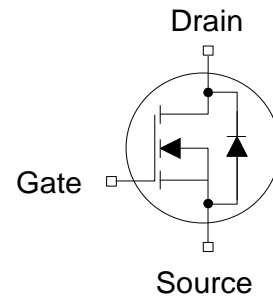




Description

Super-junction MOSFET Gen I is designed by WL-Micro Semiconductor Company, according to the SJ principle. This device provide an excellent gate charge and $R_{DS(on)}$, which leads to extremely communication and conduction losses. So it is very suitable for AC/DC power conversion, Laptop adapter, Lighting, and industrial power applications.

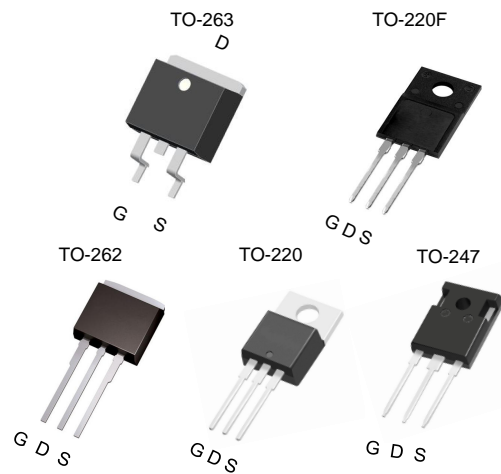


Features

- Very low FOM $R_{DS(on)} \times Q_g$
- 100% avalanche tested
- Easy to use/drive
- Ultra-fast body diode
- RoHS compliant

Applications

- Switch Mode Power Supply (SMPS)
- Uninterruptible Power Supply (UPS)
- Suitable for hard and soft switching (PFC and high performance LLC)
- Telecom and Solar invertor



Key Performance Parameters

Parameter	Value	Unit
$V_{DS} @ T_{J,max}$	650	V
$R_{DS(on),max}$	0.096	Ω
$Q_{g,typ}$	64.2	nC
I_D	40	A
$I_{D,pulse}$	120	A
$E_{OSS} @ 400V$	9.08	μJ
Body Diode di_F/dt	900	A/ μs

Device Marking and Package Information

Device	Package	Marking
WLE096R60G	TO-263	WLE096R60G
WLP096R60F	TO-220F	WLP096R60F
WLP096R60B	TO-262	WLP096R60B
WLP096R60	TO-220	WLP096R60
WLE096R60E	TO-247	WLE096R60E



Absolute Maximum Ratings $T_C = 25^\circ\text{C}$, unless otherwise noted			
Parameter	Symbol	Value	Unit
Drain-Source Voltage($V_{GS}=0\text{V}$)	V_{DS}	600	V
Continuous Drain Current ¹⁾	I_D	$T_C = 25^\circ\text{C}$	40
		$T_C = 100^\circ\text{C}$	24
Pulsed Drain Current ²⁾	$I_{D,pulse}$	120	A
Gate-Source Voltage	V_{GS}	± 30	V
Single Pulse Avalanche Energy	E_{AS}	796	mJ
Repetitive Avalanche Energy	E_{AR}	1.2	mJ
Avalanche Current	I_{AR}	6.6	A
MOSFET dv/dt Ruggedness, $V_{DS} = 0 \dots 480\text{V}$	dv/dt	50	V/ns
Power Dissipation For TO-263、TO-262、TO-220、TO-247	P_D	278	W
Power Dissipation For TO-220F		35	
Continuous Diode Forward Current	I_S	40	A
Diode Pulsed Current ²⁾	$I_{S,pulse}$	120	
Reverse Diode dv/dt ³⁾	dv/dt	50	V/ns
Maximum Diode Commutation Speed	di_f/dt	900	A/ μs
Operating Junction and Storage Temperature Range	T_J, T_{stg}	-55~+150	$^\circ\text{C}$

Thermal Resistance For TO-263、TO-262、TO-220、TO-247			
Parameter	Symbol	Value	Unit
Thermal Resistance, Junction-to-Case	R_{thJC}	0.45	$^\circ\text{C/W}$
Thermal Resistance, Junction-to-Ambient	R_{thJA}	62	

Thermal Resistance For TO-220F			
Parameter	Symbol	Value	Unit
Thermal Resistance, Junction-to-Case	R_{thJC}	3.6	$^\circ\text{C/W}$
Thermal Resistance, Junction-to-Ambient	R_{thJA}	80	

Notes

- 1) Limited by maximum junction temperature.
- 2) Repetitive Rating: Pulse width limited by maximum junction temperature.
- 3) Identical low side and high side switch with identical R_G .



Electrical Characteristics $T_J = 25^\circ\text{C}$, unless otherwise noted						
Parameter	Symbol	Test Conditions	Value			Unit
			Min.	Typ.	Max.	
Static Characteristics						
Drain-Source Breakdown Voltage	$V_{(BR)DSS}$	$V_{GS} = 0V, I_D = 250\mu A$	600	--	--	V
Zero Gate Voltage Drain Current	I_{DSS}	$V_{DS} = 600V$ $V_{GS} = 0V, T_J = 25^\circ\text{C}$	--	--	4	μA
		$V_{DS} = 600V$ $V_{GS} = 0V, T_J = 150^\circ\text{C}$	--	--	4000	
Gate-Source Leakage Current	I_{GSS}	$V_{GS} = \pm 30V$	--	--	± 100	nA
Gate-Source Threshold Voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}, I_D = 250\mu A$	3.0	4.0	5.0	V
Drain-Source On-State-Resistance	$R_{DS(on)}$	$V_{GS} = 10V, I_D = 20A$	--	0.082	0.096	Ω
Gate Resistance	R_G	$f = 1.0\text{MHz}$ open drain	--	3	--	Ω
Dynamic Characteristics						
Input Capacitance	C_{iss}	$V_{GS} = 0V, V_{DS} = 100V$ $f = 1.0\text{MHz}$	--	3028	--	μF
Output Capacitance	C_{oss}		--	97	--	
Reverse Transfer Capacitance	C_{rss}		--	3.3	--	
Total Gate Charge	Q_g	$V_{DD} = 480V, I_D = 40A$ $V_{GS} = 10V$	--	64.2	--	nC
Gate-Source Charge	Q_{gs}		--	21.0	--	
Gate-Drain Charge	Q_{gd}		--	24.6	--	
Gate Plateau Voltage	$V_{Plateau}$		--	6.8	--	V
Turn-on Delay Time	$t_{d(on)}$	$V_{DD} = 400V, I_D = 40A$ $R_G = 15\Omega, V_{GS} = 10V$	--	20	--	ns
Turn-on Rise Time	t_r		--	15	--	
Turn-off Delay Time	$t_{d(off)}$		--	70	--	
Turn-off Fall Time	t_f		--	8	--	
Drain-Source Body Diode Characteristics						
Body Diode Forward Voltage	V_{SD}	$T_J = 25^\circ\text{C}, I_{SD} = 20A$ $V_{GS} = 0V$	--	1.0	1.5	V
Reverse Recovery Time	t_{rr}	$V_R = 400V$ $I_F = 20A, di_F/dt = 100A/\mu s$	--	165	--	ns
Reverse Recovery Charge	Q_{rr}		--	1.2	--	μC
Peak Reverse Recovery Current	I_{rrm}		--	14	--	A



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

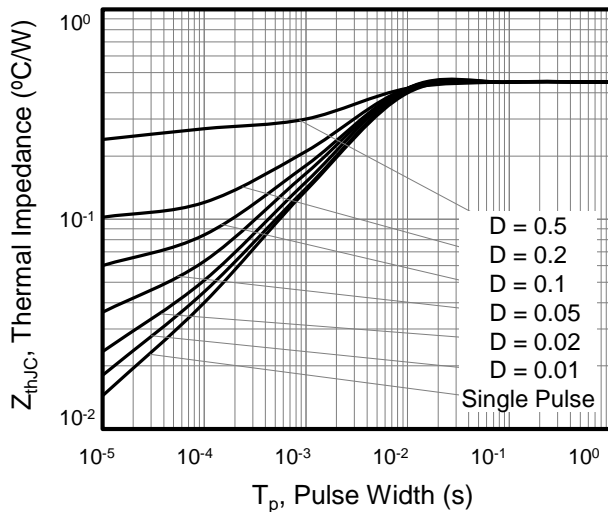


Figure 1. Transient Thermal Impedance For TO-263/262/220/247

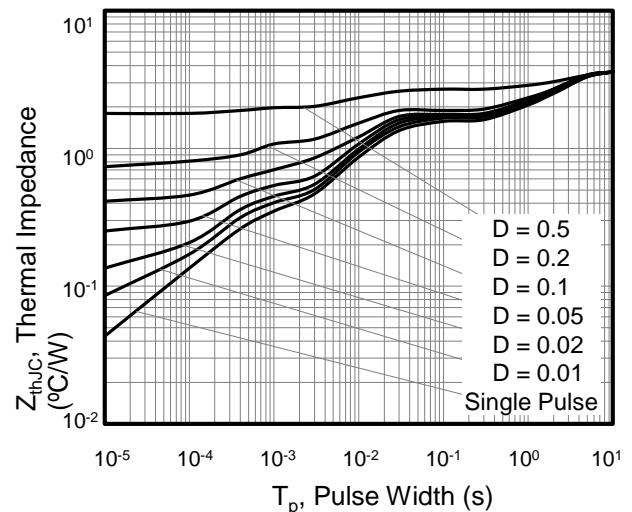


Figure 2. Transient Thermal Impedance For TO-220F

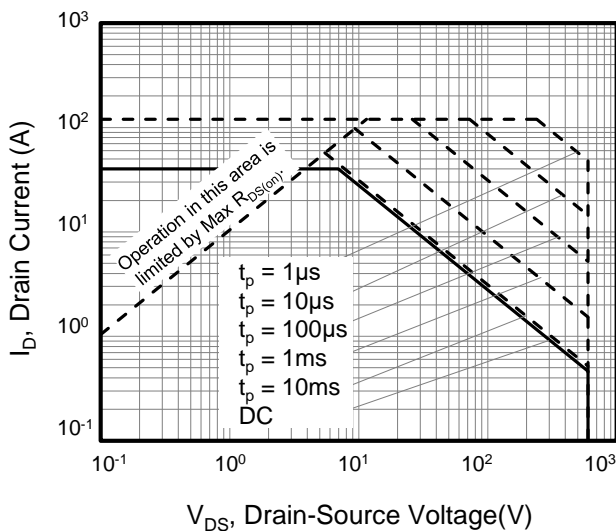


Figure 3. Safe Operation Area For TO-263/262/220/247

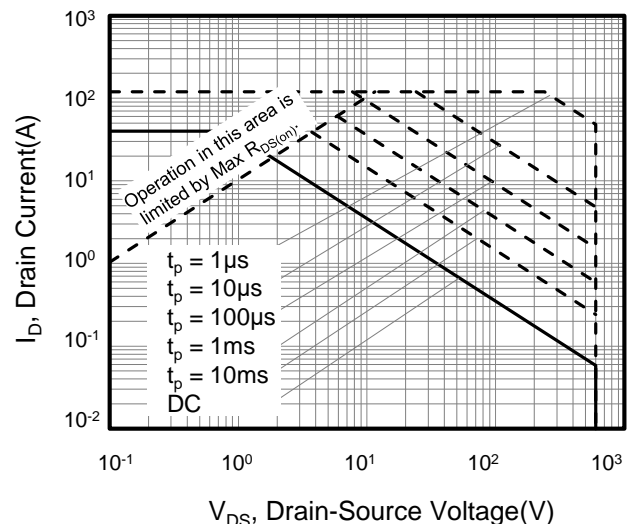


Figure 4. Safe Operation Area For TO-220F

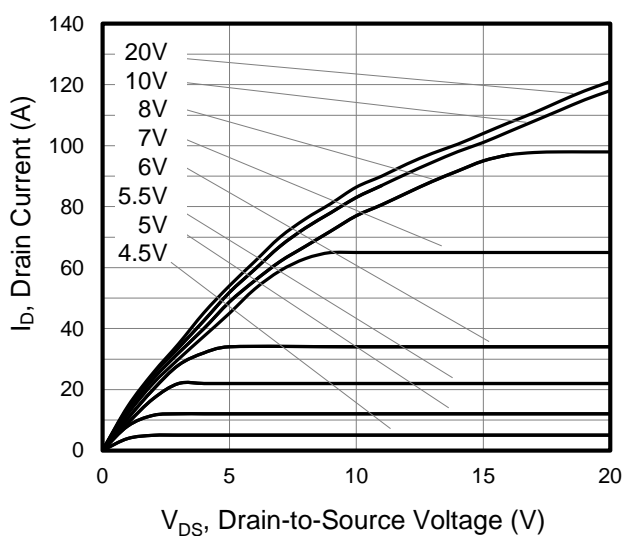


Figure 5. Output Characteristics

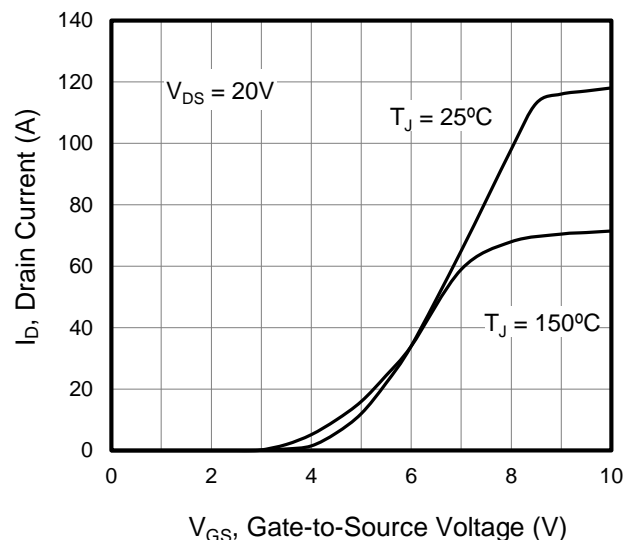


Figure 6. Transfer Characteristics



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

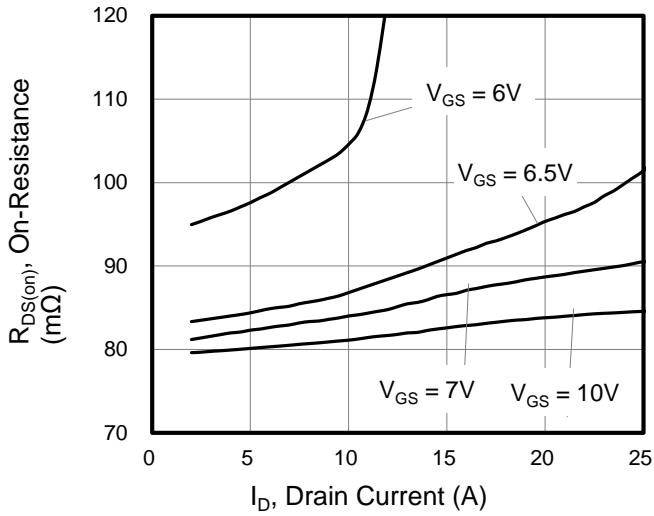


Figure 7. On-Resistance vs Drain Current

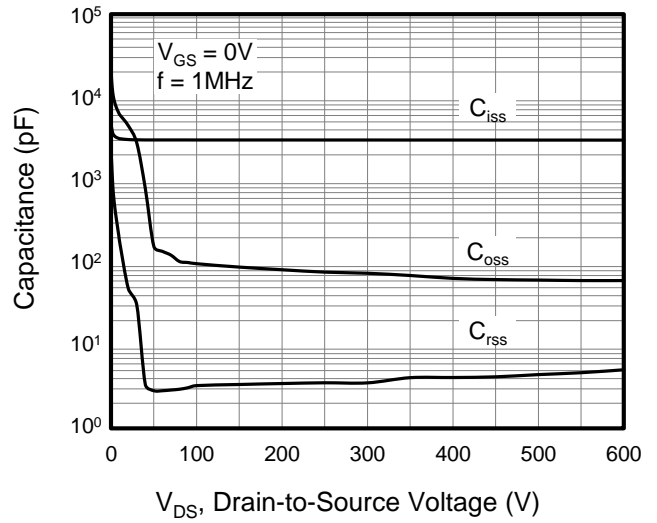


Figure 8. Capacitance

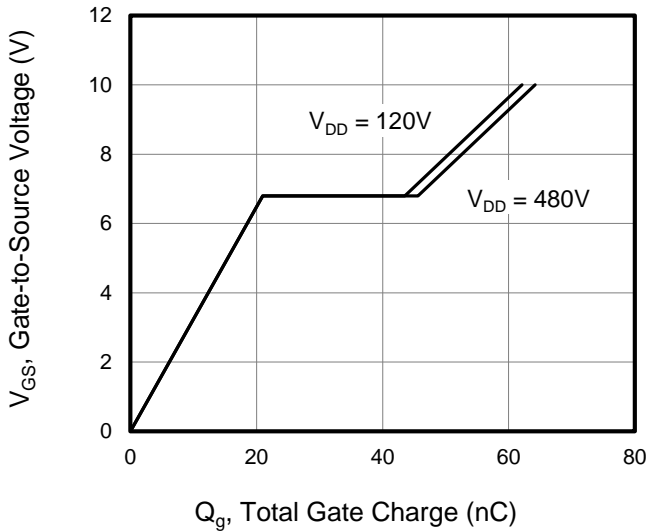


Figure 9. Gate Charge

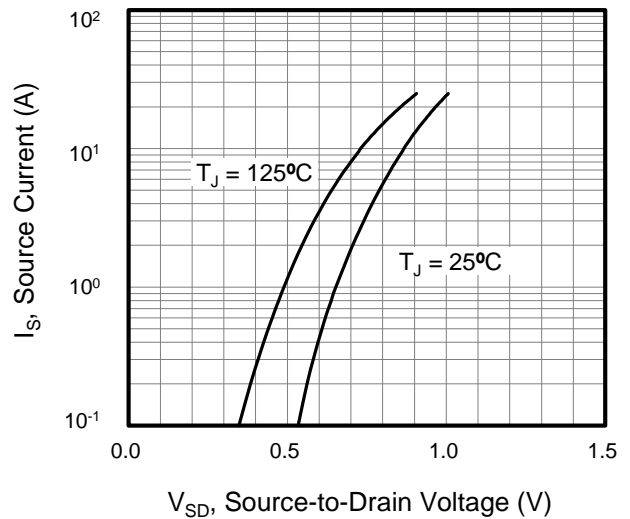


Figure 10. Body Diode Forward Voltage

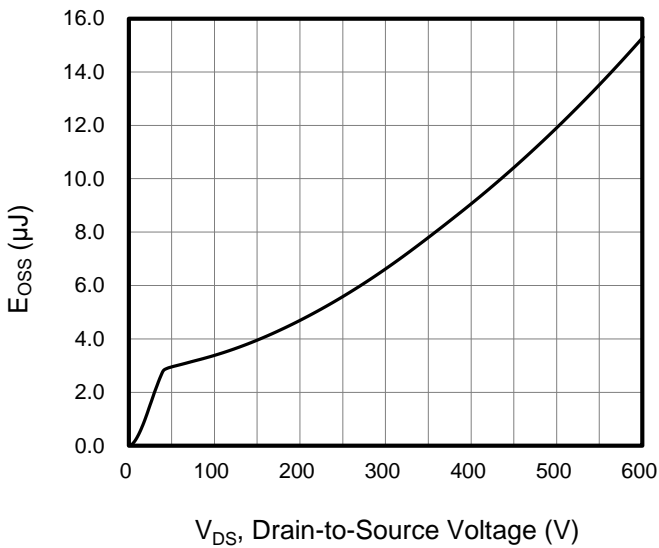


Figure 11. Typ. Coss Stored Energy

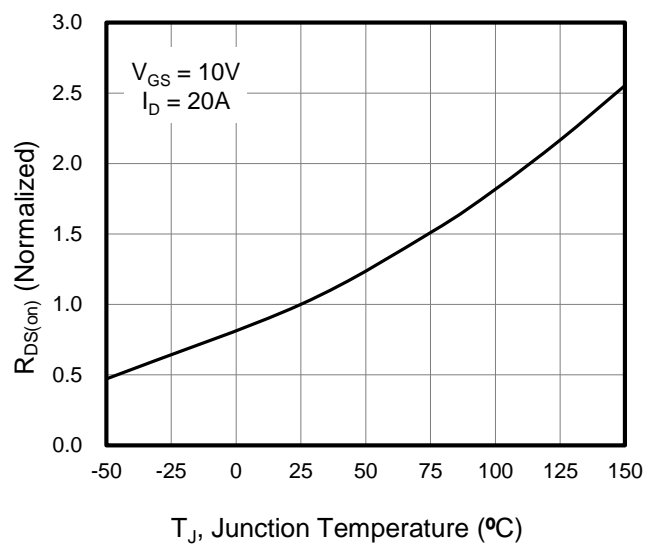


Figure 12. On-Resistance vs Temperature



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

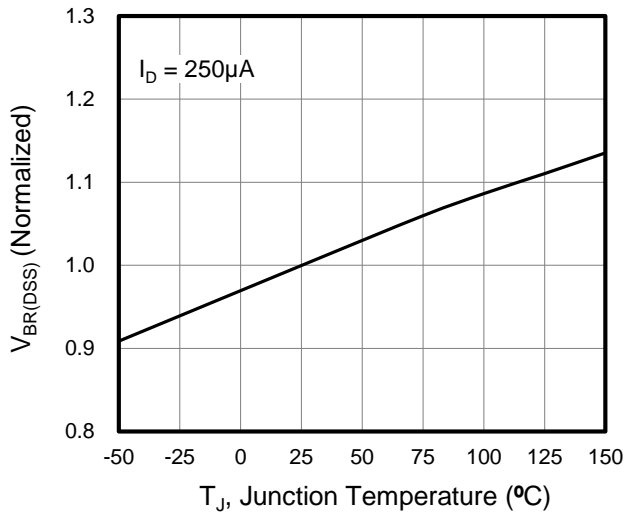


Figure 13. Breakdown Voltage vs Junction Temperature



Figure A: Gate Charge Test Circuit and Waveform

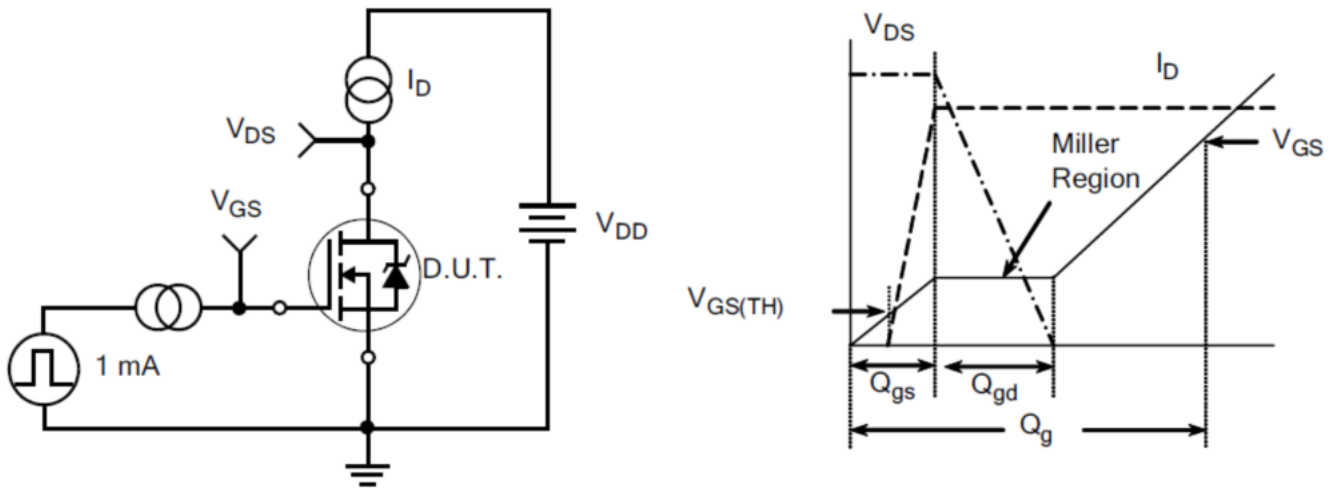


Figure B: Resistive Switching Test Circuit and Waveform

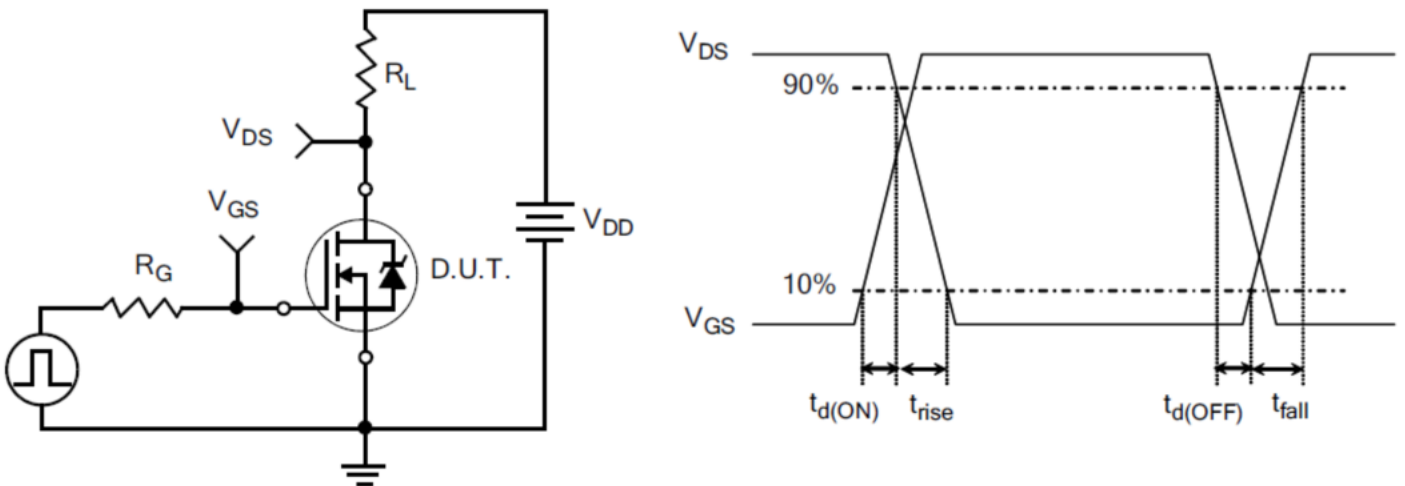
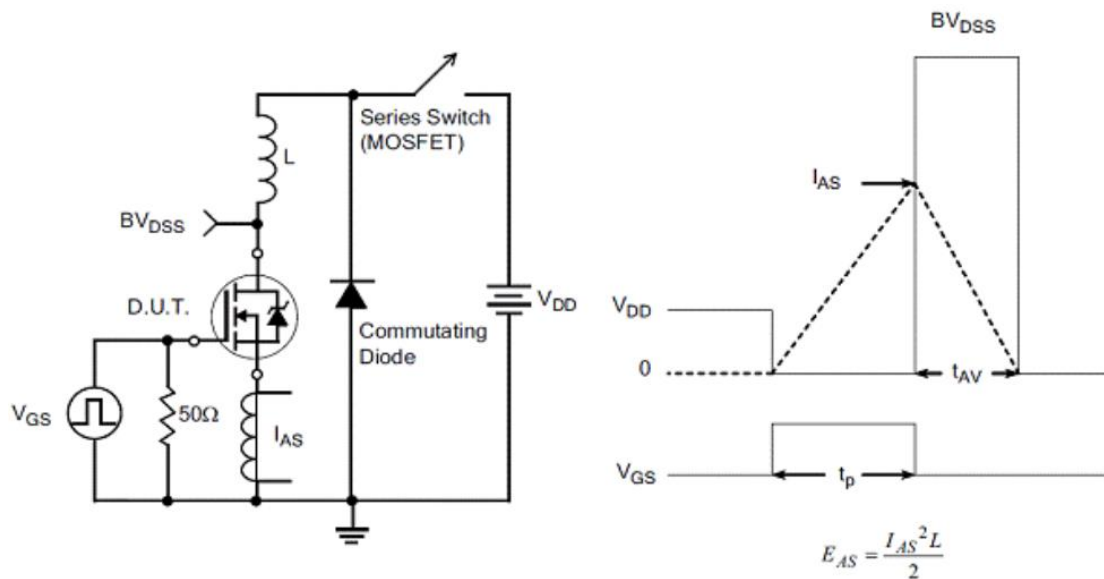
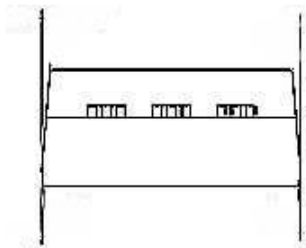
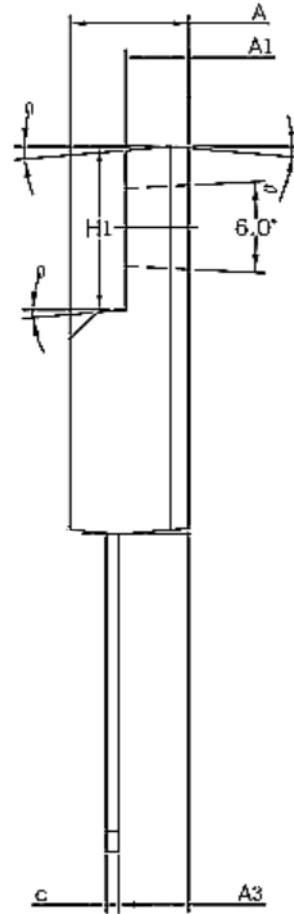
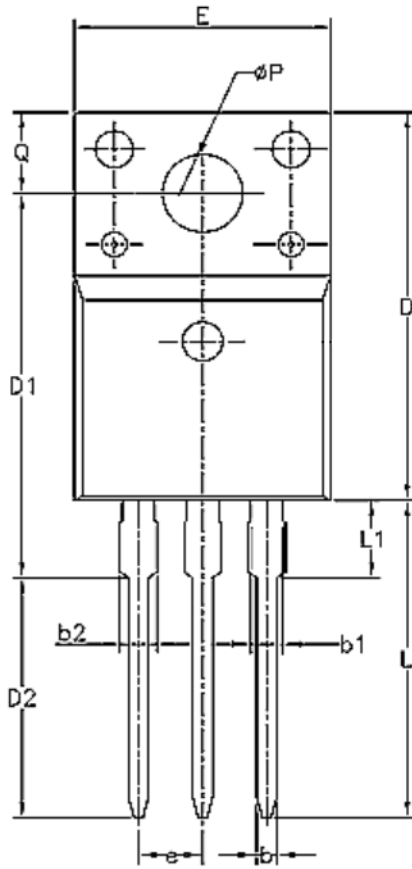


Figure C: Unclamped Inductive Switching Test Circuit and Waveform





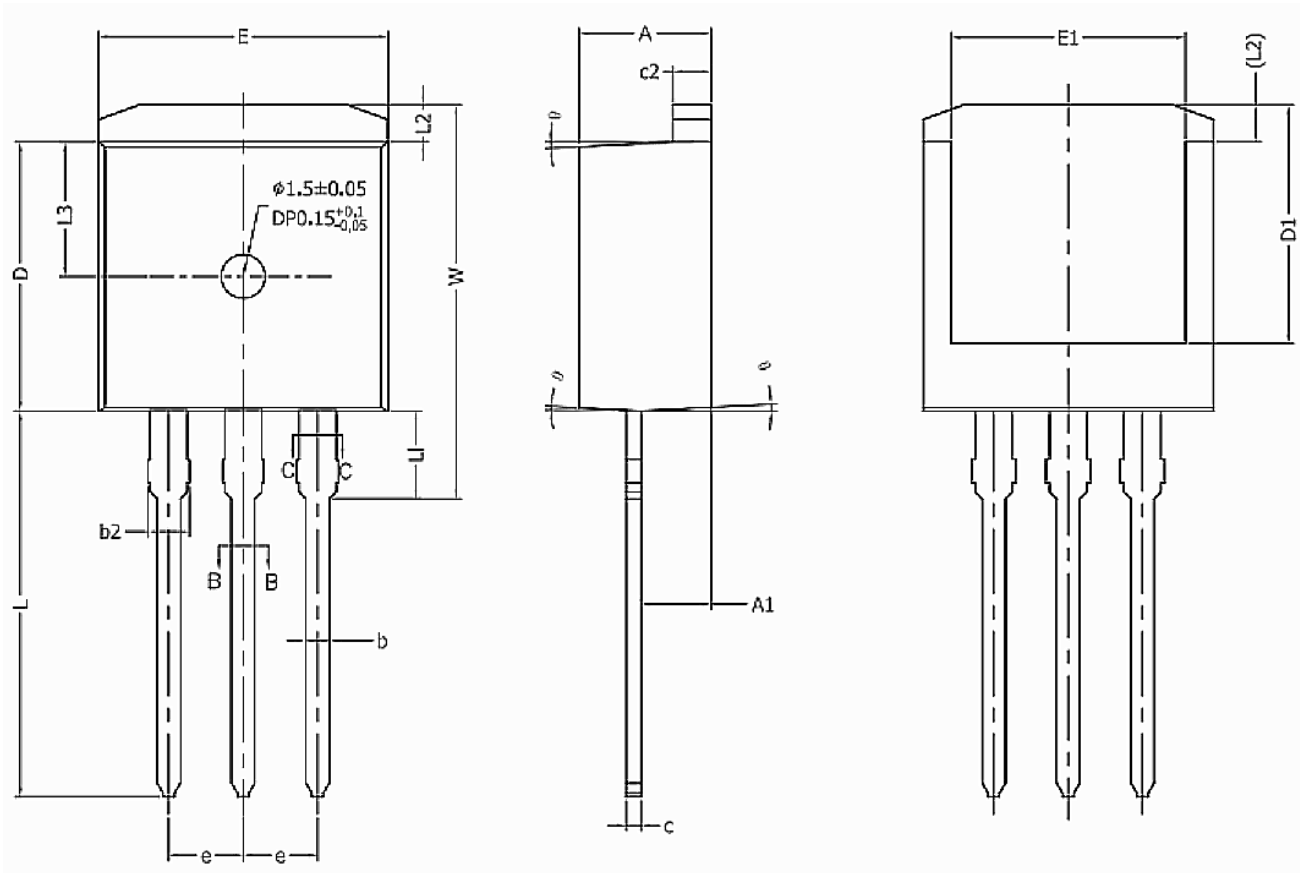
Outlines TO-220F Package



SYMBOL	MIN	NOM	MAX
A	4.5	4.7	4.9
A1	2.34	2.54	2.74
A3	2.56	2.76	2.96
b	0.7	---	0.95
b1	1.18	---	1.43
b2	---	---	1.55
c	0.4	0.5	0.65
D	15.57	15.87	16.17
D1	15.35	15.675	15.95
D2	9.6	9.875	10.15
E	9.96	10.16	10.36
e	2.54 BSC		
H1	6.48	6.68	6.88
L	12.68	12.98	13.28
L1	---	---	3.5



Outlines TO-262 Package

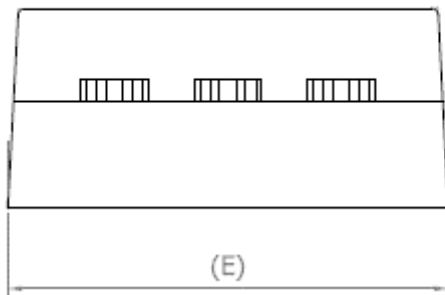
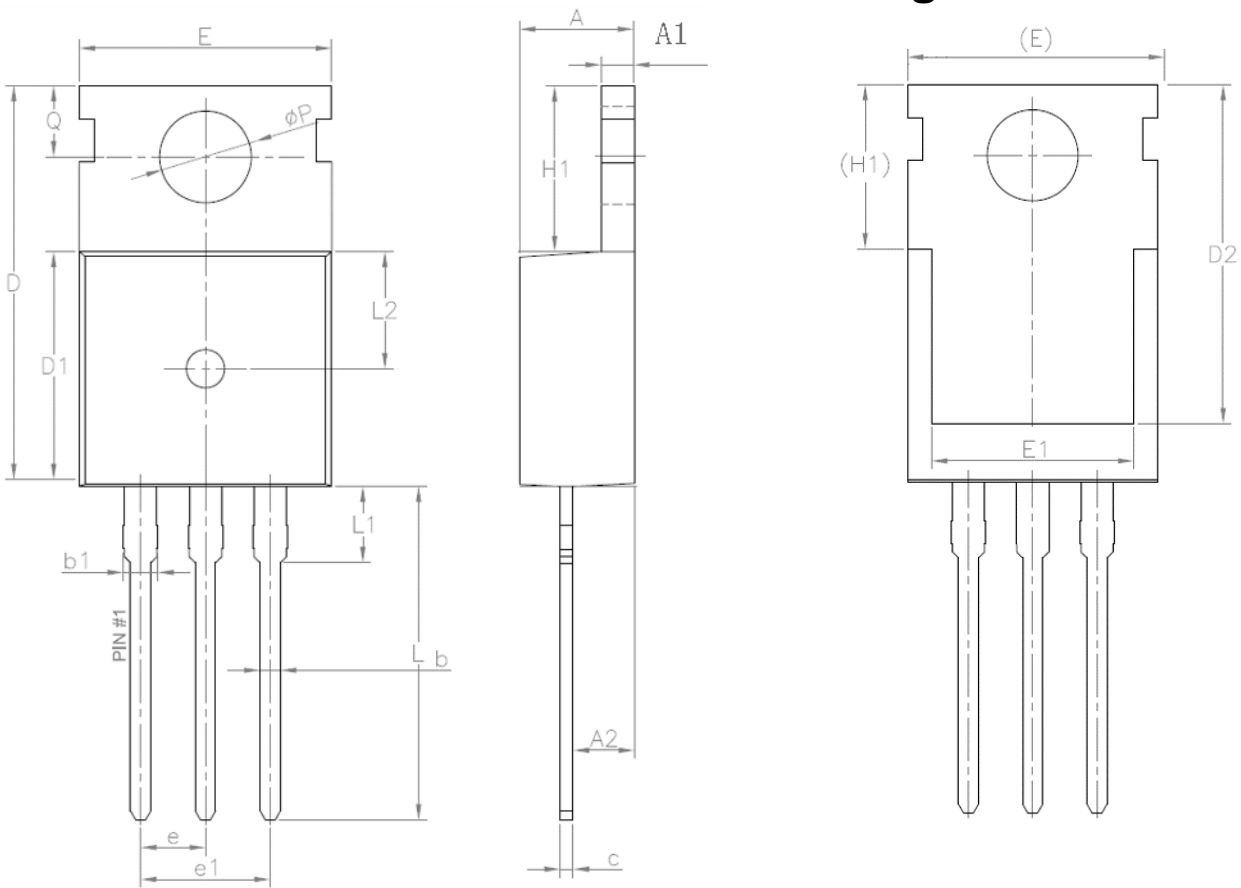


Unit:mm			
Symbol	Min.	Nom	Max.
A	4.40	4.50	4.60
A1	2.20	2.40	2.60
b	0.76	---	0.89
b1	0.75	0.80	0.85
b2	1.23	---	1.37
b3	1.22	1.27	1.32
c	0.47	---	0.60
c1	0.46	0.51	0.56
c2	1.25	1.30	1.35
D	9.10	9.20	9.30

Unit:mm			
Symbol	Min.	Nom	Max.
D1	8.00	---	---
E	9.80	9.90	10.00
E1	7.80	---	---
e	2.54 BSC		
L	12.90	13.20	13.50
L1	2.80	3.00	3.20
L2	1.17	1.27	1.40
L3	4.60 REF		
W	13.25	---	14.00
theta	1°	3°	5°



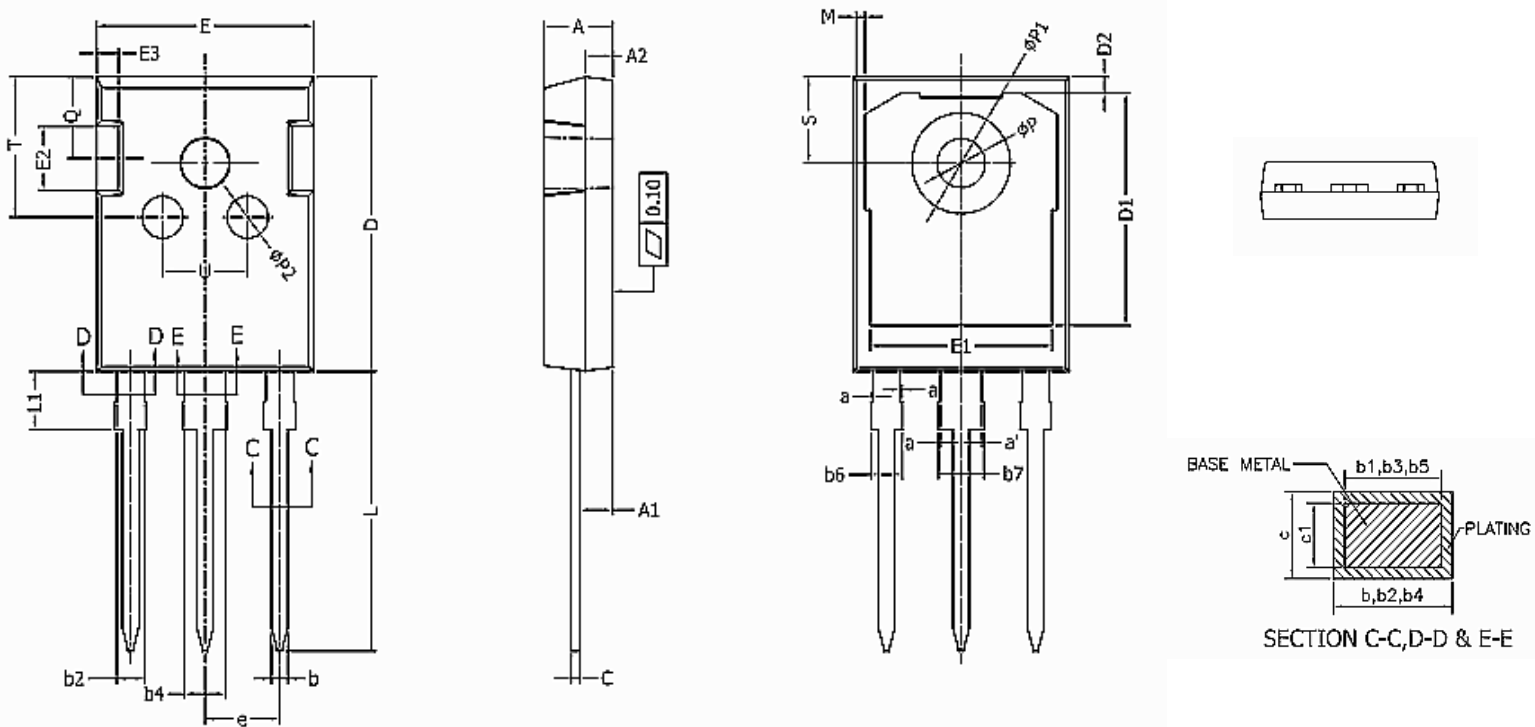
Outlines TO-220 Package



SYMBOL	MIN	NOM	MAX
A	4.37	4.535	4.7
A1	1.25	1.3	1.4
A2	2.2	2.4	2.6
b	0.7	---	0.95
b1	1.17	---	1.47
c	0.45	0.5	0.6
D	15.1	15.65	16.1
D1	8.8	9.15	9.4
D2	11.8	---	---
E	9.7	9.95	10.3
E1	7	---	---
e	2.54 BSC		
e1	5.08 BSC		
H1	6.25	6.5	6.85
L	12.75	13.29	13.8
L1	---	---	3.5
ΦP	3.4	3.67	3.8
Q	2.6	---	3



Outlines TO-247 Package



SYMBOL	MIN	NOM	MAX
A	4.9	5	5.1
A1	2.31	2.41	2.51
A2	1.9	2	2.1
a	0	---	0.15
a'	0	---	0.15
b	1.16	---	1.26
b1	1.15	1.2	1.22
b2	1.96	---	2.06
b3	1.95	2	2.02
b4	2.96	---	3.06
b5	2.96	3	3.02
b6	---	---	2.25
b7	---	---	3.25
c	0.59	---	0.66
c1	0.58	0.6	0.62
D	20.9	21	21.1
D1	16.25	16.55	16.85

SYMBOL	MIN	NOM	MAX
D2	1.05	1.17	1.35
E	15.7	15.8	15.9
E1	13.1	13.3	13.5
E2	4.4	4.5	4.6
E3	2.4	2.5	2.6
e	5.436 BSC		
L	19.8	19.92	20.1
L1	---	---	4.3
M	0.35	---	0.95
P	3.4	3.5	3.6
P1	7	---	7.4
P2	2.4	2.5	2.6
Q	5.6	---	6
S	6.05	6.15	6.25
T	9.8	---	10.2
U	6	---	6.4



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