
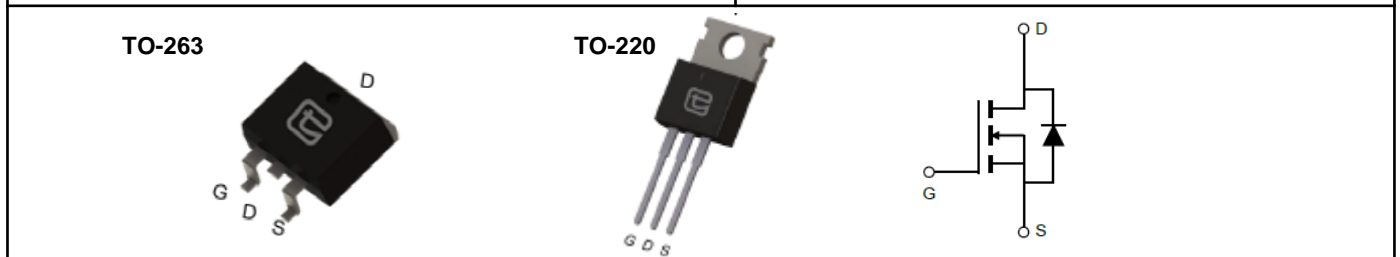




## 68V N-Channel Trench MOSFET(Preliminary)

<p><b>General Description</b></p> <ul style="list-style-type: none"> <li>● Trench Power technology</li> <li>● Low <math>R_{DS(ON)}</math></li> <li>● Low Gate Charge</li> <li>● Optimized for fast-switching applications</li> </ul> <p><b>Applications</b></p> <ul style="list-style-type: none"> <li>● Synchronous Rectification in DC/DC and AC/DC Converters</li> <li>● Isolated DC/DC Converters in Telecom and Industrial</li> </ul>	<p><b>Product Summary</b></p> <table> <tr> <td><math>V_{DS}</math></td> <td>68V</td> </tr> <tr> <td><math>I_D</math> (at <math>V_{GS}=10V</math>)</td> <td>135A</td> </tr> <tr> <td><math>R_{DS(ON)}</math> (at <math>V_{GS}=10V</math>)</td> <td>&lt; 5.0mΩ</td> </tr> </table> <p>100% UIS Tested</p> 	$V_{DS}$	68V	$I_D$ (at $V_{GS}=10V$ )	135A	$R_{DS(ON)}$ (at $V_{GS}=10V$ )	< 5.0mΩ
$V_{DS}$	68V						
$I_D$ (at $V_{GS}=10V$ )	135A						
$R_{DS(ON)}$ (at $V_{GS}=10V$ )	< 5.0mΩ						



Part Number	Package Type	Form	Marking
TTB135N68A	TO-263	Tape&Reel	135N68A
TTP135N68A	TO-220	Tube	135N68A

**Absolute Maximum Ratings ( $T_A = 25^\circ C$  unless otherwise noted)**

Parameter	Symbol	Maximum	Units
Drain-Source Voltage	$V_{DS}$	68	V
Gate-Source Voltage	$V_{GS}$	$\pm 20$	V
Continuous Drain Current	$I_D$	$T_C = 25^\circ C$	105
		$T_C = 100^\circ C$	105
Pulsed Drain Current <sup>A</sup>	$I_{DM}$	405	A
Avalanche Current <sup>A</sup>	$I_{AS}$	44	A
Single Pulse Avalanche Energy L = 0.3mH <sup>A</sup>	$E_{AS}$	290	mJ
Power Dissipation <sup>C</sup>	$P_D$	$T_C = 25^\circ C$	160
		$T_C = 100^\circ C$	80
Junction and Storage Temperature Range	$T_J, T_{STG}$	-55 to 175	$^\circ C$

**Thermal Characteristics**

Parameter	Symbol	Maximum	Units
Maximum Junction-to-Case	$R_{\theta JC}$	0.95	$^\circ C/W$
Maximum Junction-to-Ambient			
	$R_{\theta JA}$	100	



Electrical Characteristics( $T_J = 25^\circ\text{C}$ unless otherwise noted)						
Symbol	Parameter	Conditions	Value			Units
			Min	Typ	Max	
<b>STATIC PARAMETERS</b>						
$BV_{DSS}$	Drain-Source Breakdown Voltage	$I_D = 250\mu\text{A}, V_{GS} = 0\text{V}$	68			V
$I_{DSS}$	Zero Gate Voltage Drain Current	$V_{DS} = 68\text{V}, V_{GS} = 0\text{V}$	$T_J = 25^\circ\text{C}$		1	$\mu\text{A}$
			$T_J = 100^\circ\text{C}$		25	
$I_{GSS}$	Gate-Body Leakage Current	$V_{DS} = 0\text{V}, V_{GS} = \pm 20\text{V}$			$\pm 100$	nA
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}, I_D = 250\mu\text{A}$	2	3	4	V
$R_{DS(ON)}$	Static Drain-Source On-Resistance	$V_{GS} = 10\text{V}, I_D = 30\text{A}$		4.2	5	$\text{m}\Omega$
$g_{FS}$	Forward Transconductance	$V_{DS} = 5\text{V}, I_D = 20\text{A}$		30		S
$V_{SD}$	Diode Forward Voltage	$I_S = 20\text{A}, V_{GS} = 0\text{V}$			1	V
$I_S$	Maximum Body-Diode Continuous Current <sup>B</sup>				105	A
<b>DYNAMIC PARAMETERS</b>						
$C_{iss}$	Input Capacitance	$V_{GS} = 0\text{V}, V_{DS} = 30\text{V}, f = 1\text{MHz}$		6646		$\text{pF}$
$C_{oss}$	Output Capacitance			443		
$C_{rss}$	Reverse Transfer Capacitance			396		
<b>SWITCHING PARAMETERS</b>						
$Q_g(10\text{V})$	Total Gate Charge	$V_{GS} = 10\text{V}, V_{DS} = 30\text{V}, I_D = 30\text{A}$		114		nC
$Q_{gs}$	Gate Source Charge			26		
$Q_{gd}$	Gate Drain Charge			34		
$t_{D(on)}$	Turn-On Delay Time	$V_{GS} = 10\text{V}, V_{DS} = 30\text{V}, I_D = 30\text{A}, R_G = 3\Omega$		17		ns
$t_r$	Turn-On Rise Time			11		
$T_{D(off)}$	Turn-Off Delay Time			55		
$t_f$	Turn-Off Fall Time			15		
$t_{rr}$	Body Diode Reverse Recovery Time	$I_F = 20\text{A}, di/dt = 100\text{A}/\mu\text{s}$		33		ns
$Q_{rr}$	Body Diode Reverse Recovery Charge			51		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  $T_{J(MAX)} = 175^\circ\text{C}$ , 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

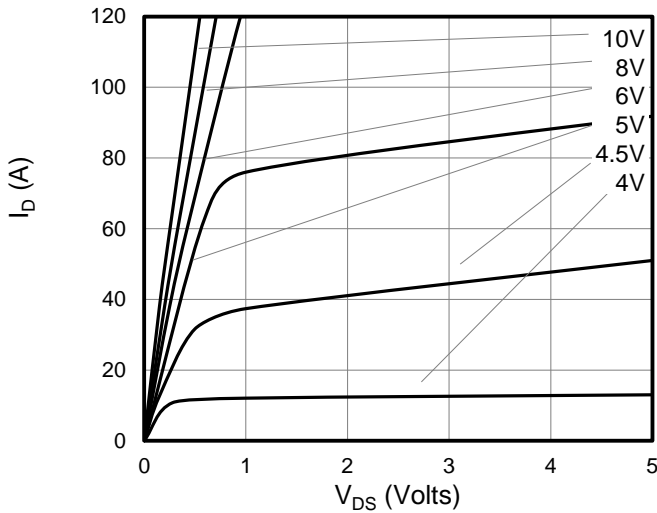


Figure 1: On-Region Characteristics

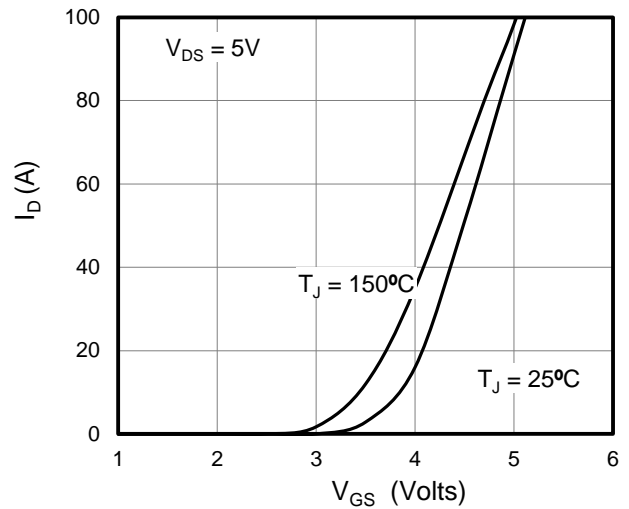


Figure 2: Transfer Characteristics

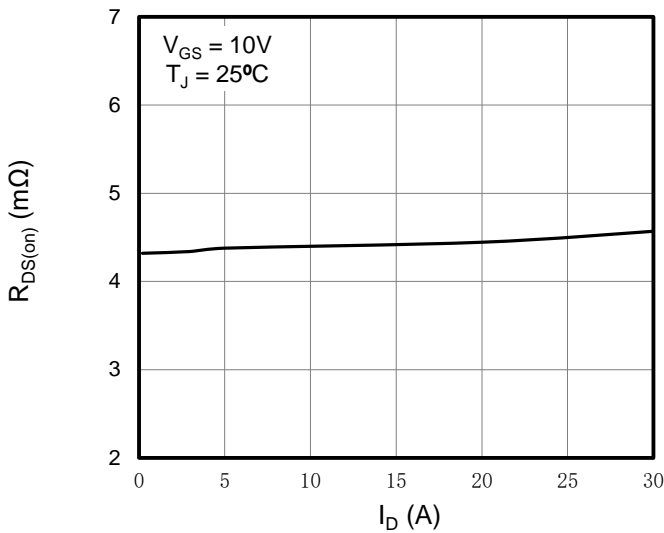


Figure 3: On-Resistance vs. Drain Current

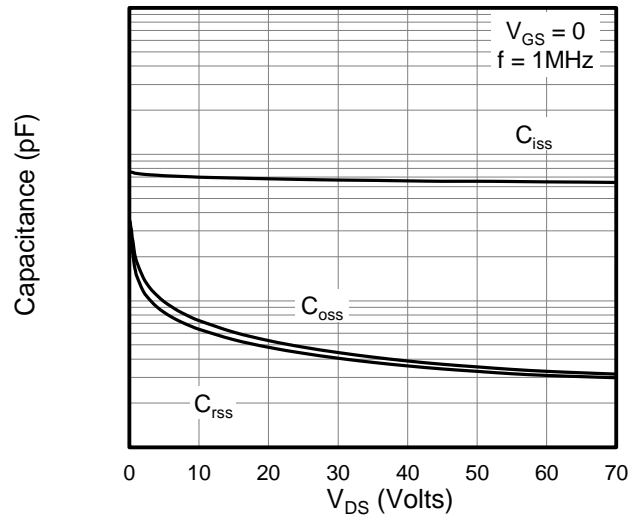


Figure 4: Capacitance Characteristics

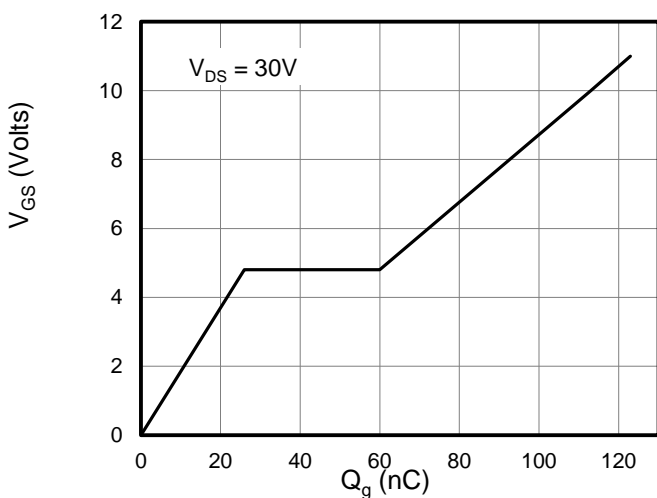


Figure 5: Gate Charge Characteristics

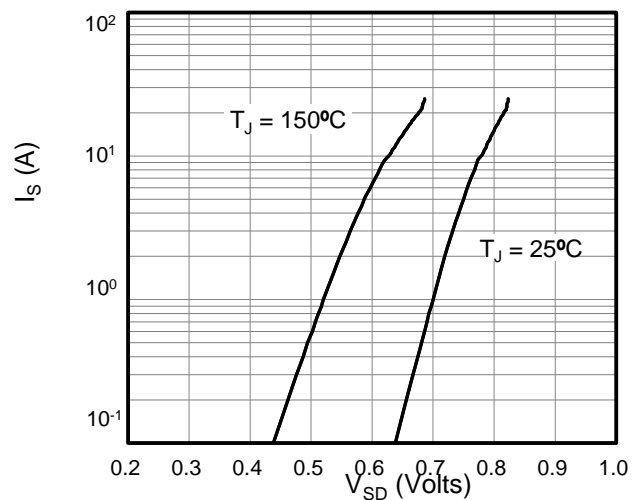


Figure 6: Body Diode Forward Voltage



### TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

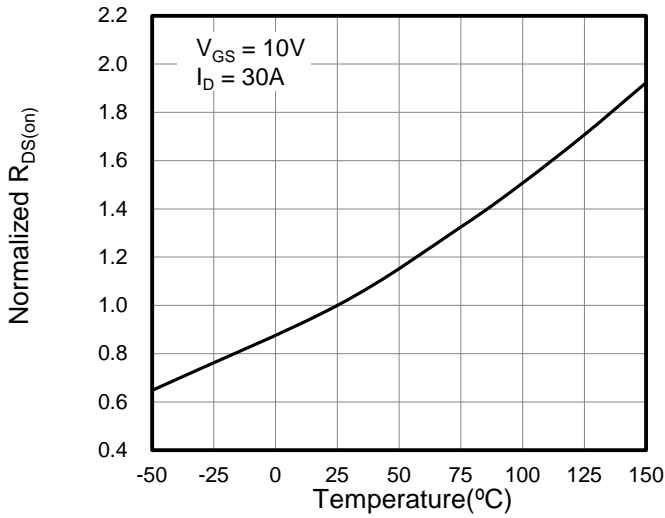


Figure 7: On-Resistance vs. Junction Temperature

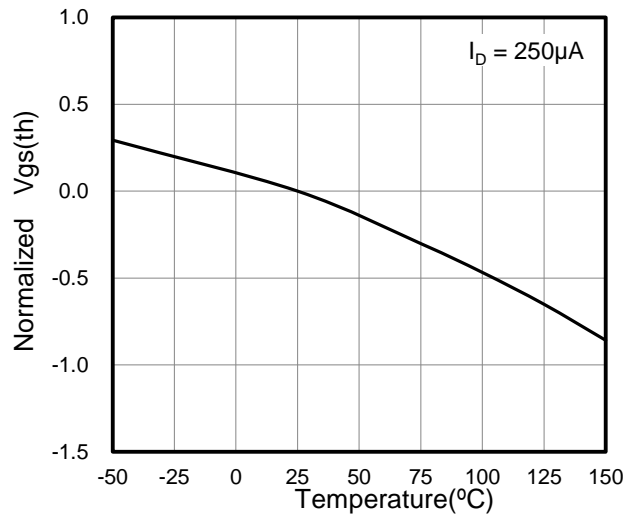


Figure 8:  $V_{GS(th)}$  vs. Junction Temperature

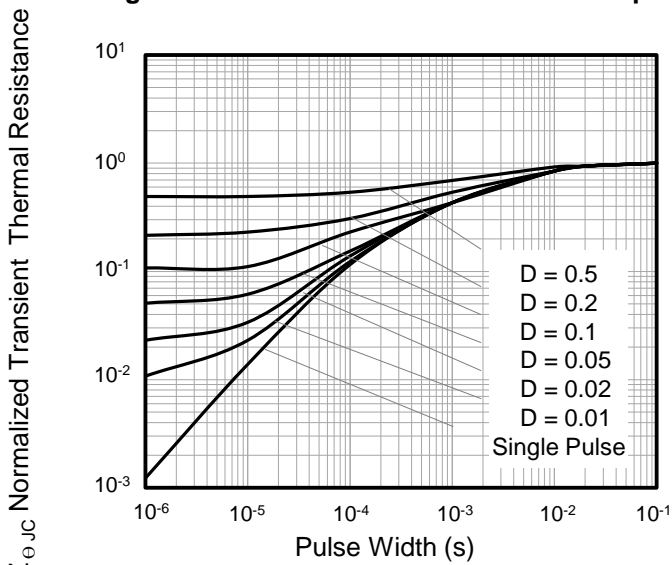


Figure 9: Normalized Transient Thermal Resistance

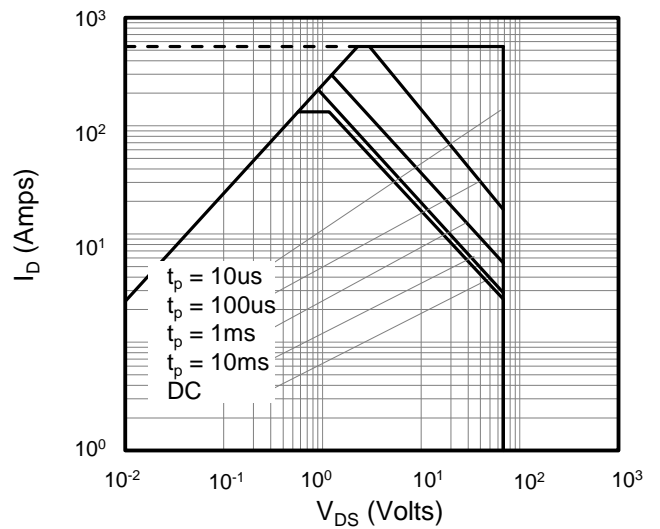


Figure 10: Safe Operating Area

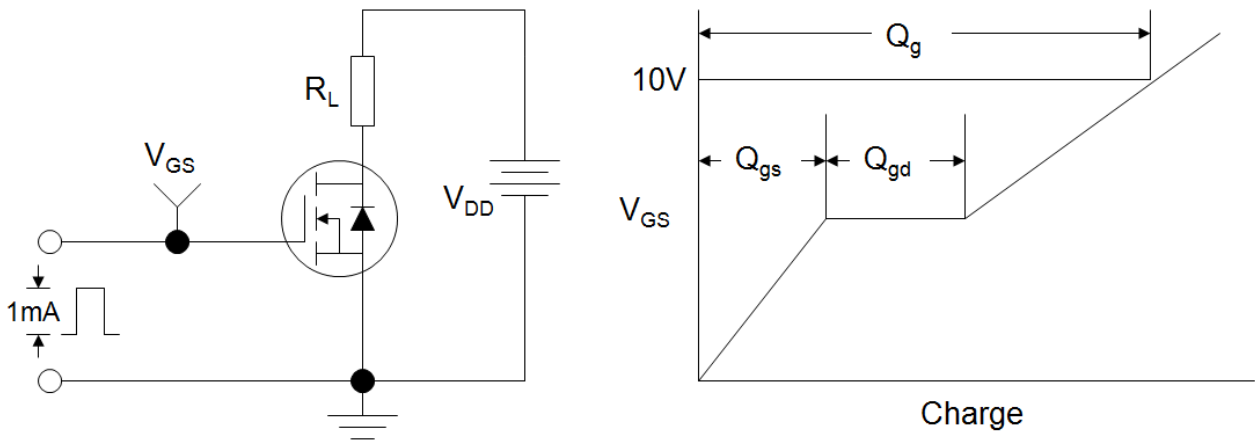


Figure A: Gate Charge Test Circuit and Waveforms

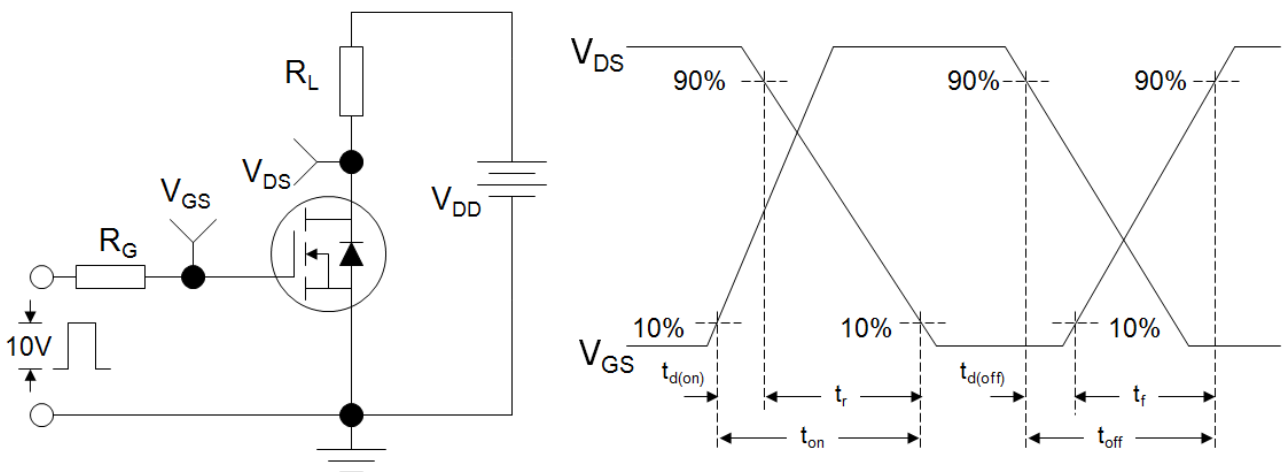


Figure B: Resistive Switching Test Circuit and Waveforms

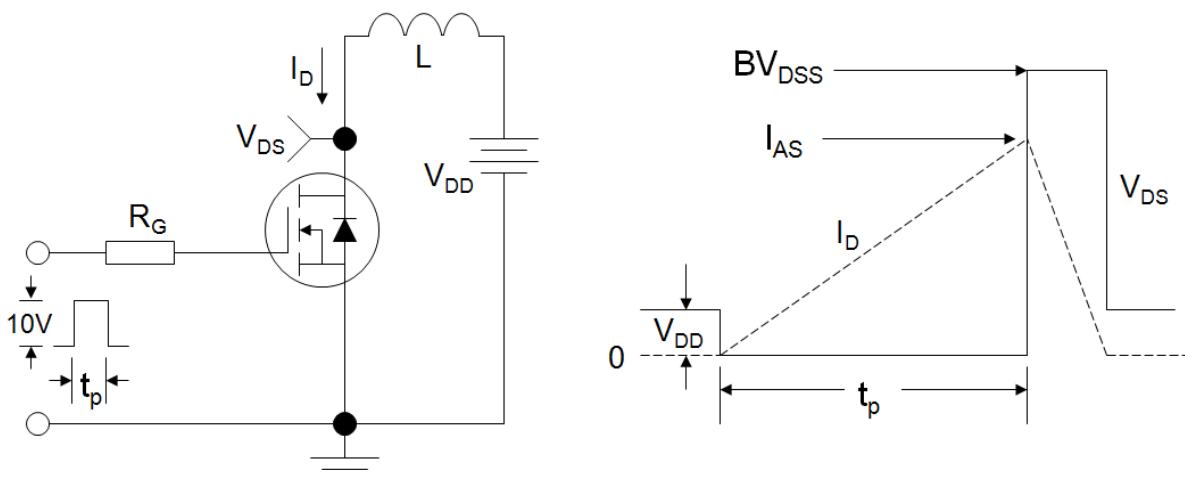
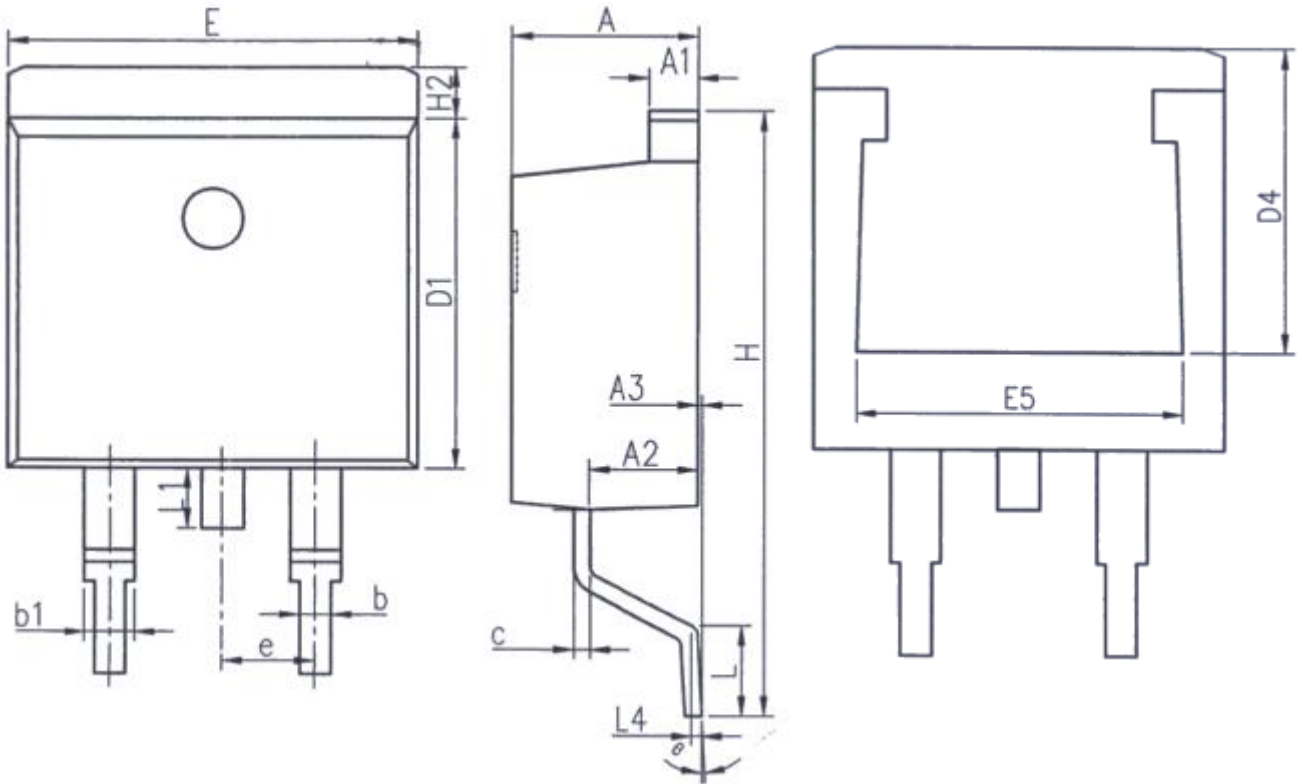


Figure C: Unclamped Inductive Switching (UIS) Test Circuit and Waveforms



### TO-263(集佳)

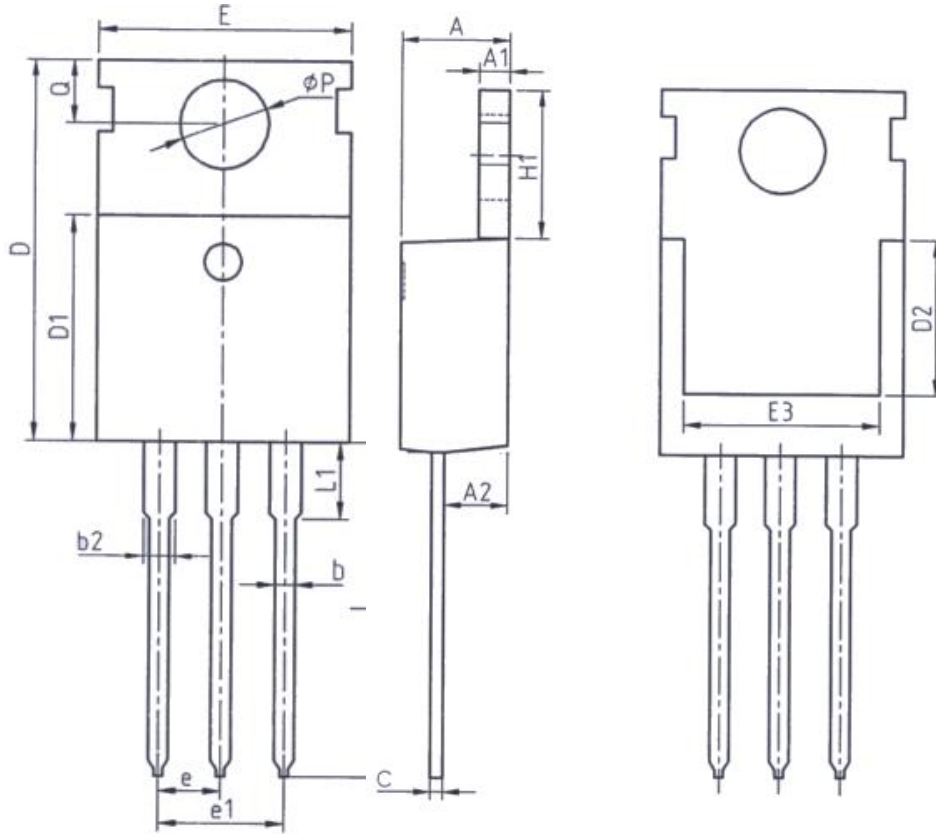


Unit: mm			
Symbol	Min	Nom	Max
A	4.40	4.50	4.60
A1	1.25	1.30	1.35
A2	2.20	2.40	2.60
A3	0	0.10	0.25
b	0.76	-	0.89
b1	1.23	-	1.37
c	0.47	-	0.60
D1	9.10	9.20	9.30
D4	8.00	-	-

Unit: mm			
Symbol	Min	Nom	Max
E	9.80	9.90	10.00
E5	7.80	-	-
e	2.54BSC		
H	14.90	15.30	15.70
H2	1.17	1.27	1.40
L	2.00	2.30	2.60
L1	-	-	1.75
L4	0.25BSC		
θ	0°		8°



### TO-220(华天)

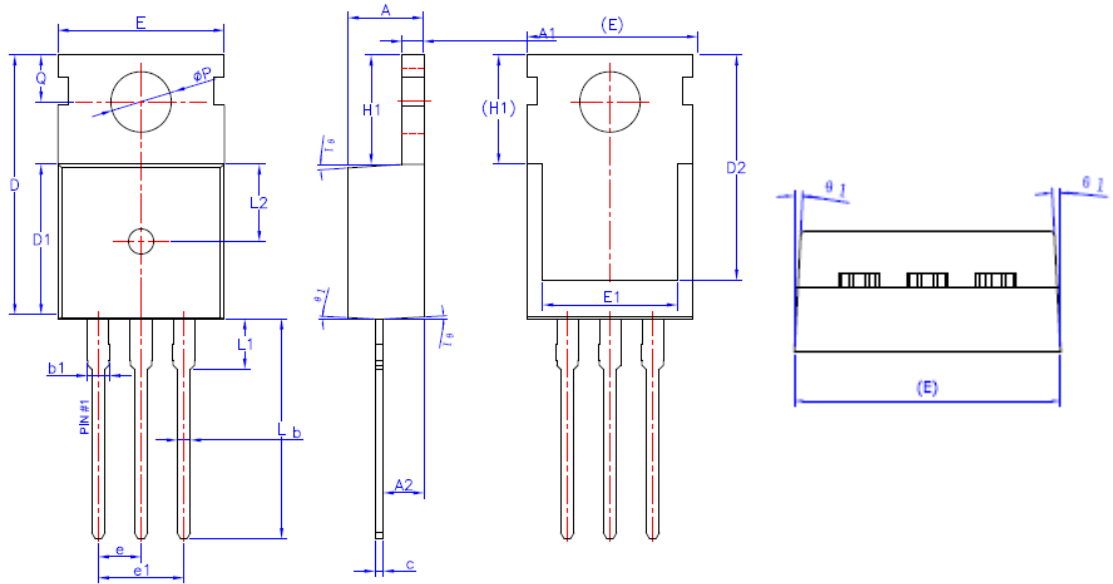


Unit: mm		
Symbol	Min.	Max.
A	4.37	4.77
A1	1.25	1.45
A2	2.20	2.60
b	0.70	0.95
b2	1.17	1.47
c	0.40	0.65
D	15.10	16.10
D1	8.80	9.40
D2	5.50	-

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



## TO-220(集佳)



SYMBOL	MIN	NOM	MAX
A	4.40	4.50	4.60
A1	1.27	1.30	1.33
A2	2.30	2.40	2.50
b	0.70	—	0.90
b1	1.27	—	1.40
c	0.45	0.50	0.60
D	15.30	15.70	16.10
D1	9.10	9.20	9.30
D2	13.10	—	13.70
E	9.70	9.90	10.20
E1	7.80	8.00	8.20
e	2.54BSC		
e1	5.08BSC		
H1	6.30	6.50	6.70
L	12.78	13.08	13.38
L1	—	—	3.50
L2	4.60REF		
$\phi P$	3.55	3.60	3.65
Q	2.73	—	2.87
$\theta 1$	1°	3°	5°





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