
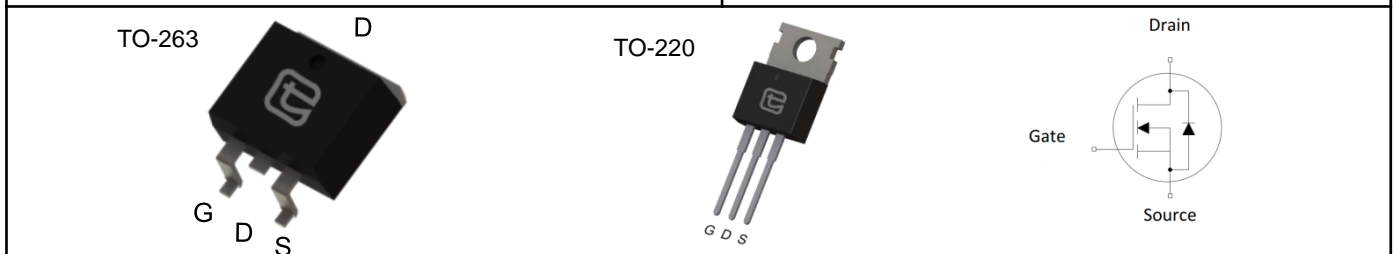




68V N-Channel Trench MOSFET

<p>General Description</p> <ul style="list-style-type: none"> ● Trench Power Technology ● Low $R_{DS(ON)}$ ● Low Gate Charge ● Optimized for Fast-switching Applications` <p>Applications</p> <ul style="list-style-type: none"> ● Synchronous Rectification in DC/DC and AC/DC Converters ● Isolated DC/DC Converters in Telecom and Industrial 	<p>Product Summary</p> <p>V_{DS} 68V</p> <p>I_D (at $V_{GS}=10V$) 95A</p> <p>$R_{DS(ON)}$ (at $V_{GS}=10V$) < 7.5mΩ</p> <p>100% UIS Tested</p> 
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Device	Package	Form	Marking
TTB95N68A	TO-263	Tape&Reel	95N68A
TTP95N68A	TO-220	Tube	95N68A

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}	± 20	V
Continuous Drain Current	I_D	$T_C = 25^\circ C$	95
		$T_C = 100^\circ C$	66
Pulsed Drain Current ^A	I_{DM}	285	A
Avalanche Current ^A	I_{AS}	37	A
Single Pulse Avalanche Energy $L = 0.3mH$ ^A	E_{AS}	380	mJ
Power Dissipation ^C	P_D	$T_C = 25^\circ C$	130.5
		$T_C = 100^\circ C$	65.5
Operating 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_{thJC}	1.15	$^\circ C/W$
Maximum Junction-to-Ambient			
	R_{thJA}	100	



Electrical Characteristics($T_J = 25^\circ\text{C}$ unless otherwise noted)							
Symbol	Parameter	Conditions	Value			Units	
			Min	Typ	Max		
STATIC PARAMETERS							
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	μA
			$T_J = 100^\circ\text{C}$	--	--	25	
I_{GSS}	Gate-Body Leakage Current	$V_{DS} = 0\text{V}, V_{GS} = \pm 20\text{V}$	--	--	± 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	$V_{GS} = 10\text{V}, I_D = 30\text{A}$	--	6.5	7.5	m Ω	
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 ^B		--	--	95	A	
DYNAMIC PARAMETERS							
C_{iss}	Input Capacitance	$V_{GS} = 0\text{V}, V_{DS} = 30\text{V}, f = 1\text{MHz}$	--	4169	--	pF	
C_{oss}	Output Capacitance		--	274	--		
C_{rss}	Reverse Transfer Capacitance		--	222	--		
SWITCHING PARAMETERS							
$Q_g(10\text{V})$	Total Gate Charge	$V_{GS} = 10\text{V}, V_{DS} = 30\text{V}, I_D = 30\text{A}$	--	70	--	nC	
Q_{gs}	Gate Source Charge		--	20	--		
Q_{gd}	Gate Drain Charge		--	18	--		
$t_{D(on)}$	Turn-On Delay Time	$V_{GS} = 10\text{V}, V_{DS} = 30\text{V}, I_D = 30\text{A}, R_G = 3\Omega$	--	15	--	ns	
t_r	Turn-On Rise Time		--	94	--		
$T_{D(off)}$	Turn-Off Delay Time		--	46	--		
t_f	Turn-Off Fall Time		--	32	--		
t_{rr}	Body Diode Reverse Recovery Time	$I_F = 20\text{A}, di/dt = 100\text{A}/\mu\text{s}$	--	78	--	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 Characteristics $T_J = 25^\circ\text{C}$, unless otherwise noted

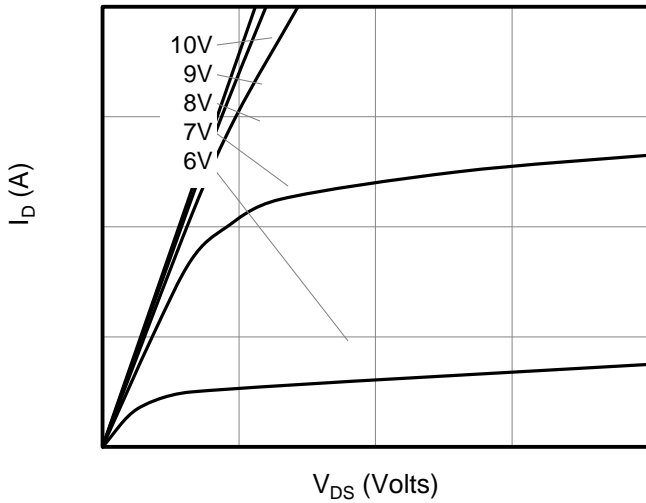


Figure 1: On-Region Characteristics

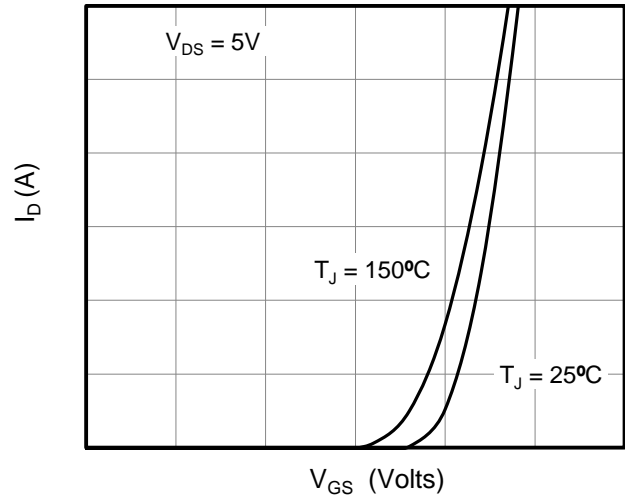


Figure 2: Transfer Characteristics

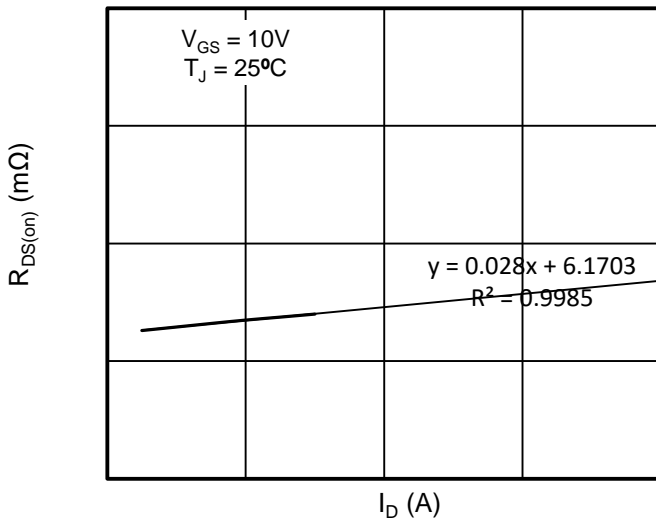


Figure 3: On-Resistance vs. Drain Current

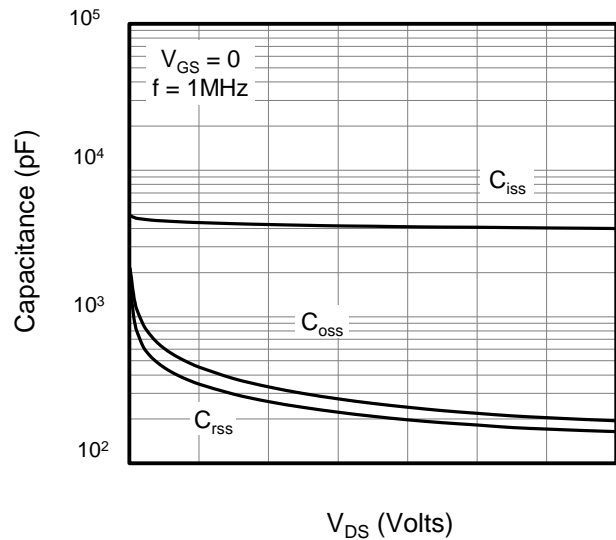


Figure 4: Capacitance Characteristics

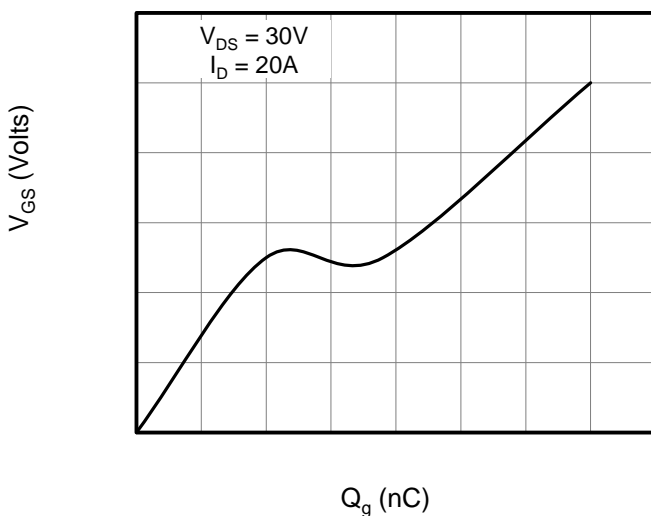


Figure 5: Gate Charge Characteristics

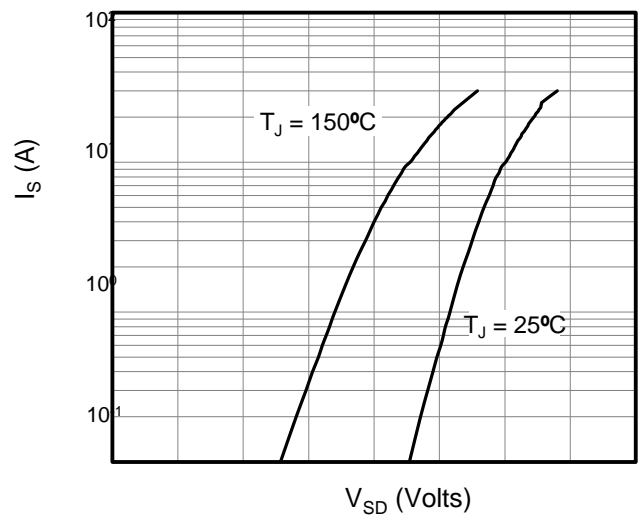


Figure 6: Body Diode Forward Voltage



Typical Characteristics $T_J = 25^{\circ}\text{C}$, unless otherwise noted

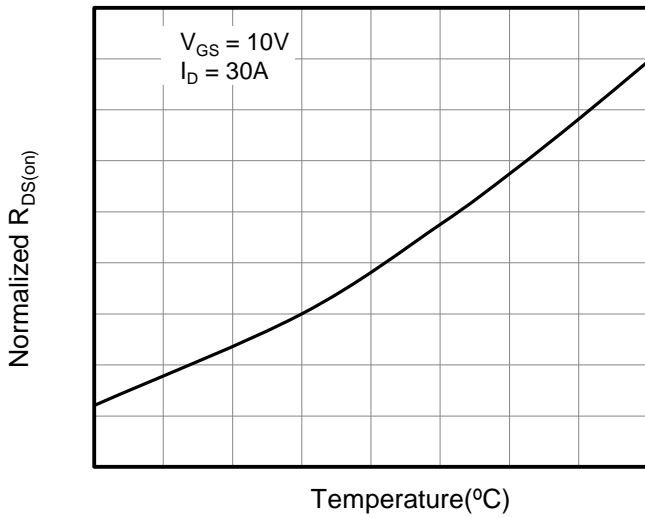


Figure 7: On-Resistance vs. Junction Temperature

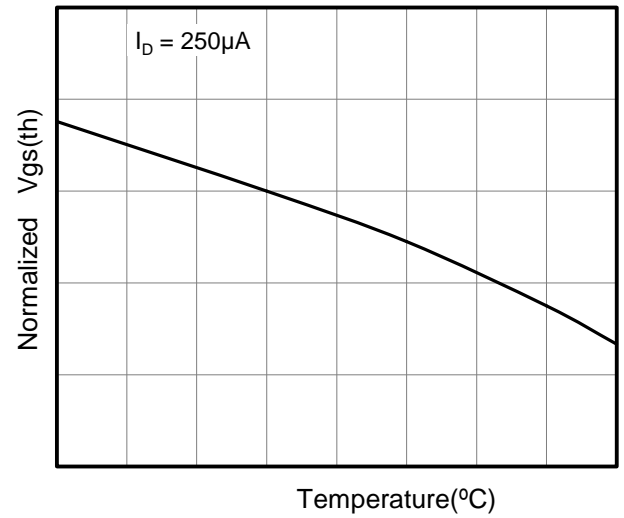


Figure 8: $V_{gs(th)}$ vs. Junction Temperature

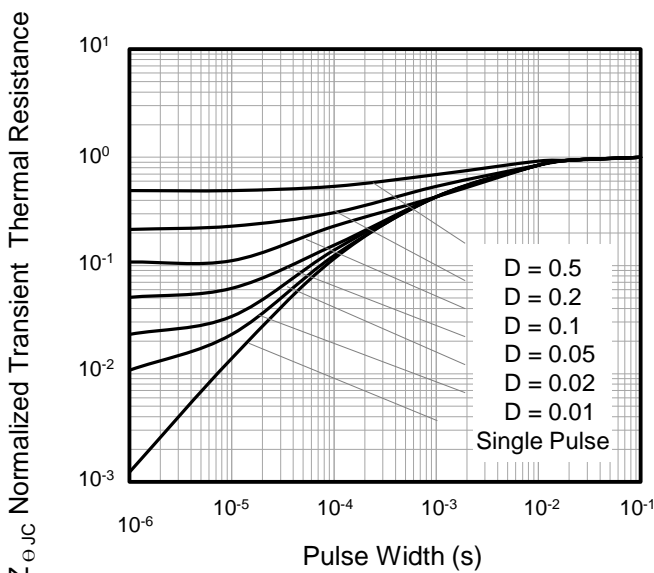


Figure 9: Normalized Transient Thermal Resistance

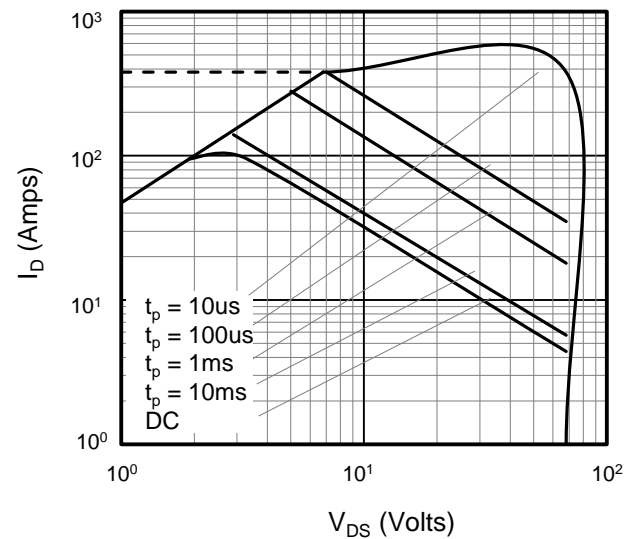


Figure 10: Safe Operating Area



Figure A: Gate Charge Test Circuit and Waveform



Figure B: Resistive Switching Test Circuit and Waveform

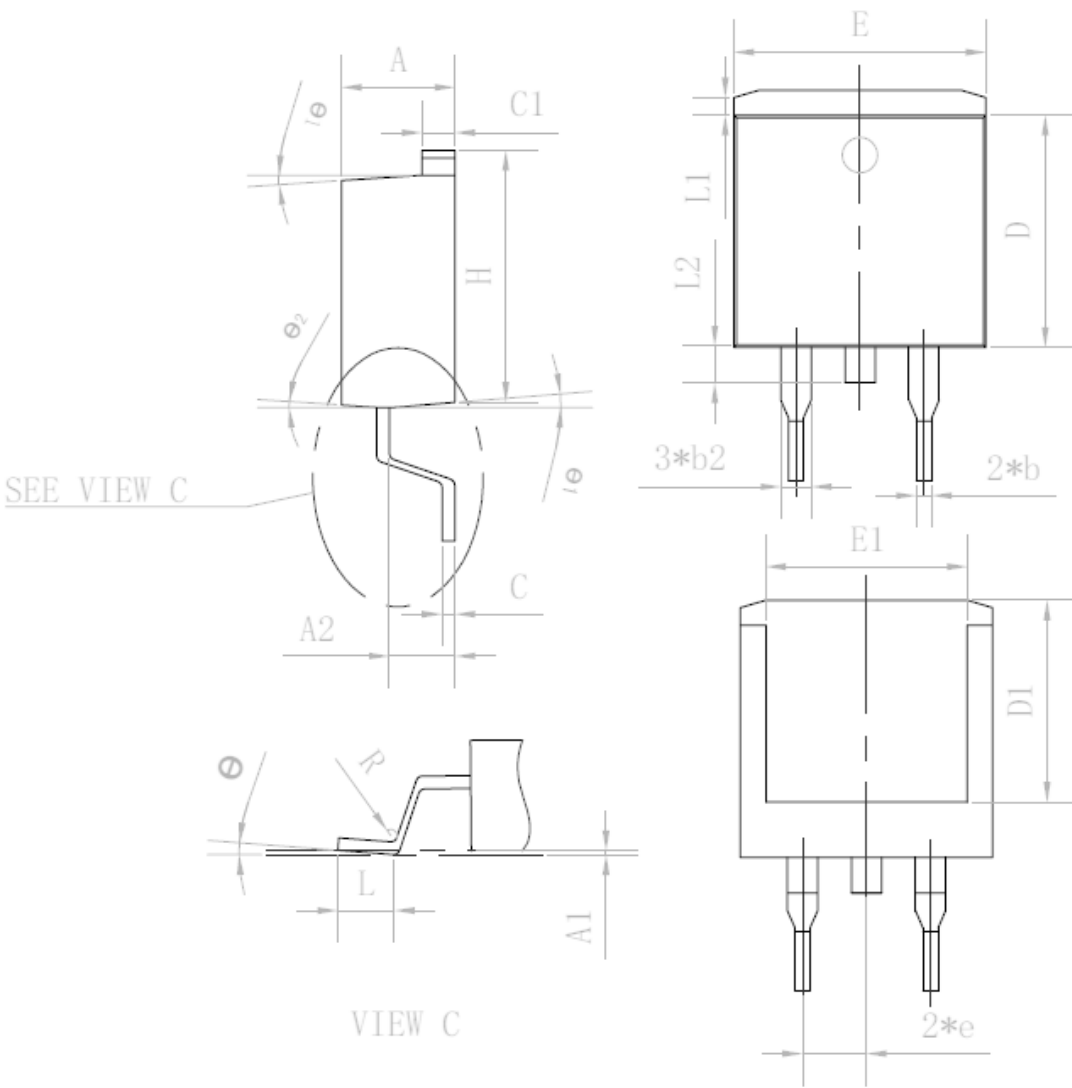


Figure C: Unclamped Inductive Switching Test Circuit and Waveform





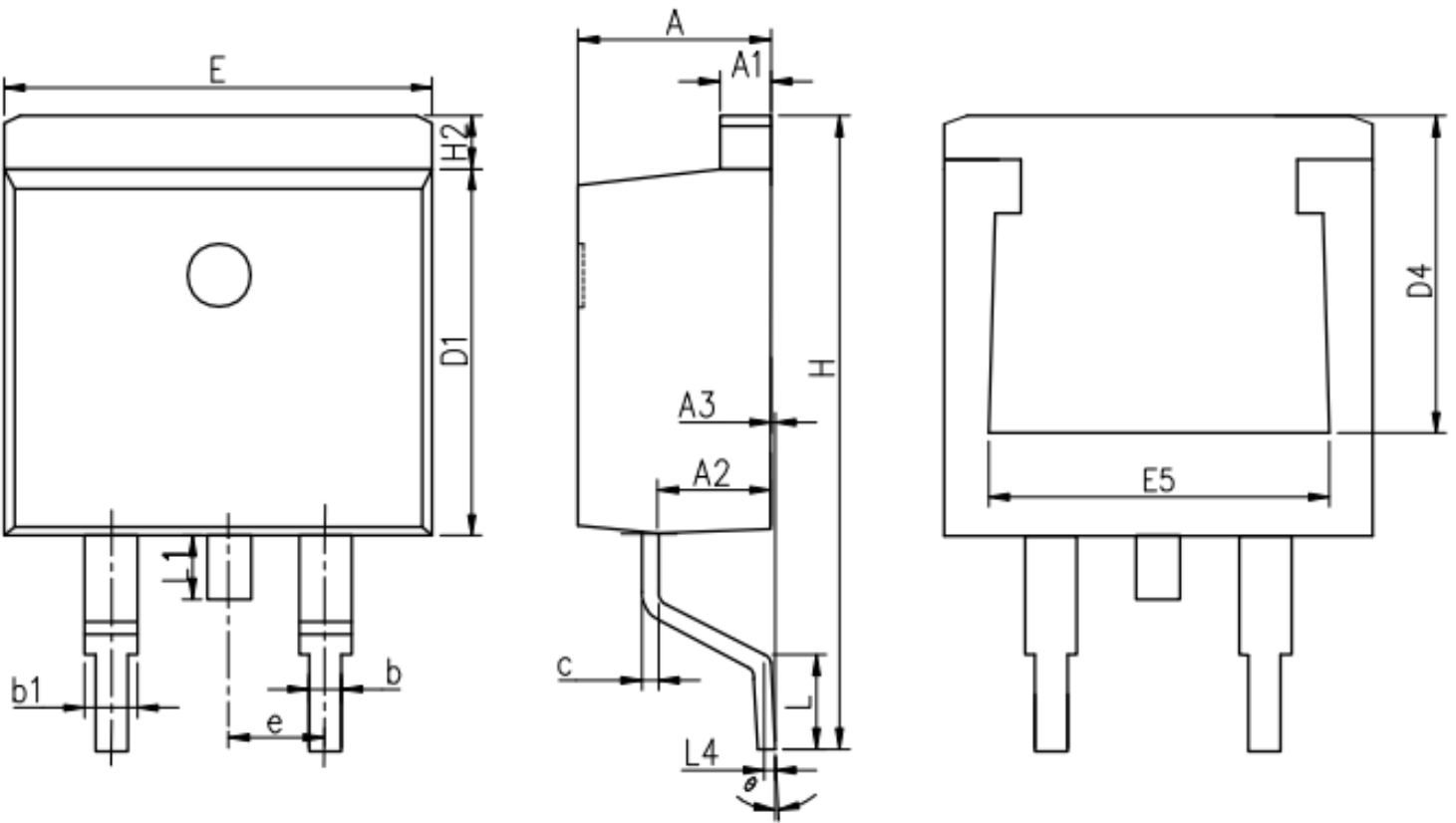
TO-263 (E)



SYMBOL	MIN	NOM	MAX
A	4.35	4.47	4.60
A1	0.09	0.10	0.11
A2	2.30	2.40	2.50
b	0.70	0.80	1.00
b2	1.25	1.36	1.38
C	0.45	0.50	0.55
C1	1.29	1.30	1.31
D	9.10	9.20	9.30
D1	7.90	8.00	8.10
E	9.85	10.00	10.20
E1	7.90	8.00	8.10
H	15.30	15.50	15.70
e	-	2.54	-
L	2.34	2.54	2.74
L1	1.00	1.10	1.20
L2	1.30	1.40	1.50
R	0.24	0.25	0.26
e	0°	4°	8°
e1	4°	7°	10°
e2	0°	3°	6°



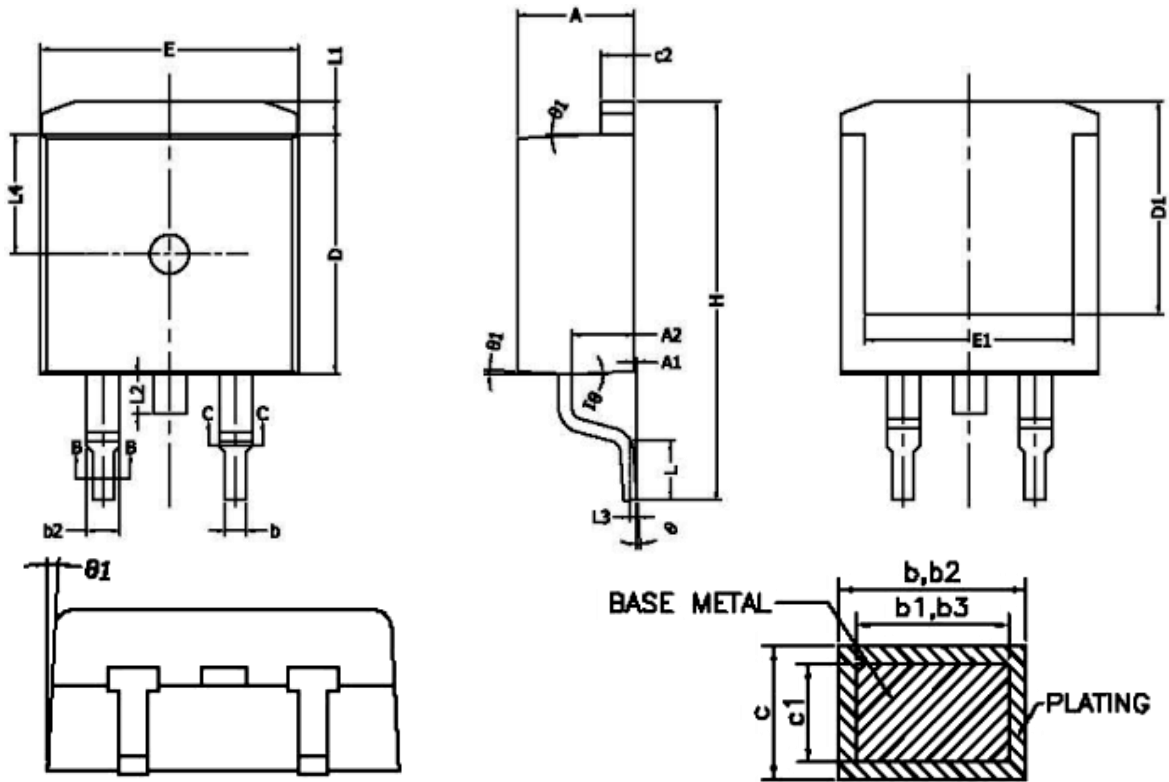
TO-263 (H)



Unit:mm				Unit:mm			
Symbol	Min.	Nom	Max.	Symbol	Min.	Nom	Max.
A	4.37	4.57	4.77	E	9.86	10.16	10.36
A1	1.22	1.27	1.42	E5	7.06	-	-
A2	2.49	2.69	2.89	e	2.54BSC		
A3	0.00	0.13	0.25	H	14.70	15.10	15.50
b	0.70	0.81	0.96	H2	1.07	1.27	1.47
b1	1.17	1.27	1.47	L	2.00	2.30	2.60
c	0.30	0.38	0.53	L1	1.40	1.55	1.70
D1	8.50	8.70	8.90	L4	0.25BSC		
D4	6.60	-	-	θ	0°	5°	9°



TO-263 (I)

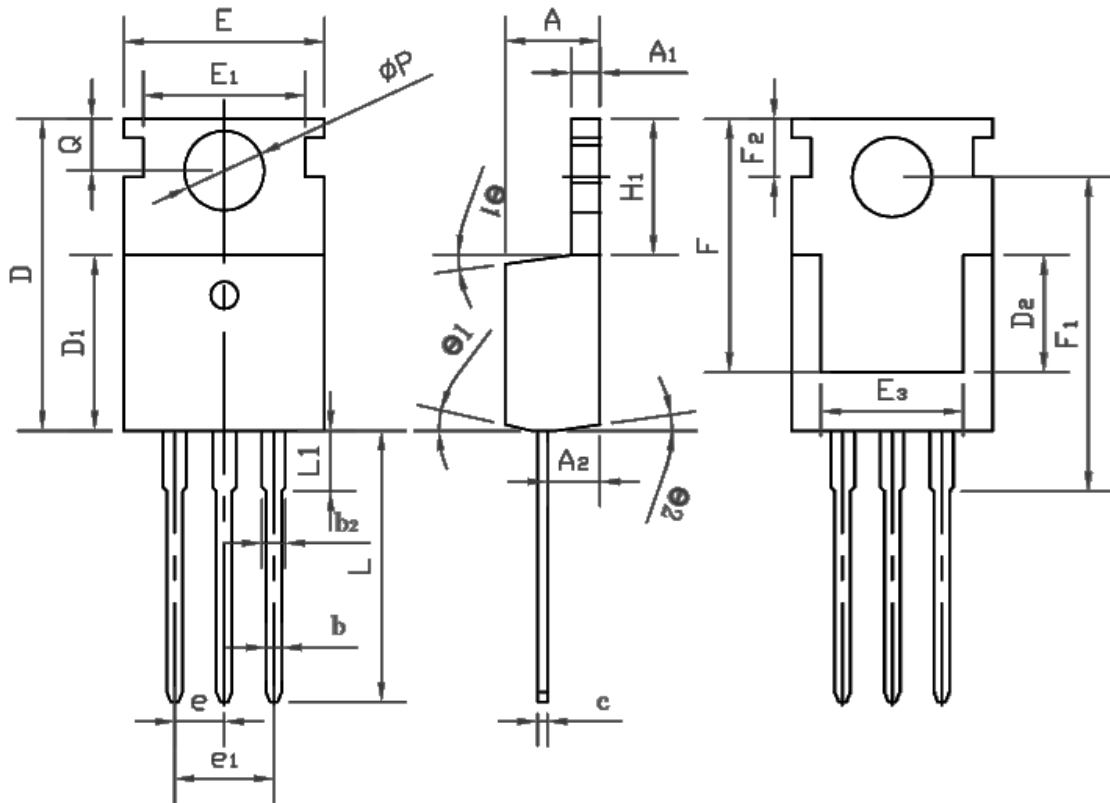


SECTION B-B&C-C

SYMBOL	MIN	NOM	MAX
A	4.40	4.50	4.60
A1	0	0.10	0.25
A2	2.20	2.40	2.60
b	0.76	--	0.89
b1	0.75	0.80	0.85
b2	1.23	--	1.37
b3	1.22	1.27	1.32
c	0.47	--	0.60
c1	0.46	0.51	0.56
c2	1.25	1.30	1.35
D	9.10	9.20	9.30
D1	8.00	--	--
E	9.80	9.90	10.00
E1	7.80	--	--
e	2.54 BSC		
H	14.90	15.30	15.70
L	2.00	2.30	2.60
L1	1.17	1.27	1.40
L2	--	--	1.75
L3	0.25BSC		
L4	4.60 REF		
theta	0°	--	8°
theta1	1°	3°	5°



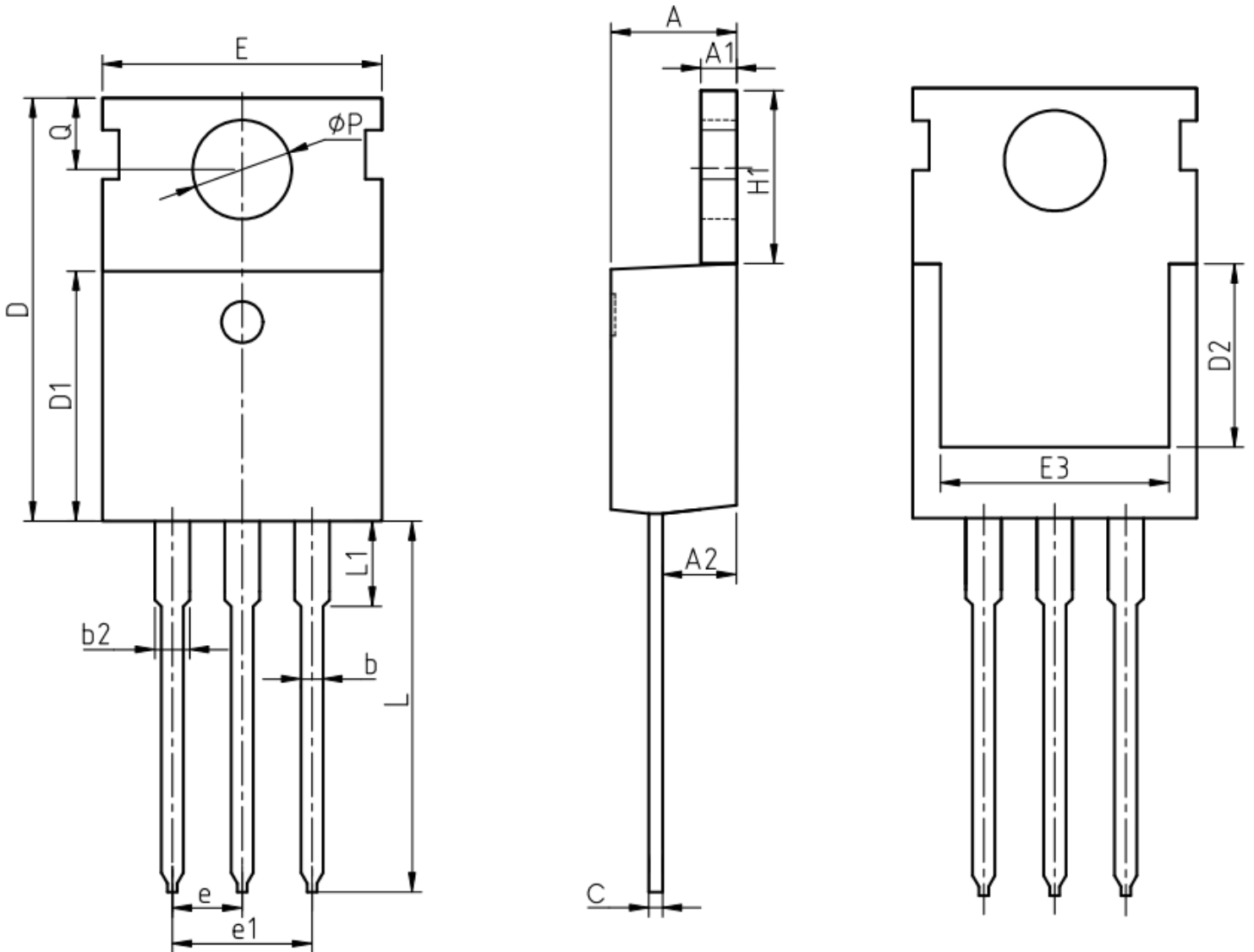
TO-220 (E)



SYMBOL	MIN	NOM	MAX
A	4.27	4.57	4.87
A ₁	1.15	1.30	1.45
A ₂	2.10	2.40	2.70
b	0.70	0.80	1.00
b ₂	1.17	1.27	1.50
c	0.40	0.50	0.65
D	15.10	15.60	16.10
D ₁	8.80	9.10	9.40
D ₂	5.70	6.70	7.00
E	9.70	10.00	10.30
E ₁	-	8.70	-
E ₂	9.63	10.00	10.35
E ₃	7.00	8.00	8.40
e	2.54 BSC		
e ₁	5.08 BSC		
H ₁	6.00	6.50	6.85
L	12.75	13.50	13.90
L ₁	-	3.10	3.40
∅P	3.45	3.60	3.75
Q	2.60	2.80	3.00
∅ ₁	4°	7°	10°
∅ ₂	0°	3°	6°
F	13.30	13.50	13.70
F ₁	15.50	15.90	16.30
F ₂	2.80	3.00	3.20



TO-220 (H)

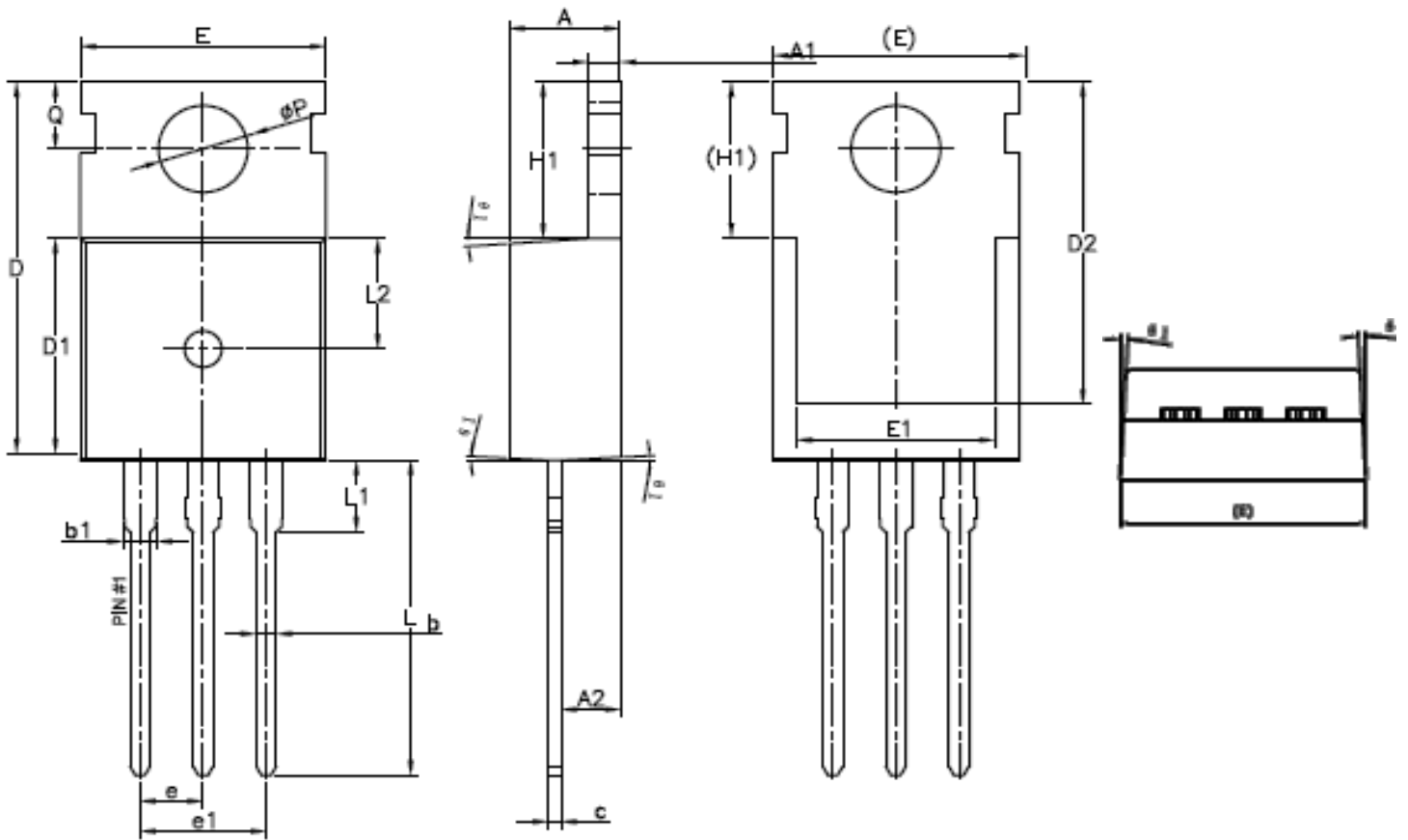


Unit:mm			
Symbol	Min.	Nom	Max.
A	4.37	4.57	4.70
A1	1.25	1.30	1.40
A2	2.20	2.40	2.60
b	0.70	0.80	0.95
b2	1.17	1.27	1.47
c	0.45	0.50	0.60
D	15.10	15.60	16.10
D1	8.80	9.10	9.40
D2	5.50	-	-

Unit:mm			
Symbol	Min.	Nom	Max.
E	9.70	10.00	10.30
E3	7.00	-	-
e	2.54 BSC		
e1	5.08 BSC		
H1	6.25	6.50	6.85
L	12.75	13.50	13.80
L1	-	3.10	3.40
ϕP	3.40	3.60	3.80
Q	2.60	2.80	3.00



TO-220 (I)



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		
ϕP	3.55	3.60	3.65
Q	2.73	—	2.87
ϕ_1	1"	3"	5"



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