°C		14.4	W
Junction and Storage Temperature Range		T_J, T_{STG}	-55 to 175	°C

Thermal Characteristics

Parameter		Symbol	Maximum	Units
Maximum Junction-to-Case	Steady-State	$R_{\theta JC}$	5.2	°C/W
Maximum Junction-to-Ambient	Steady-State	$R_{\theta JA}$	100	

Electrical Characteristics(T_J =25ºC unless otherwise noted)

Symbol	Parameter	Conditions		Value			Units
				Min	Typ	Max	
STATIC PARAMETERS							
BV_{DSS}	Drain-Source Breakdown Voltage	I_D =250μA,V_{GS} =0V		40			V
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS} =40V, V_{GS} =0V	T_J =25ºC			1	μA
			T_J =125ºC			100	
I_{GSS}	Gate-Body Leakage Current	V_{DS} =0V, V_{GS} =±20V				±100	nA
$V_{GS(th)}$	Gate Threshold Voltage	V_{DS} =V_{GS}, I_D =250μA		1	1.4	2	V
$R_{DS(ON)}$	Static Drain-Source On-Resistance	V_{GS} =10V, I_D =20A			18	23	mΩ
		V_{GS} =4.5V, I_D =16A			21.5	28	mΩ
g_{FS}	Forward Transconductance	V_{DS} =5V, I_D =20A			19		S
V_{SD}	Diode Forward Voltage	I_S =20A, V_{GS} =0V				1	V
I_S	Maximum Body-Diode Continuous Current [B]					20	A
DYNAMIC PARAMETERS							
C_{iss}	Input Capacitance	V_{GS} =0V, V_{DS} =20V, f =1MH_Z			659		pF
C_{oss}	Output Capacitance				70		
C_{rss}	Reverse Transfer Capacitance				62		
R_g	Gate Resistance	f =1MH_Z			1.2		Ω
SWITCHING PARAMETERS							
Q_g(10V)	Total Gate Charge	V_{GS} =10V,V_{DS} =20V, I_D =20A			16.7		nC
Q_g(4.5V)	Total Gate Charge				9		
Q_{gs}	Gate Source Charge				1.9		
Q_{gd}	Gate Drain Charge				4.5		
$t_{D(on)}$	Turn-On Delay Time	V_{GS} =10V,V_{DS} =20V, I_D =20A, R_G =1.8Ω			31		ns
t_r	Turn-On Rise Time				3.6		
$T_{D(off)}$	Turn-Off Delay Time				46		
t_f	Turn-Off Fall Time				2.8		
t_{rr}	Body Diode Reverse Recovery Time	I_F =20A, di/dt =100A/μs			18.3		ns
Q_{rr}	Body Diode Reverse Recovery Charge				4		nC

A. Single pulse width limited by maximum junction temperature.

B. The maximum current rating is package limited.

C. The power dissipation P_D is based on $T_{J(MAX)}$ =175ºC, using junction-to-case thermal resistance, and is more useful in setting the upper dissipation limit for cases where additional heatsinking is used.

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

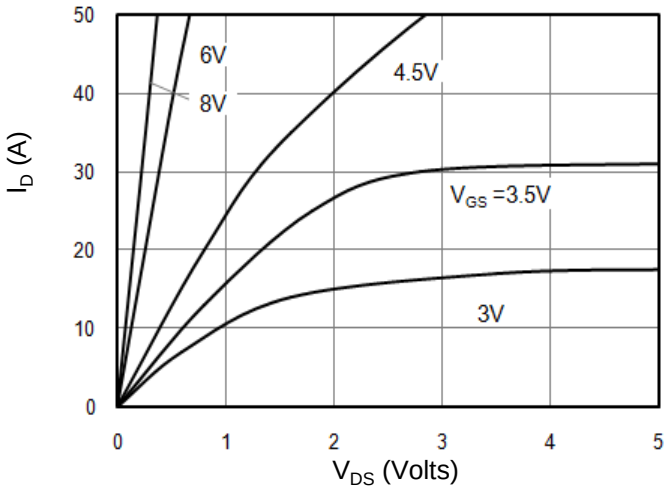


Figure 1: On-Region Characteristics

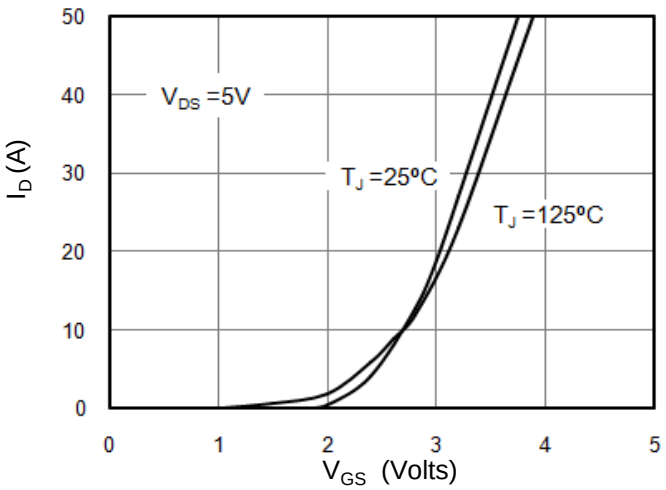


Figure 2: Transfer Characteristics

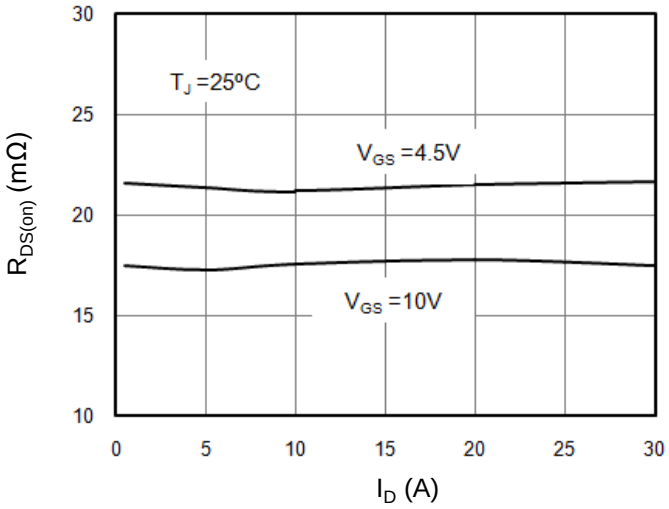


Figure 3: On-Resistance vs. Drain Current

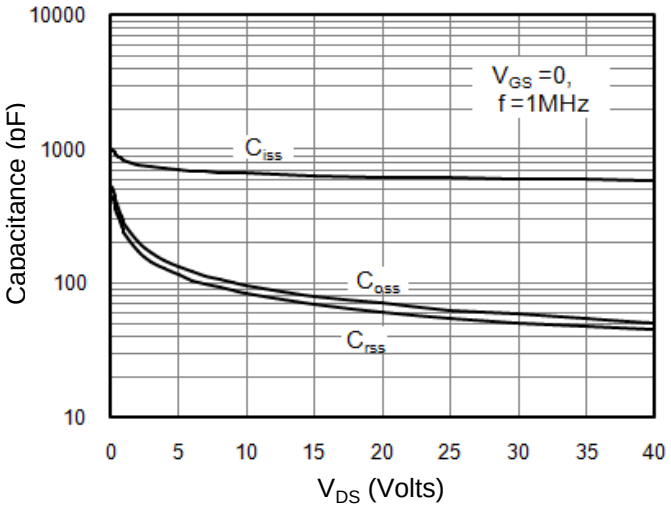


Figure 4: Capacitance Characteristics

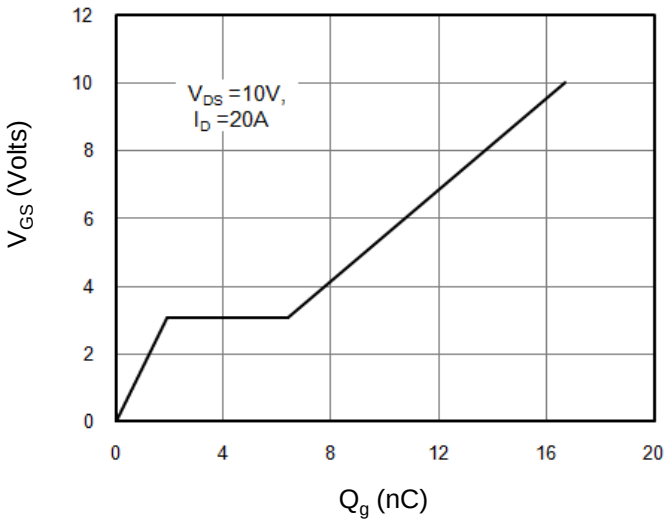


Figure 5: Gate Charge Characteristics

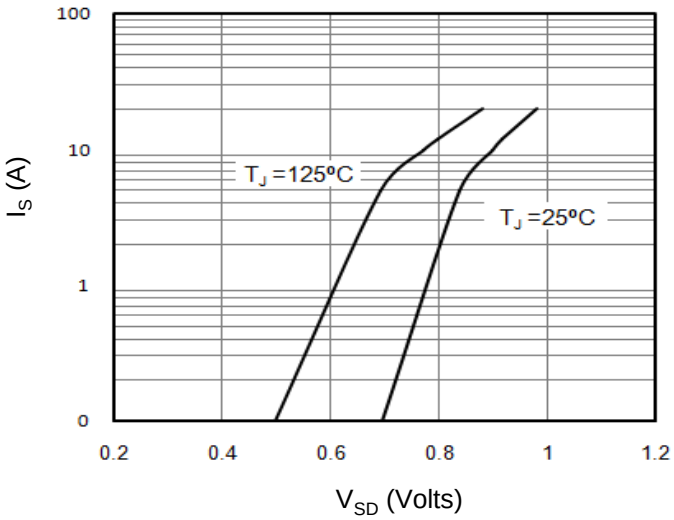


Figure 6: Body Diode Forward Voltage

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

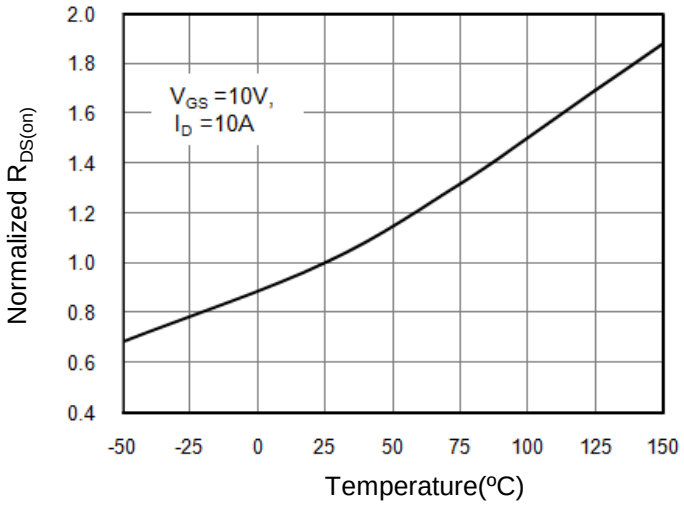


Figure 7: On-Resistance vs. Junction Temperature

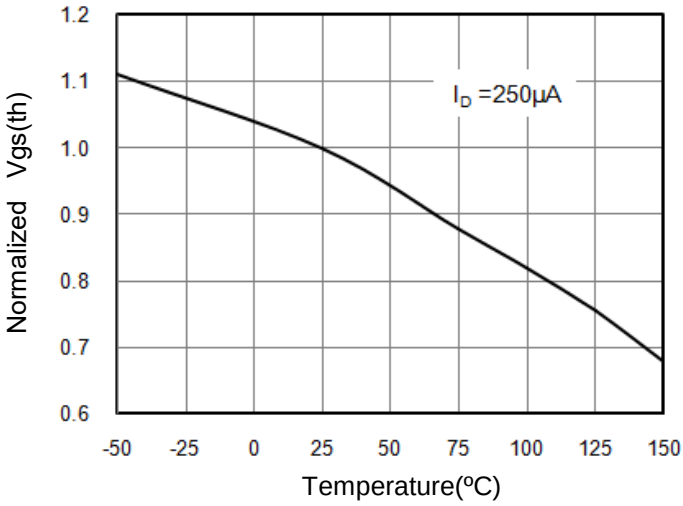


Figure 8: Vgs(th) vs. Junction Temperature

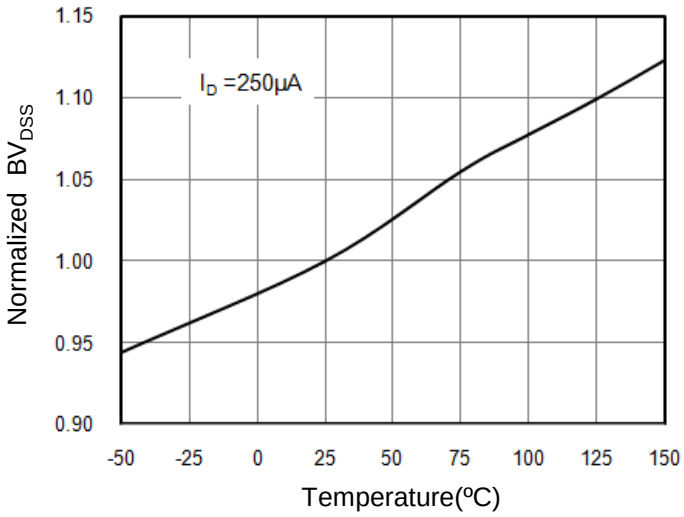


Figure 9: BV_{DSS} vs. Junction Temperature

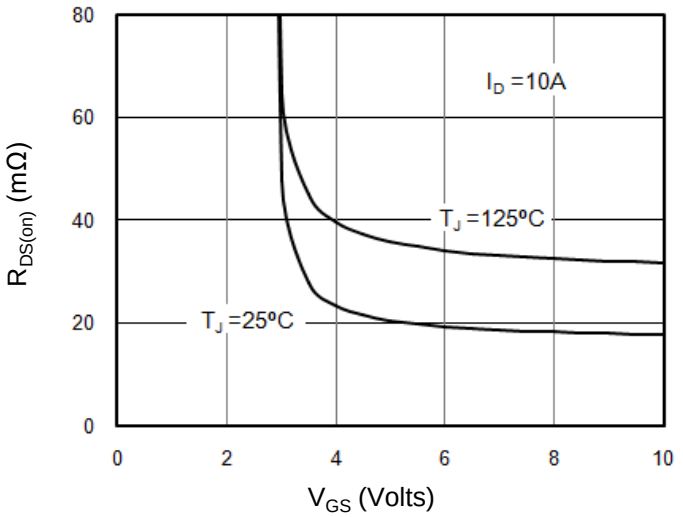


Figure 10: On-Resistance vs. Gate-Source Voltage

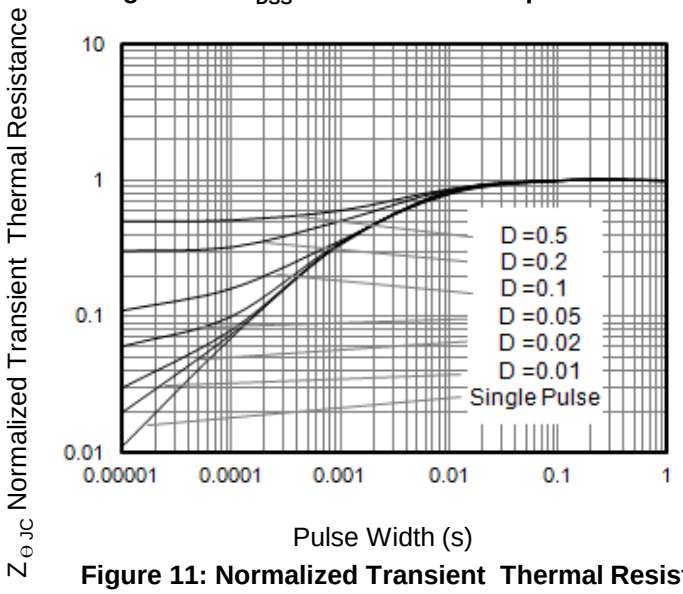


Figure 11: Normalized Transient Thermal Resistance

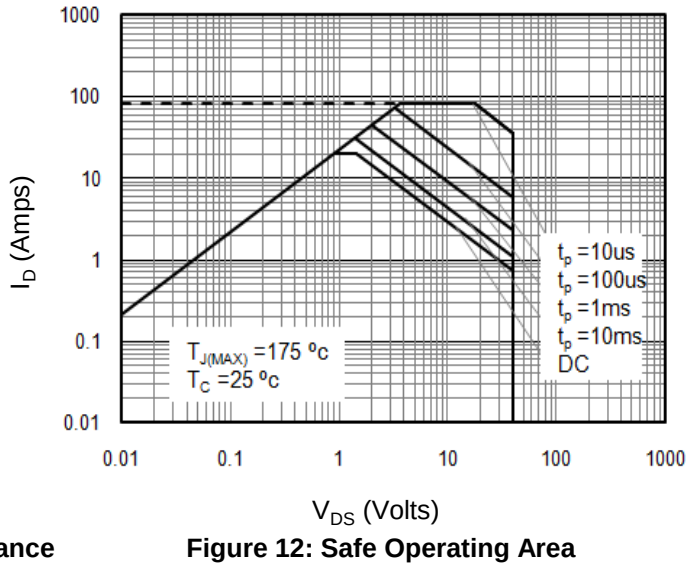


Figure 12: Safe Operating Area

Figure A：Gate Charge Test Circuit and Waveforms

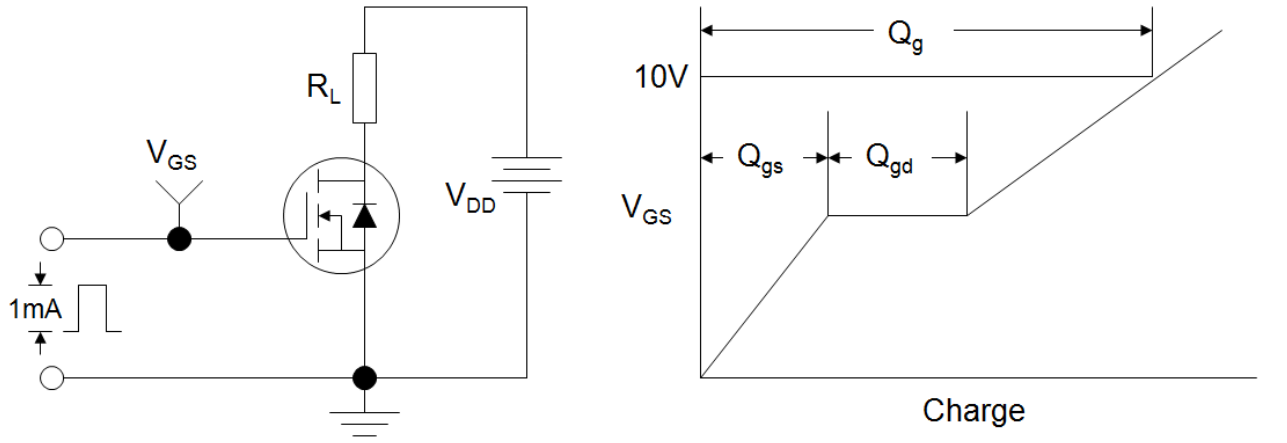


Figure B：Resistive Switching Test Circuit and Waveforms

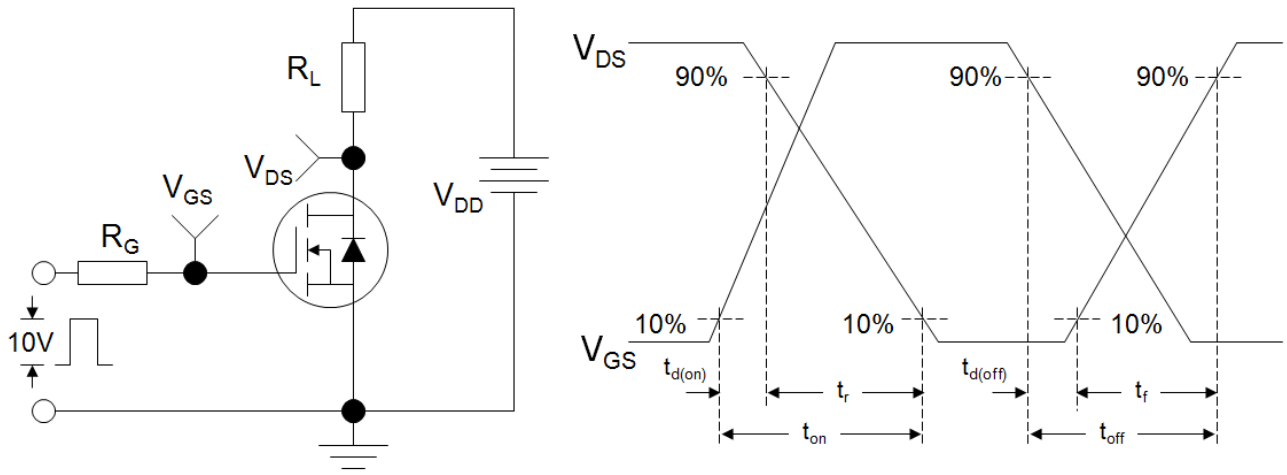
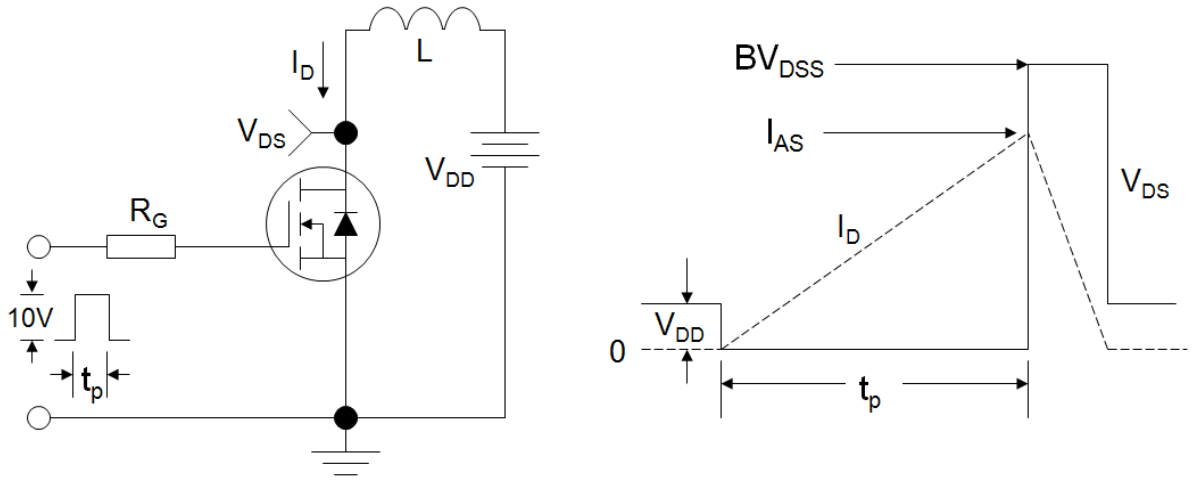
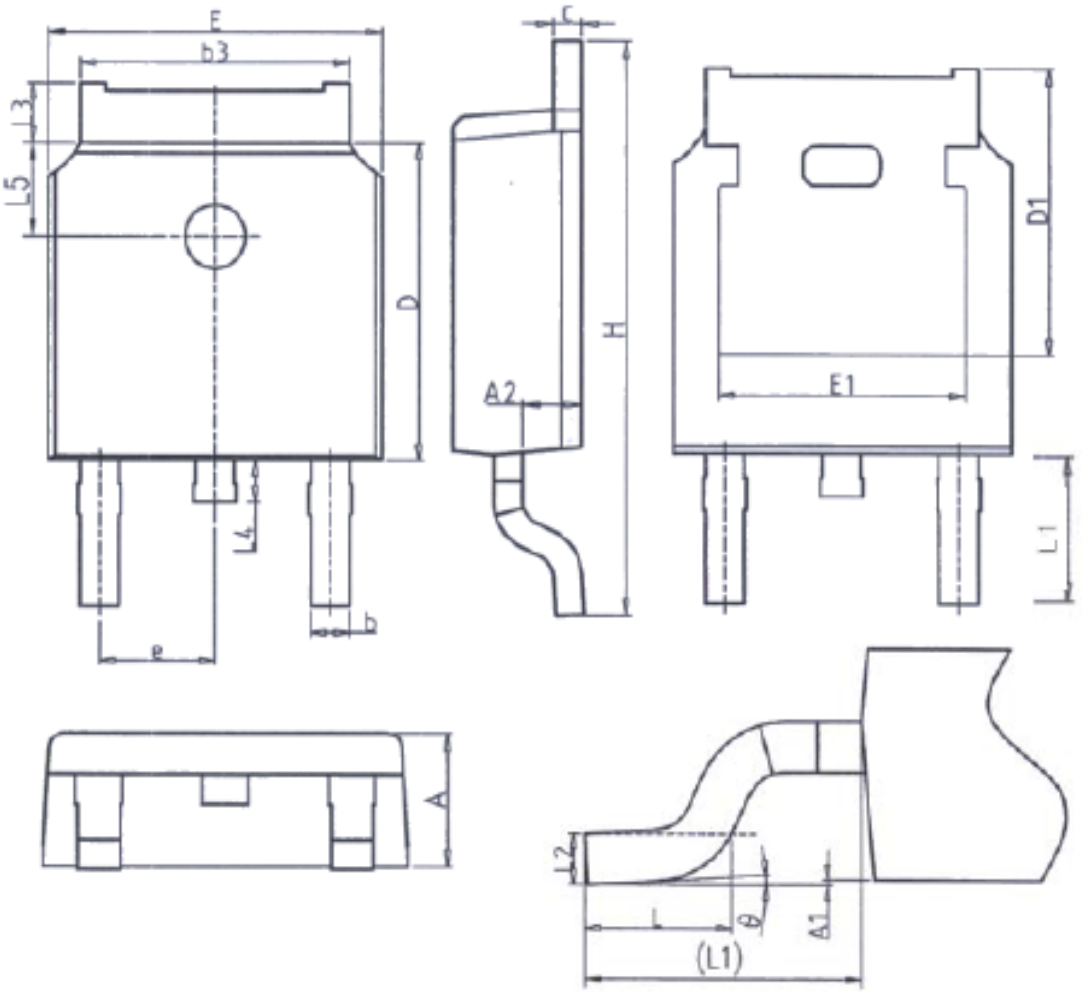


Figure C：Unclamped Inductive Switching (UIS) Test Circuit and Waveforms



TO-252(集佳)



Unit：mm			
Symbol	Min	Nom	Max
A	2.20	2.30	2.38
A1	0.00	-	0.10
A2	0.90	1.01	1.10
b	0.72	-	0.85
b3	5.13	5.33	5.46
c	0.47	-	0.60
D	6.00	6.10	6.20
D1		5.25 REF	
E	6.50	6.60	6.70
E1	4.70	-	-

Unit：mm			
Symbol	Min	Nom	Max
e		2.286BSC	
H	9.80	10.10	10.40
L	1.40	1.50	1.70
L1		2.90REF	
L2		0.508BSC	
L3	0.90	-	1.25
L4	0.60	0.80	1.00
L5		1.8 REF	
θ	0°	-	8°

Disclaimer

All product specifications and data are subject to change without notice.

For documents and material available from this datasheet, Wuxi Unigroup does not warrant or assume any legal liability or responsibility for the accuracy, completeness of any product or technology disclosed hereunder.

No license, express or implied, by estoppels or otherwise, to any intellectual property rights is granted by this document or by any conduct of Wuxi Unigroup.

The products shown herein are not designed for use in medical, life-saving, or life-sustaining applications. Customers using or selling Wuxi Unigroup products not expressly indicated for use in such applications do so entirely at their own risk and agree to fully indemnify Wuxi Unigroup for any damages arising or resulting from such use or sale.

Wuxi Unigroup disclaims any and all liability arising out of the use or application of any product described herein or of any information provided herein to the maximum extent permitted by law. The product specifications do not expand or otherwise modify Wuxi Unigroup's terms and conditions of purchase, including but not limited to the warranty expressed therein, which apply to these products.

Wuxi Unigroup Microelectronics CO., LTD. strives to supply high-quality high-reliability products. However, any and all semiconductor products fail with some probability. It is possible that these probabilistic failures could give rise to accidents or events that could endanger human lives that could give rise to smoke or fire, or that could cause damage to other property. When designing equipment, adopt safety measures so that these kinds of accidents or events cannot occur. Such measures include but are not limited to protective circuits and error prevention circuits for safe design, redundant design, and structural design.

In the event that any or all Wuxi Unigroup products (including technical data, services) described or contained herein are controlled under any of applicable local export control laws and regulations, such products must not be exported without obtaining the export license from the authorities concerned in accordance with the above law.

Information (including circuit diagrams and circuit parameters) herein is for example only. It is not guaranteed for volume production. Wuxi Unigroup believes information herein is accurate and reliable, but no guarantees are made or implied regarding its use or any infringements of intellectual property rights or other rights of third parties.