



650 V N-Channel Super-Junction MOSFET

Features

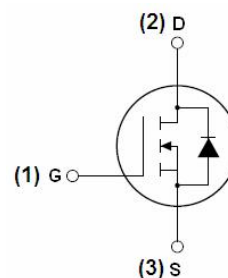
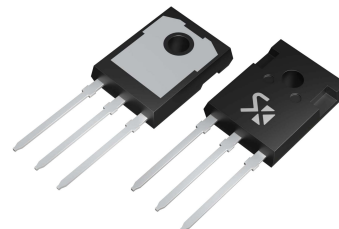
- Much lower On-resistance $R_{DS(ON)}$
- Low C_{rss}
- Fast switching
- 100% avalanche tested
- Improved dv/dt capability

Applications

- LED/LCD/PDP TV and monitor Lighting
- Solar/Renewable/UPS-Micro Inverter System
- Charger
- Power Supply

Product Summary

VDS	650	V
$R_{DS(on)}$, Typ. @ $V_{GS}=10V$	31	m Ω
ID	83	A



TO-247-3

Absolute Maximum Ratings

$T_C = 25^\circ\text{C}$ unless otherwise noted

Symbol	Parameter	Value	Units
V_{DSS}	Drain-Source Voltage	650	V
I_D	Drain Current - Continuous ($T_C = 25^\circ\text{C}$)	83	A
	- Continuous ($T_C = 100^\circ\text{C}$)	59	A
I_{DM}	Drain Current - Pulsed (Note 1)	332	A
V_{GSS}	Gate-Source Voltage	± 20	V
E_{AS}	Single Pulsed Avalanche Energy	1200	mJ
P_D	Power Dissipation ($T_C = 25^\circ\text{C}$)	633	W
$R_{\theta JC}$	Thermal Resistance, Junction to Case	0.141	W/ $^\circ\text{C}$
T_J, T_{STG}	Operating and Storage Temperature Range	-55 to +150	$^\circ\text{C}$
T_L	Maximum lead temperature for soldering purposes, 1/8" from case for 5 seconds	300	$^\circ\text{C}$

* Drain current limited by maximum junction temperature.



Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
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Off Characteristics

BV _{DSS}	Drain-Source Breakdown Voltage	V _{GS} = 0 V, I _D = 250 μ A	650	--	--	V
I _{DSS}	Zero Gate Voltage Drain Current	V _{DS} = 650V, V _{GS} = 0 V	--	--	5	μ A
		V _{DS} = 520V, T _c = 125°C	--	--	10	μ A
I _{GSSF}	Gate-Body Leakage Current, Forward	V _{GS} = 30V, V _{DS} = 0 V	--	--	100	nA
I _{GSSR}	Gate-Body Leakage Current, Reverse	V _{GS} = -30 V, V _{DS} = 0 V	--	--	-100	nA

On Characteristics

V _{GS(th)}	Gate Threshold Voltage	V _{DS} = V _{GS} , I _D = 250 μ A	2.5	4.0	4.5	V
R _{DS(on)}	Static Drain-Source On-Resistance	V _{GS} = 10 V, I _D = 30A	--	31	37	m Ω

Dynamic Characteristics

C _{iss}	Input Capacitance	V _{DS} = 50 V, V _{GS} = 0 V, f = 100 KHz	--	6319	-	pF
C _{oss}	Output Capacitance		--	4232	-	pF
C _{rss}	Reverse Transfer Capacitance		--	27.6	-	pF
R _g	Gate resistance	V _{GS} =0 V, f=1 MHz	--	7.0	-	Ω

Switching Characteristics

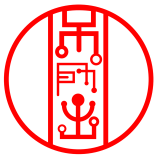
t _{d(on)}	Turn-On Delay Time	V _{GS} = 10 V, V _{DS} =400 V, R _G = 27 Ω , I _D =42A	--	171	--	ns
t _r	Turn-On Rise Time		--	111	--	ns
t _{d(off)}	Turn-Off Delay Time		--	492	--	ns
t _f	Turn-Off Fall Time		--	88	--	ns
Q _g	Total Gate Charge	V _{DS} = 480 V, I _D = 42A, V _{GS} = 10V	--	166	--	nC
Q _{gs}	Gate-Source Charge		--	48	--	nC
Q _{gd}	Gate-Drain Charge		--	63	--	nC

Drain-Source Diode Characteristics and Maximum Ratings

I _S	Maximum Continuous Drain-Source Diode Forward Current	--	--	83	A
I _{SM}	Maximum Pulsed Drain-Source Diode Forward Current	--	--	124	A
V _{SD}	Drain to Source Diode Forward Voltage, V _{GS} = 0V, I _{SD} = 20A, T _J = 25°C	0.32	0.8	1.2	V
t _{rr}	Body Diode Reverse Recovery Time, I _F = 41A, dI/dt = 100A/ μ s	--	192	--	nS
Q _{rr}	Body Diode Reverse Recovery Charge, I _F = 41A, dI/dt = 100A/ μ s	--	2.33	--	nC

Notes:

1. Repetitive Rating: Pulse Width Limited by Maximum Junction Temperature
2. EAS condition: T_J = 25°C, V_{DD} = 50V, V_G = 10V, R_G = 25 Ω , L = 0.5mH,
3. Pulse Test: Pulse Width $\leq$ 300 μ s, Duty Cycle $\leq$ 0.5%



Typical Performance Characteristics

Fig 1. Output Characteristics ($T_j=25^\circ\text{C}$)

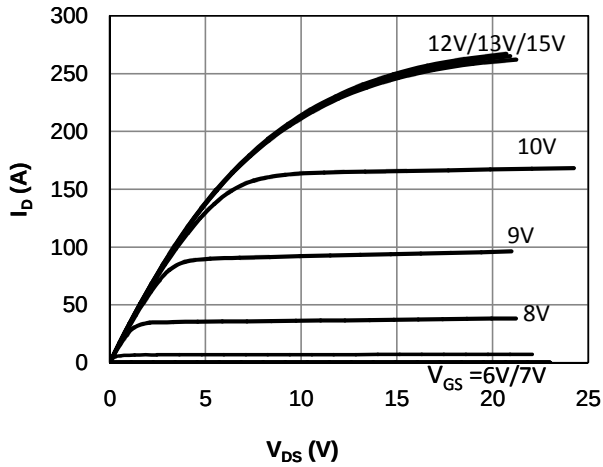


Fig 2. Output Characteristics ($T_j=150^\circ\text{C}$)

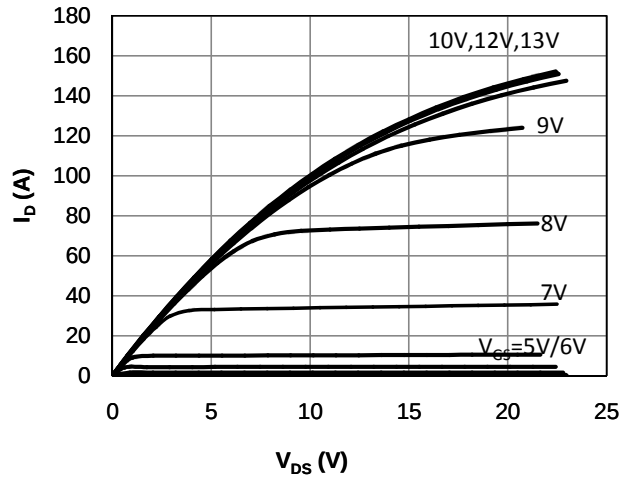


Fig 3: Transfer Characteristics

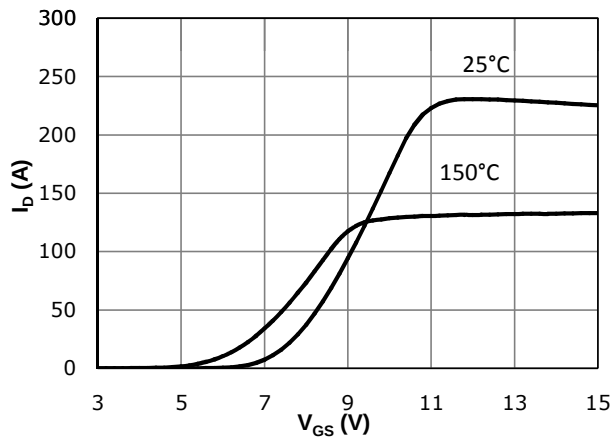


Fig 4: V_{TH} Vs T_j Temperature Characteristics

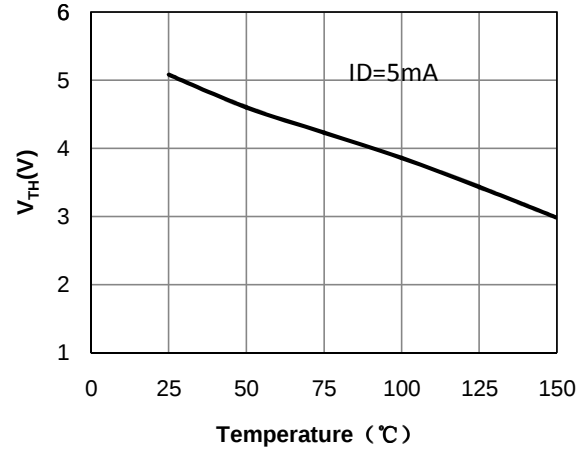


Fig 5: $R_{DS(on)}$ Vs I_{DS} Characteristics ($T_c=25^\circ\text{C}$)

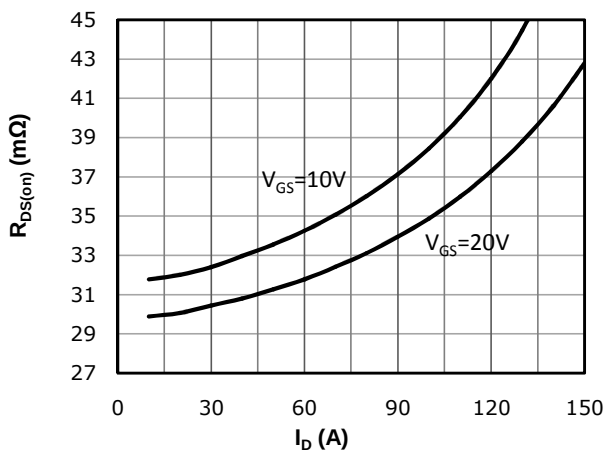
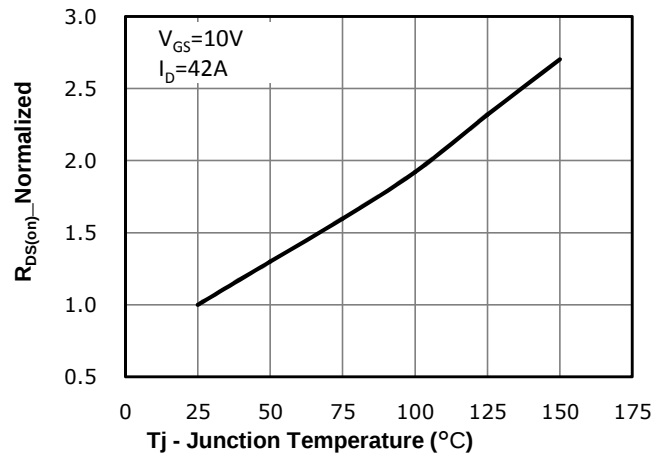


Fig 6: $R_{DS(on)}$ vs. Temperature



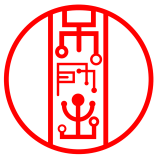


Fig 7: BVDSS vs. Temperature

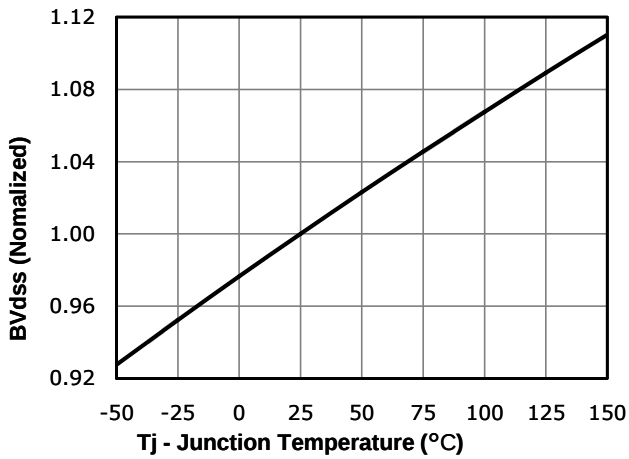


Fig 8: Rds(on) vs Gate Voltage

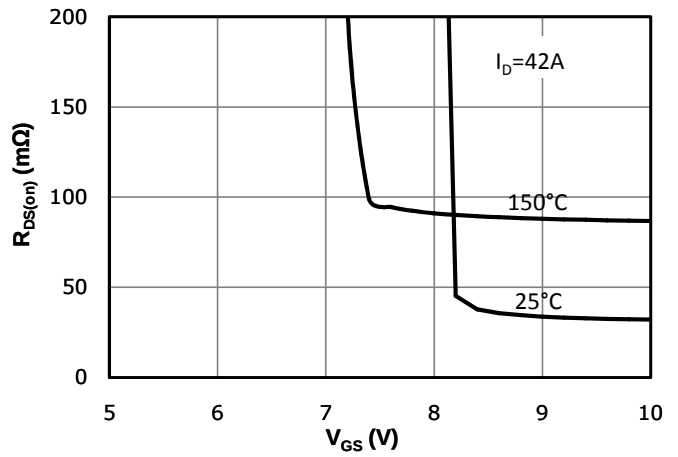


Fig 9: Body-diode Forward Characteristics

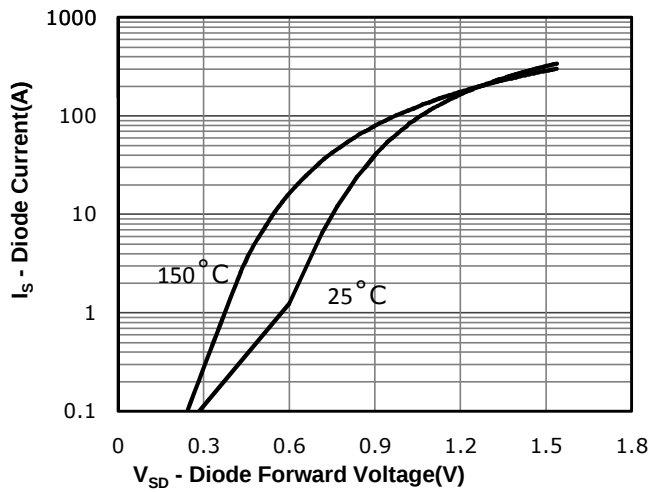


Fig 10: Gate Charge Characteristics

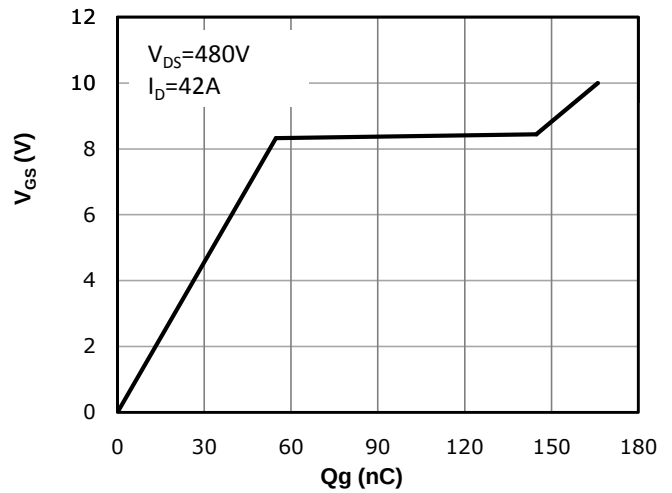


Fig 11: Capacitance Characteristics

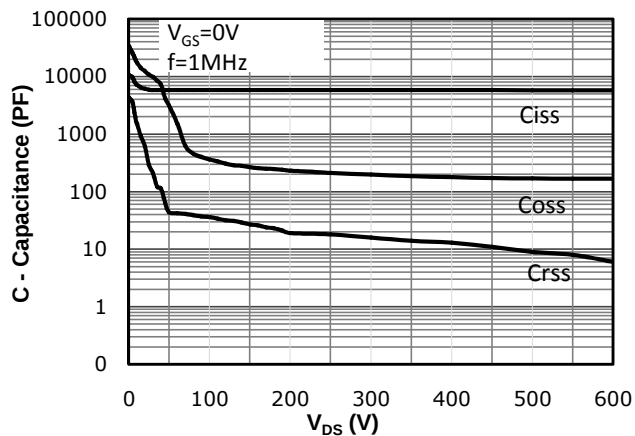
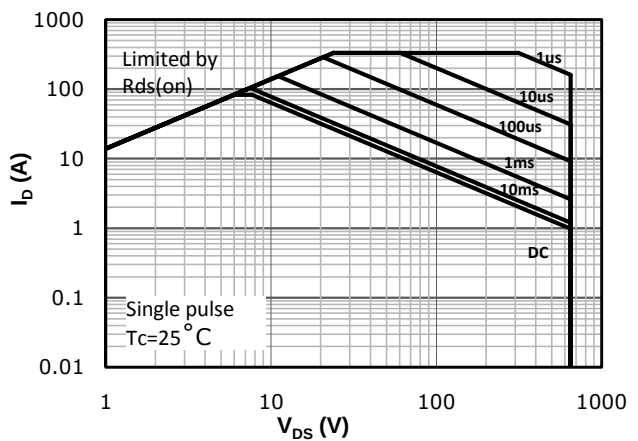


Fig 12: Safe Operating Area



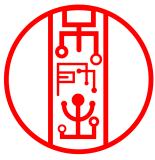
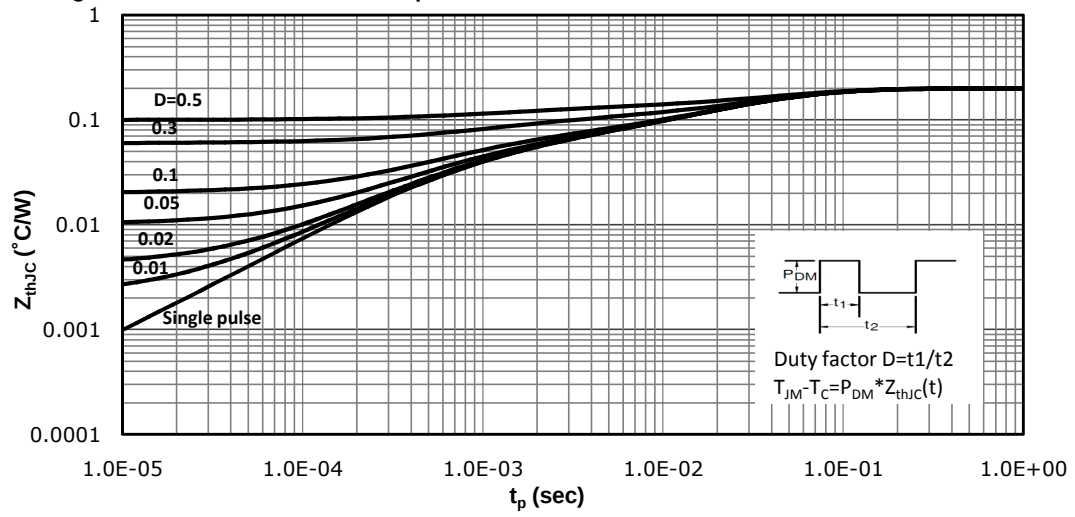
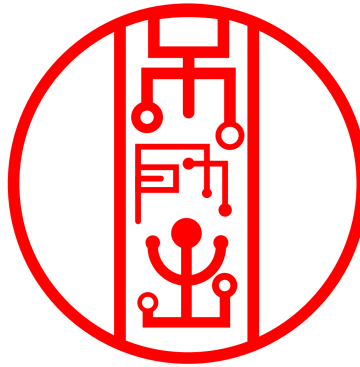
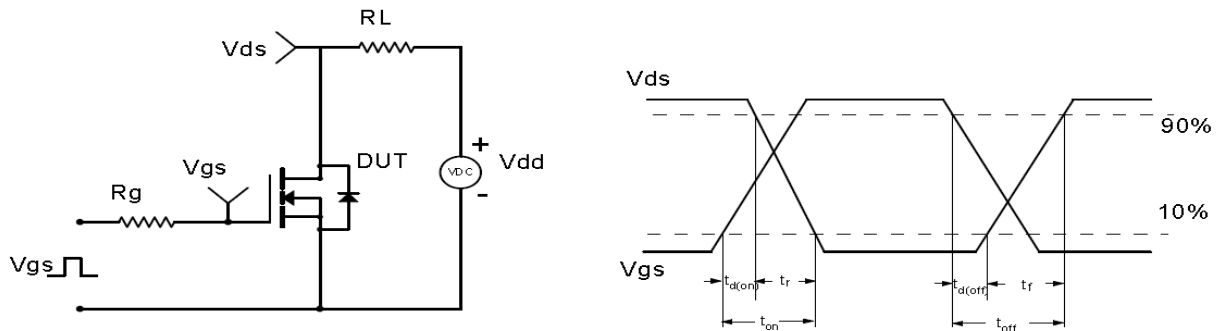


Fig 13: Max. Transient Thermal Impedance

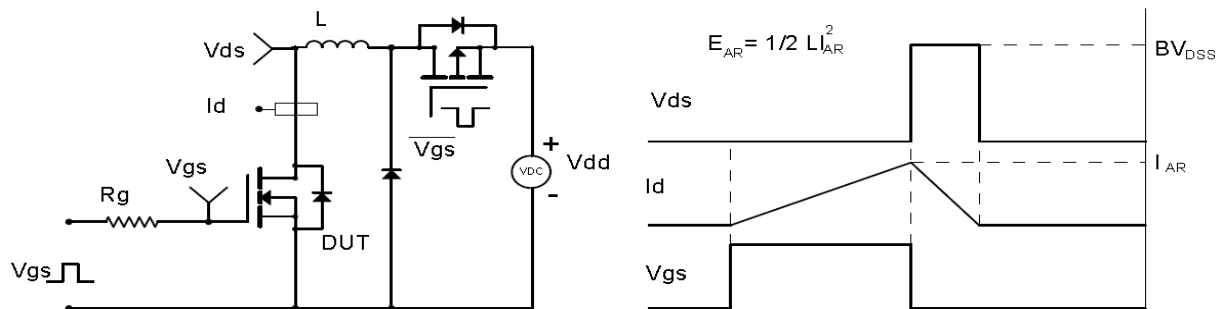




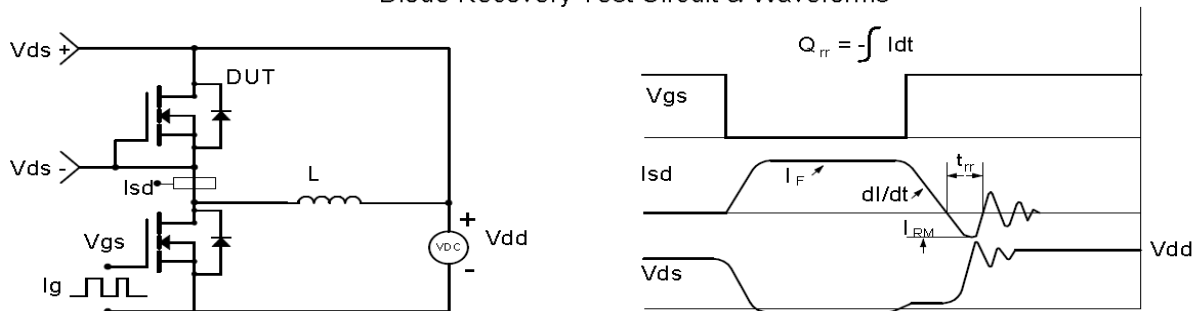
Resistive Switching Test Circuit & Waveforms

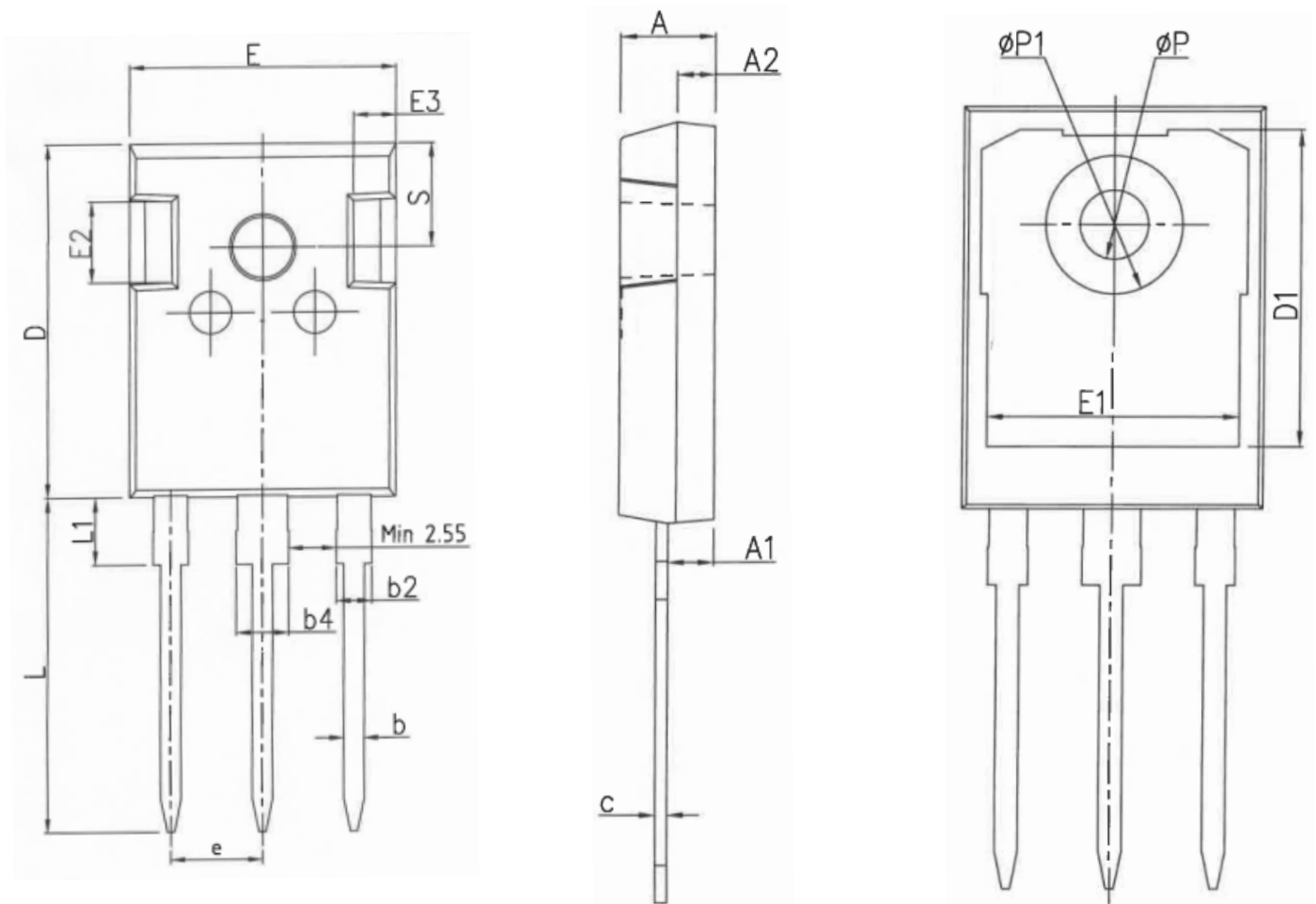


Unclamped Inductive Switching (UIS) Test Circuit & Waveforms



Diode Recovery Test Circuit & Waveforms



**TO-247 PACKAGE INFORMATION****COMMON DIMENSIONS**

SYMBOL	mm		
	MIN	NOM	MAX
A	4.80	5.00	5.20
A1	2.21	2.41	2.59
A2	1.85	2.00	2.15
b	1.11	1.21	1.36
b2	1.91	2.01	2.21
b4	2.91	3.01	3.21
c	0.51	0.61	0.75
D	20.70	21.00	21.30
D1	16.25	16.55	16.85
E	15.50	15.80	16.10
E1	13.00	13.30	13.60
E2	4.80	5.00	5.20
E3	2.30	2.50	2.70
e	5.44BSC		
L	19.62	19.92	20.22
L1	-	-	4.30
ΦP	3.40	3.60	3.80
ΦP1	-	-	7.30
S	6.15BSC		