Wuxi Unigroup Microelectronics CO.,LTD.

40V P-Channel Trench MOSFET

Features

- Trench Power Technology
- Low $R_{DS(ON)}$
- Low Gate Charge
- Optimized for Fast-switching Applications

Applications

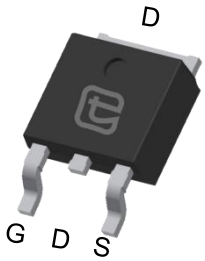
- Synchronous Rectification in DC/DC and AC/DC Converters
- Isolated DC/DC Converters in Telecom and Industrial

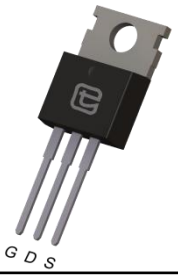
Product Summary

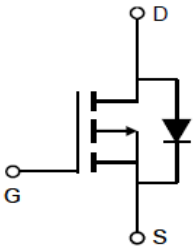
V_{DS}	-40V
$R_{DS(ON)}$ (at V_{GS}=-10V)	< 6.5mΩ
$R_{DS(ON)}$ (at V_{GS}=-4.5V)	<10mΩ
I_D (at V_{GS}=-10V)	-70A

100% UIS Tested

RoHS







Device	Package	Marking
TTD70P04AT	TO-252	70P04AT
TTP70P04AT	TO-220	70P04AT

Absolute Maximum Ratings T_C = 25ºC, unless otherwise noted

Parameter		Symbol	Value	Unit
Drain-Source Voltage (V_{GS} = 0V)		V_{DSS}	-40	V
Continuous Drain Current	T_C = 25ºC	I_D	-70	A
	T_C = 100ºC		-49	
Pulsed Drain Current (note1)		I_{DM}	-280	A
Gate-Source Voltage		V_{GSS}	±20	V
Single Pulse Avalanche Energy (note2)		E_{AS}	487	mJ
Avalanche Current		I_{As}	-57	A
Power Dissipation (note3)	T_C = 25ºC	P_D	143	W
	T_C = 100ºC		71.43	W
Operating Junction and Storage Temperature Range		T_J, T_{stg}	-55~+175	ºC

Thermal Resistance

Parameter	Symbol	Value	Unit
Thermal Resistance, Junction-to-Case	R_{thJC}	1.05	ºC/W
Thermal Resistance, Junction-to-Ambient	R_{thJA}	60	

Specifications T_J = 25ºC, unless otherwise noted

Parameter	Symbol	Test Conditions	Value			Unit
			Min.	Typ.	Max.	
Static						
Drain-Source Breakdown Voltage	$V_{(BR)DSS}$	V_{GS} = 0V, I_D = -250μA	-40	--	--	V
Zero Gate Voltage Drain Current	I_{DSS}	V_{DS} = -40V, V_{GS} = 0V, T_J = 25ºC	--	--	-1	μA
		V_{DS} = -40V, V_{GS} = 0V, T_J = 100ºC	--	--	-25	
Gate-Source Leakage	I_{GSS}	V_{GS} = ±20V	--	--	±100	nA
Gate-Source Threshold Voltage	$V_{GS(th)}$	V_{DS} = V_{GS}, I_D = -250μA	-1.0	-1.7	-2.4	V
Drain-Source On-Resistance (Note3)	$R_{DS(on)}$	V_{GS} = -10V, I_D = -30A	--	5.5	6.5	mΩ
		V_{GS} = -4.5V, I_D = -30A	--	8.3	10	mΩ
Forward Transconductance (Note3)	g_{fs}	V_{DS} = -5V, I_D = -20A	38	--	--	S
Dynamic						
Input Capacitance	C_{iss}	V_{GS} = 0V, V_{DS} = -20V, f = 1.0MHz	--	3285	--	pF
Output Capacitance	C_{oss}		--	560	--	
Reverse Transfer Capacitance	C_{rss}		--	370	--	
Total Gate Charge	Q_g	V_{DD} = -20V, I_D = -30A, V_{GS} = -10V	--	147	--	nC
Gate-Source Charge	Q_{gs}		--	26	--	
Gate-Drain Charge	Q_{gd}		--	24	--	
Turn-on Delay Time	$t_{d(on)}$	V_{DD} = -20V, I_D = -30A, R_G = 2.5Ω	--	16	--	ns
Turn-on Rise Time	t_r		--	15	--	
Turn-off Delay Time	$t_{d(off)}$		--	78	--	
Turn-off Fall Time	t_f		--	21	--	
Drain-Source Body Diode Characteristics						
Continuous Body Diode Current	I_S	T_C = 25ºC	--	--	-70	A
Pulsed Diode Forward Current	I_{SM}		--	--	-280	
Body Diode Voltage	V_{SD}	T_J = 25ºC, I_{SD} = -30A, V_{GS} = 0V	--	--	-1.2	V
Reverse Recovery Time	t_{rr}	I_F = -30A, di_F/dt = 100A/μs	--	54	--	ns
Reverse Recovery Charge	Q_{rr}		--	55	--	nC

Notes

1. Repetitive Rating: Pulse width limited by maximum junction temperature
2. V_{DD} = 40V, R_G = 25Ω, Starting T_J = 25°C
3. Pulse Test: Pulse width ≤ 300μs, Duty Cycle ≤ 1%

Typical Characteristics T_J = 25ºC, unless otherwise noted

Figure 1. Output Characteristics

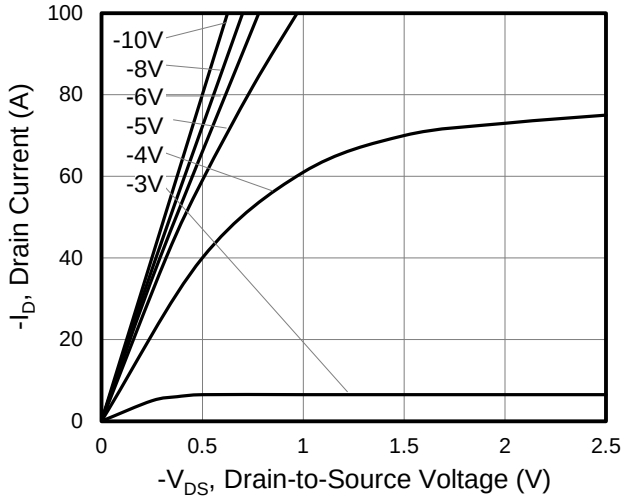


Figure 2. Transfer Characteristics

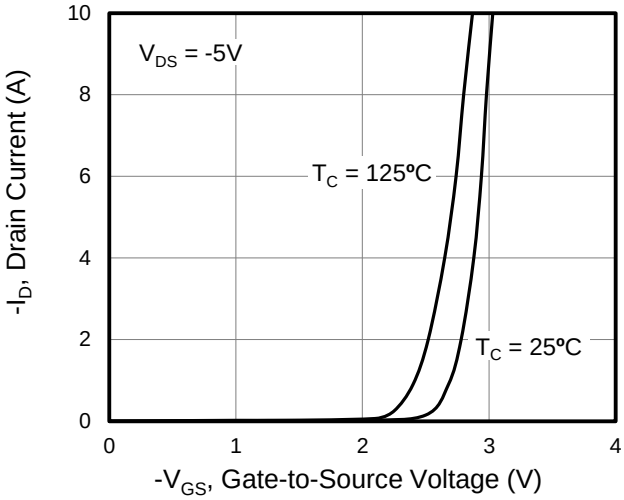


Figure 3. On-Resistance vs. Drain Current

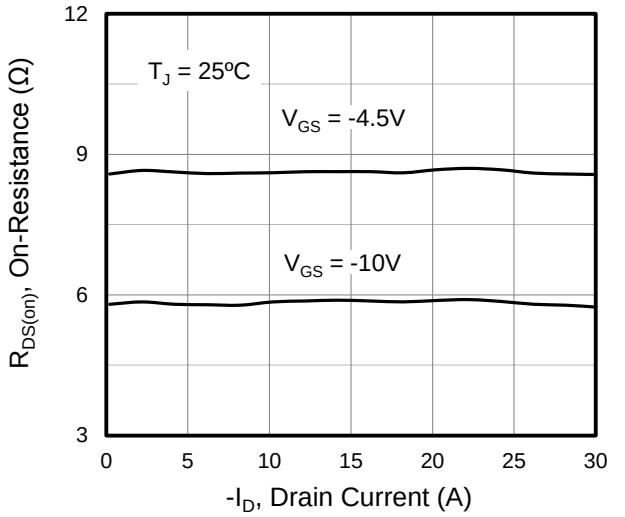


Figure 4. Capacitance

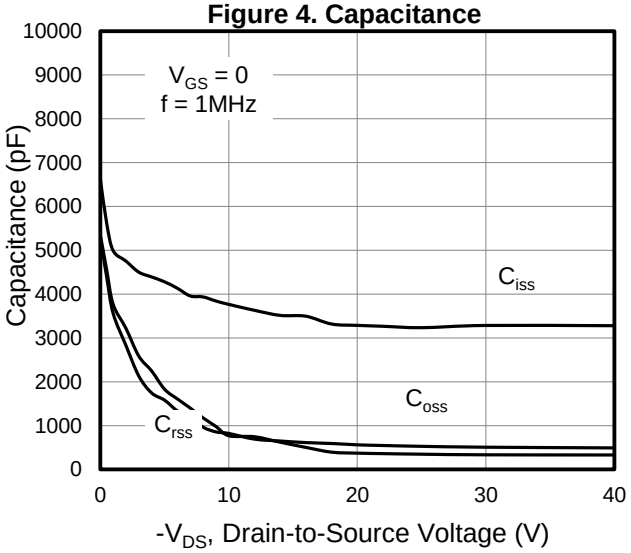


Figure 5. Gate Charge

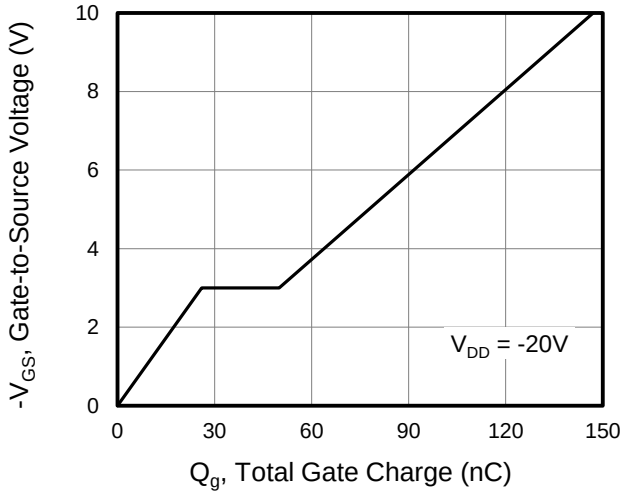
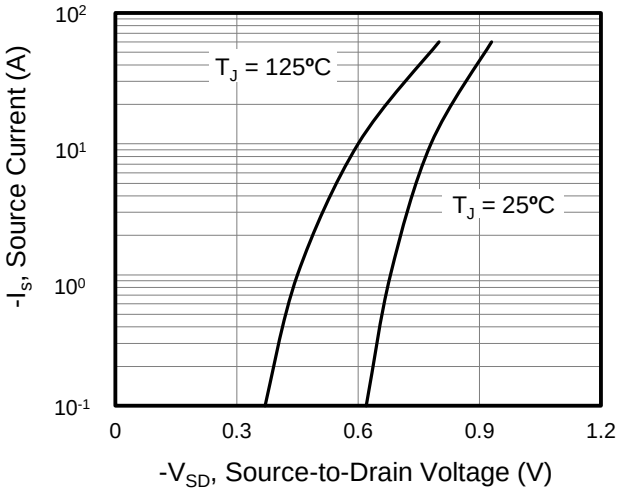


Figure 6. Body Diode Forward Voltage



Typical Characteristics T_J = 25ºC, unless otherwise noted

Figure 7. On-Resistance vs. Junction Temperature

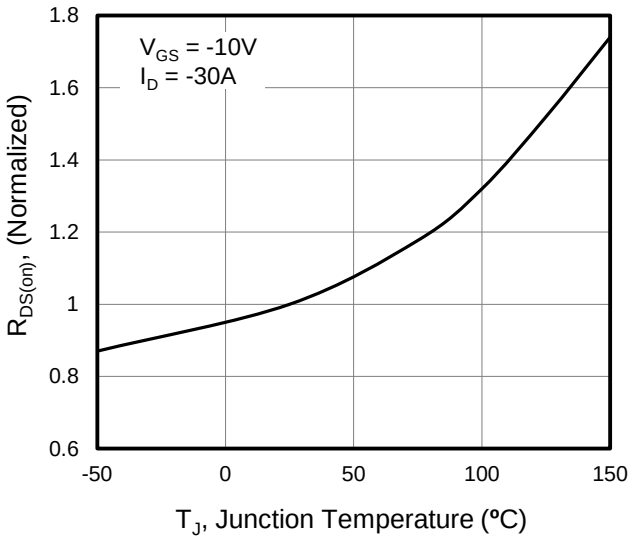


Figure 8. Threshold Voltage vs. Junction Temperature

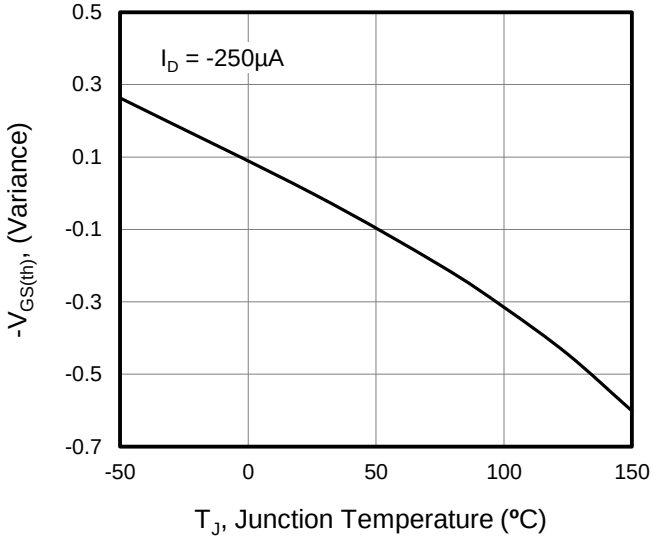


Figure 9. Transient Thermal Impedance

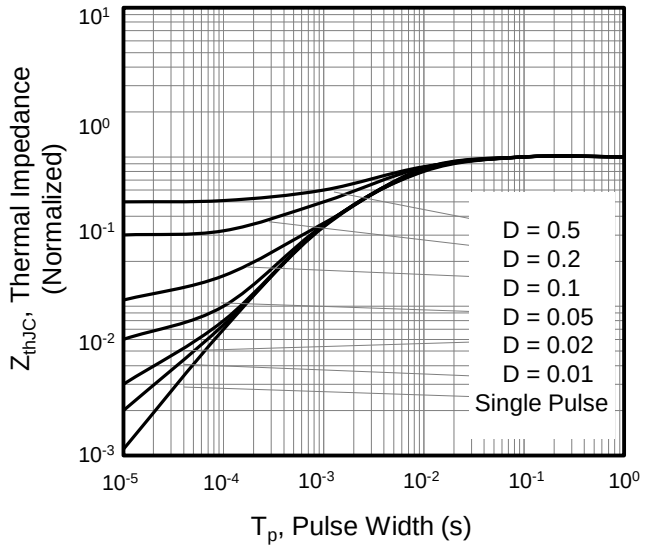


Figure 10. Safe operation area

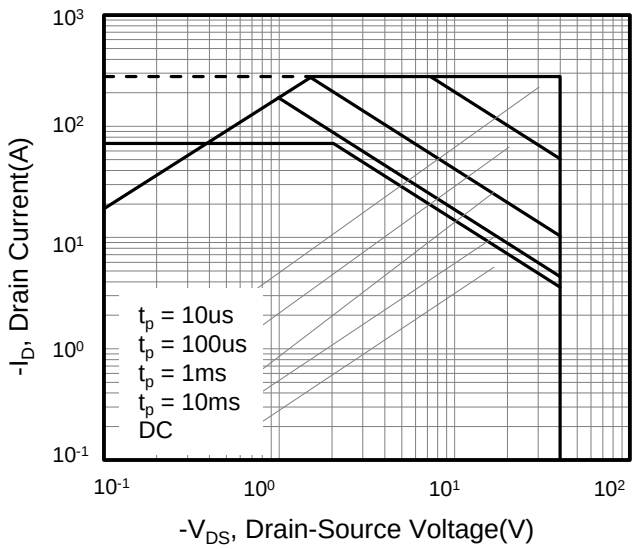


Figure A：Gate Charge Test Circuit and Waveform

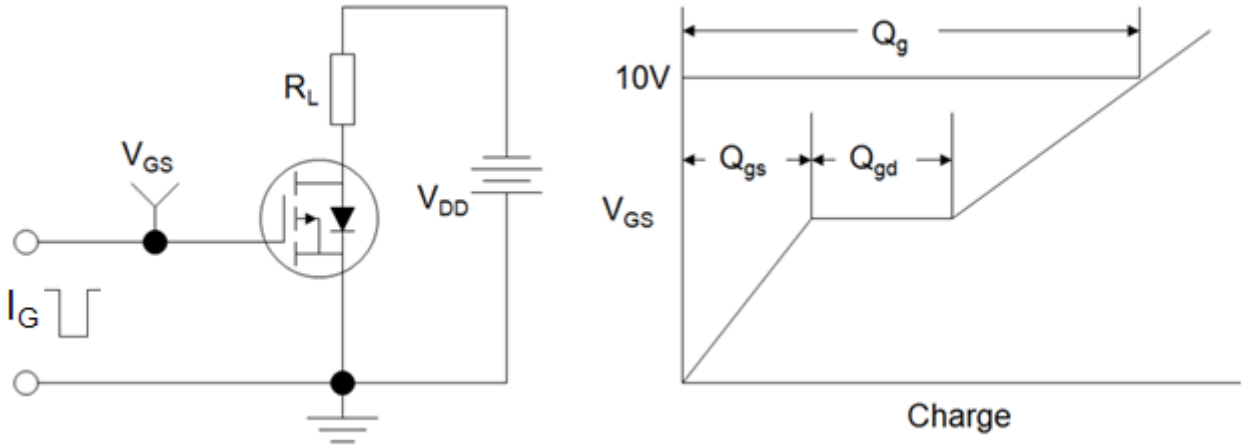


Figure B：Resistive Switching Test Circuit and Waveform

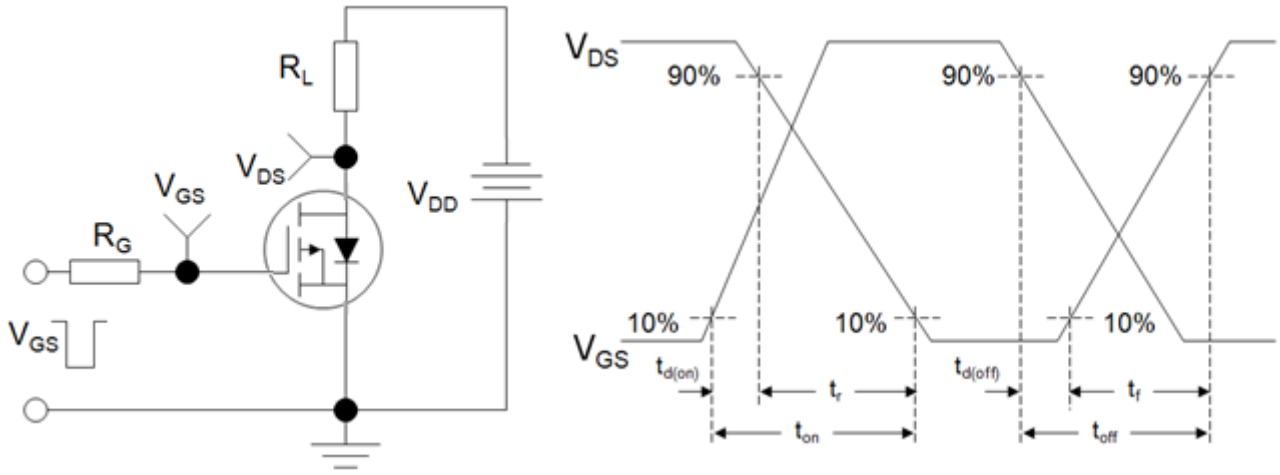
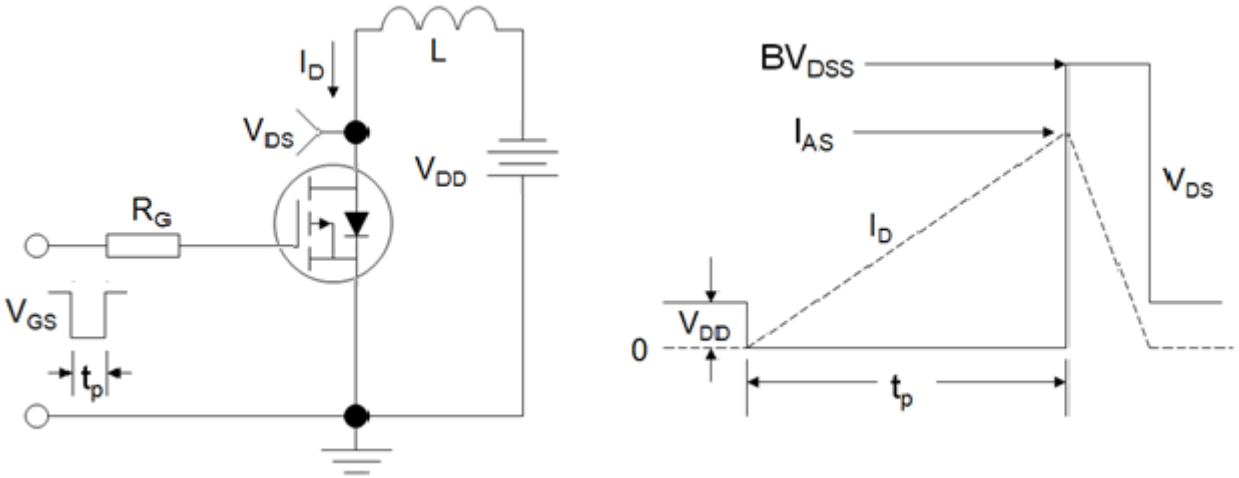
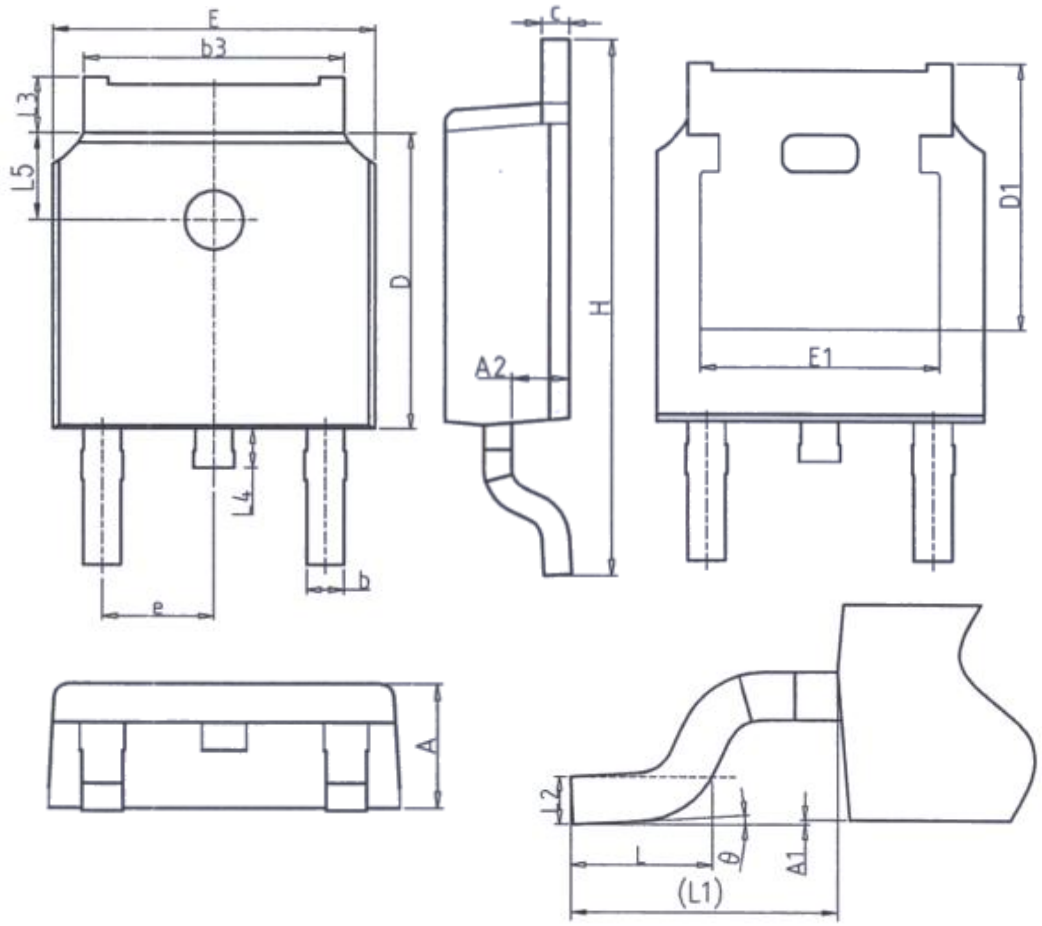


Figure C：Unclamped Inductive Switching Test Circuit and Waveform



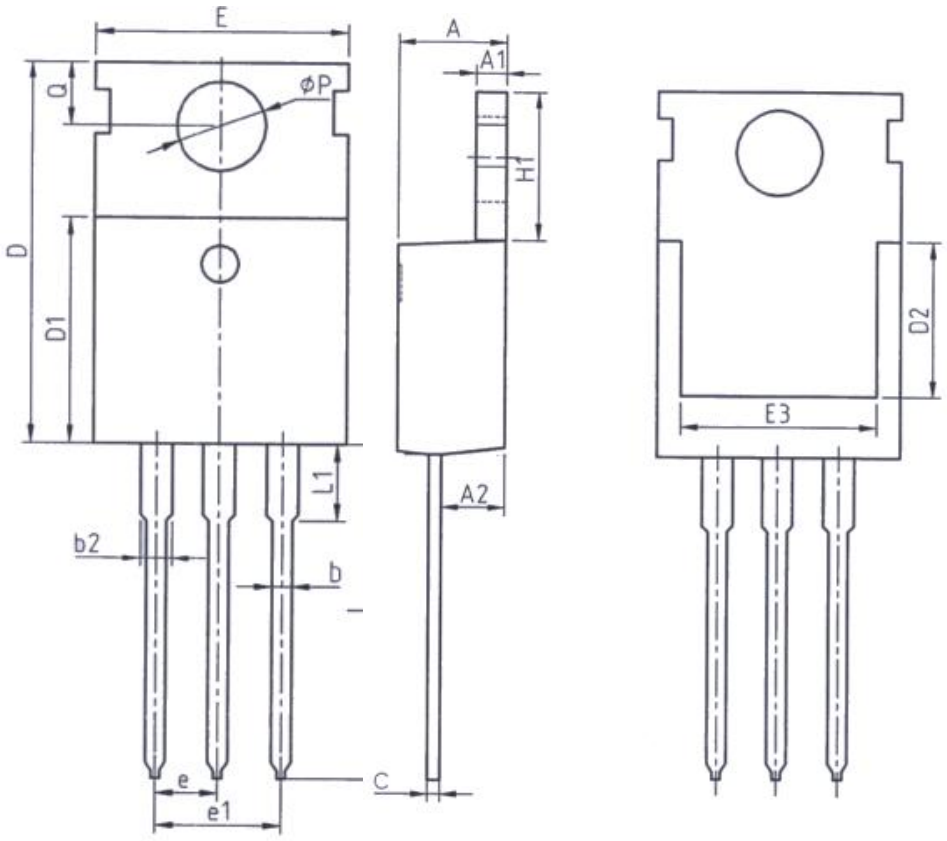
TO-252



Unit: mm		
Symbol	Min.	Max.
A	2.20	2.40
A1	0.00	0.20
A2	0.97	1.17
b	0.68	0.90
b3	5.20	5.50
c	0.43	0.63
D	5.98	6.22
D1	5.30REF	
E	6.40	6.80
E1	4.63	–

Unit: mm		
Symbol	Min.	Max.
e	2.286BSC	
H	9.40	10.50
L	1.38	1.75
L1	2.90REF	
L2	0.51BSC	
L3	0.88	1.28
L4	–	1.00
L5	1.65	1.95
θ	0°	8°

TO-220



Unit: mm		
Symbol	Min.	Max.
A	4.37	4.77
A1	1.25	1.45
A2	2.20	2.60
b	0.70	0.95
b2	1.17	1.47
c	0.40	0.65
D	15.10	16.10
D1	8.80	9.40
D2	5.50	–

Unit: mm		
Symbol	Min.	Max.
E	9.70	10.30
E3	7.00	–
e	2.54BSC	
e1	5.08BSC	
H1	6.25	6.85
L	12.75	13.80
L1	–	3.40
P	3.40	3.80
Q	2.60	3.00

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