PWS1TF065N65PR

Silicon Carbide MOSFET 650V, 65mΩ, 40A

重庆平伟半导体股份有限公司

Features

- Extremely low on-resistance RDS(on)
- Robust body diode operation under hard commutation events
- Easy to Parallel and Simple to Drive
- Qualified according to JEDEC criteria

Applications

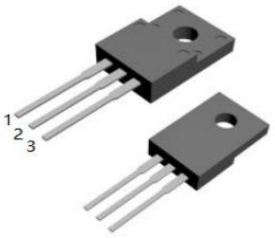
- SMPS
- Solar PV inverters
- EV charging infrastructure
- Energy storage and battery formation

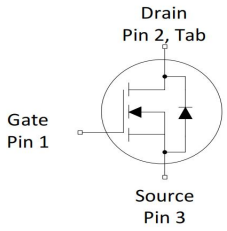
100% DVDS Tested
100%
AvalancheTested

Product Summary

V_{DS}	650V
$R_{DS(on)\ typ.}$	65mΩ
I_D	40A

TO-220TF-3L





Package Marking and Ordering Information

Part #	Marking	Package	Packing	Reel Size	Tape Width	Qty
PWS1TF065N65PR	S1065N65P	TO-220TF-3L	Tube	N/A	N/A	50

Absolute Maximum Ratings

Parameter	**Symbol**	**Value**	**Unit**
Drain-source voltage	V_{DS}	650	V
Continuous drain current T_C = 25°C T_C = 100°C	I_D	 40 28	A
Pulsed drain current (T_C = 25°C)	$I_{D\ pulse}$	119	A
Avalanche energy, single pulse (L=5mH)	E_{AS}	114	mJ
Gate-Source voltage,max.transient voltage	V_{GSmax}	-10/+22	V
Recommended operating values	V_{GSsop}	-5/+18	V
Power dissipation T_C = 25°C	P_{tot}	 25	W
Operating junction and storage temperature	T_j , T_{stg}	-55...+175	°C

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Thermal Resistance

Parameter	Symbol	Value			Unit	Test Condition
		min.	typ.	max.		
Thermal resistance, junction – case.	R_{thJC}	-	4.08	6.1	°C/W	-
Thermal resistance, junction - ambient(min. footprint)	R_{thJA}	-	-	40	°C/W	

Electrical Characteristic (at Tj = 25 °C, unless otherwise specified)

Parameter	Symbol	Value			Unit	Test Condition
		min.	typ.	max.		
Static Characteristic						
Drain-source breakdown voltage	BV_{DSS}	650	-	-	V	V_{GS}=0V, I_D=100uA
Gate threshold voltage	$V_{GS(th)}$	2.2	3.2	4.2	V	V_{DS}=V_{GS}, I_D=5mA
Zero gate voltage drain current	I_{DSS}	-	1	10	μA	V_{DS}=650V,V_{GS}=0V T_j=25°C
Gate-source leakage current	I_{GSS}	-	-	200	nA	V_{GS}=22V,V_{DS}=0V
		-	-	-200	nA	V_{GS}=-10V,V_{DS}=0V
Drain-source on-state resistance	$R_{DS(on)}$	-	65	75	mΩ	V_{GS}=18V,I_D=20A, T_J=25℃
Transconductance	g_{fs}	-	13.0	-	S	V_{DS}=20V,I_D=15A
Dynamic Characteristic						
Input Capacitance	C_{iss}	-	1144	-	pF	V_{GS}=0V, V_{DS}=400V, f=1MHz
Output Capacitance	C_{oss}	-	74	-		
Reverse Transfer Capacitance	C_{rss}	-	5	-		
Gate Total Charge	Q_G	-	40	-	nC	V_{DS}=400V,I_D=20A ,V_{GS}=-5V/18V
Gate-Source charge	Q_{gs}	-	16	-		
Gate-Drain charge	Q_{gd}	-	12	-		
Turn-on delay time	$t_{d(on)}$	-	39	-	ns	V_{GS}=-5/18V, V_{DD}=400V, R_G=10Ω,I_D=20A
Rise time	t_r	-	35	-		
Turn-off delay time	$t_{d(off)}$	-	26	-		
Fall time	t_f	-	12	-		
Turn-on energy	E_{on}	-	34	-	uJ	
Turn-off energy	E_{off}	-	44	-		
Gate resistance	R_G	-	3.6	-	Ω	V_{GS}=0V, f=1MHz

Body Diode Characteristic

Parameter	Symbol	Value			Unit	Test Condition
		min.	typ.	max.		
Body Diode Forward Voltage	V_{SD}	- -	3.42 3.12	-	V	V_{GS}=-5V, I_{SD}=10A T_j=25°C T_j=175°C
Body Diode Continuous Forward Current	I_S	-	40	-	A	T_C = 25°C
		-	29	-	A	T_C = 100°C
Body Diode Reverse Recovery Time	t_{rr}	-	13	-	ns	V_{GS}=-5V,I_{SD}=20A, V_R=400V di/dt=1200A/us
Body Diode Reverse Recovery Charge	Q_{rr}	-	39	-	nC	
Peak Reverse Recovery Current	I_{RRM}	-	5.0	-	A	

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Typical Performance Characteristics

Fig 1: Output Characteristics Tj=25°C

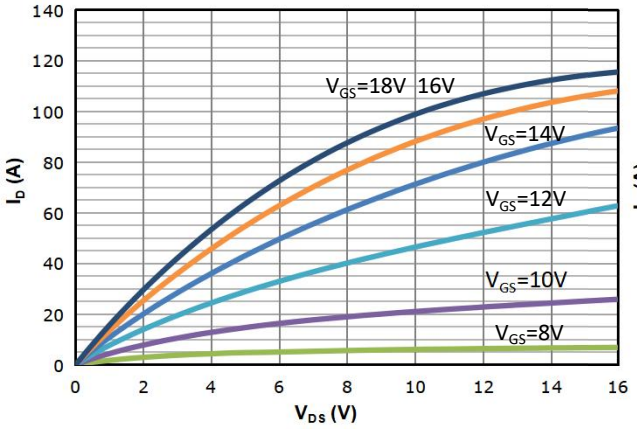


Fig 2: Output Characteristics Tj=175°C

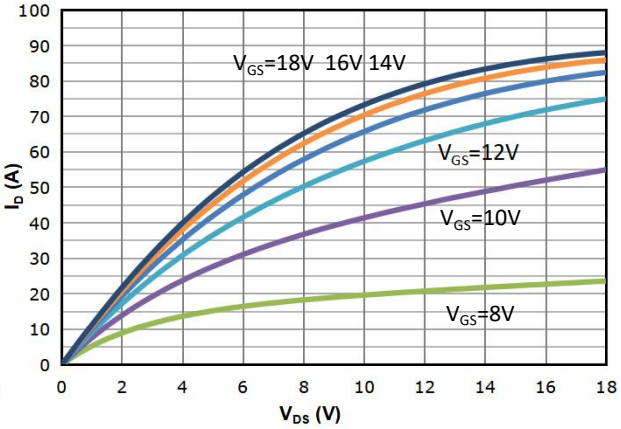


Fig 3: Transfer Characteristics

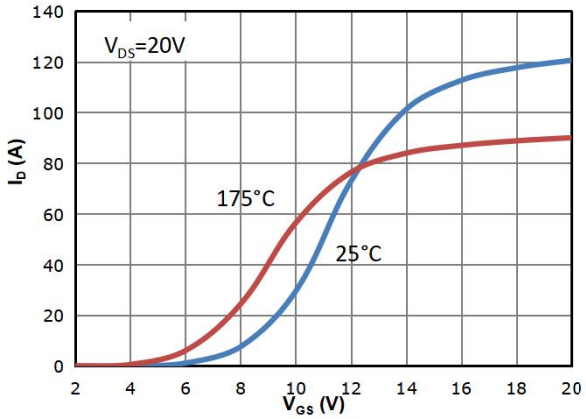


Fig 4: Rds(on) vs Drain Current and Gate Voltage

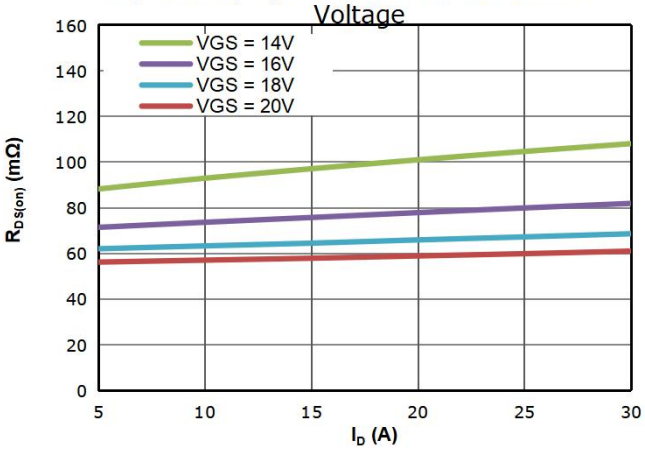


Fig 5: Rds(on) vs. Temperature

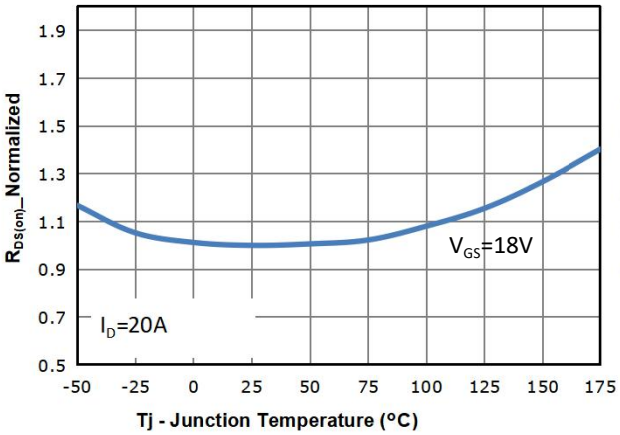


Fig 6: Vgs(th) vs. Temperature

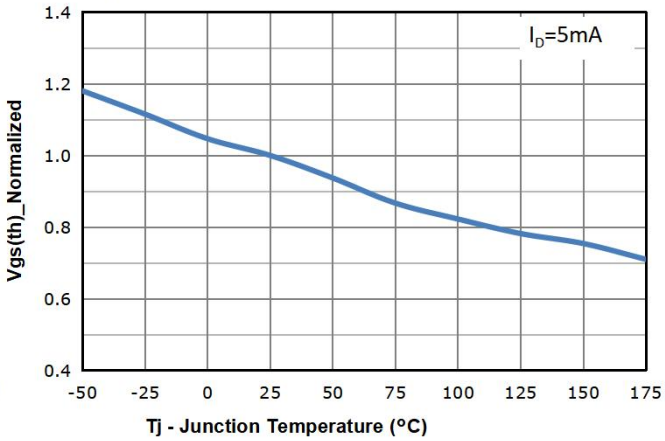


Fig 7: BVdss vs. Temperature

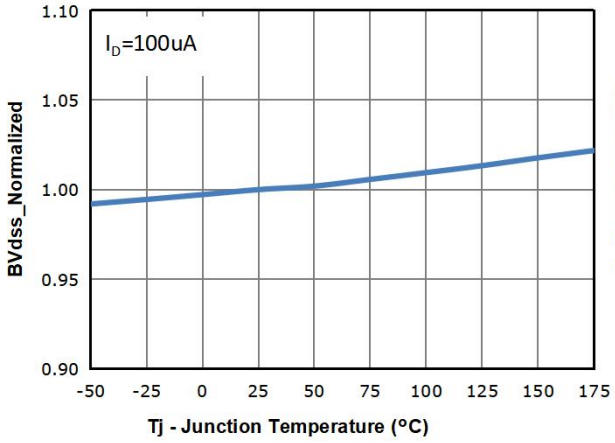


Fig 8: Capacitance Characteristics

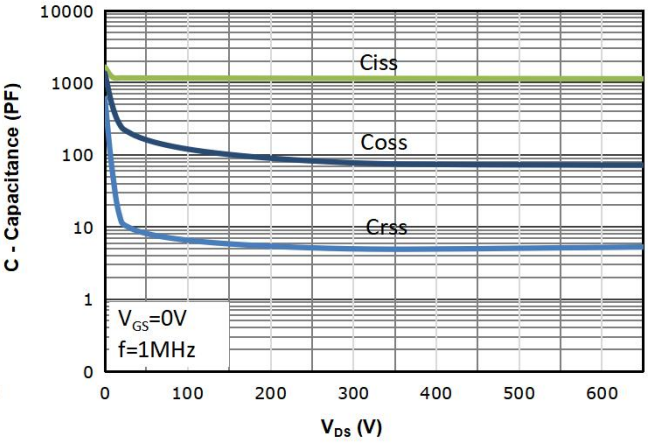


Fig 9: Gate ChargeCharacteristics

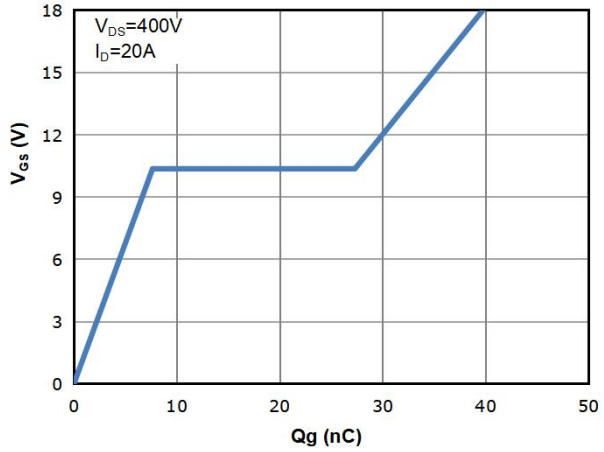


Fig 10: Body-diode Forward Characteristics

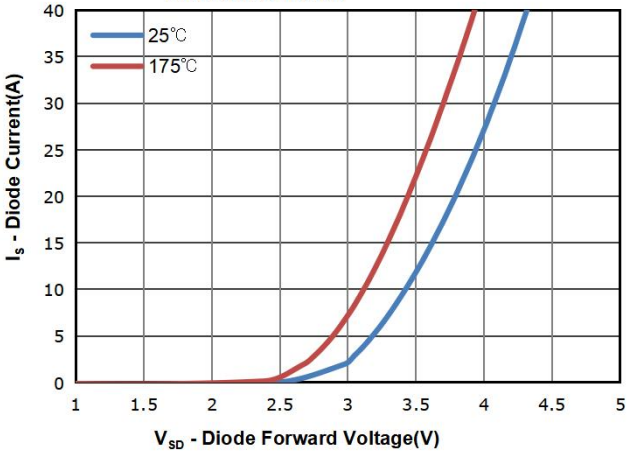


Fig 11: Power Dissipation

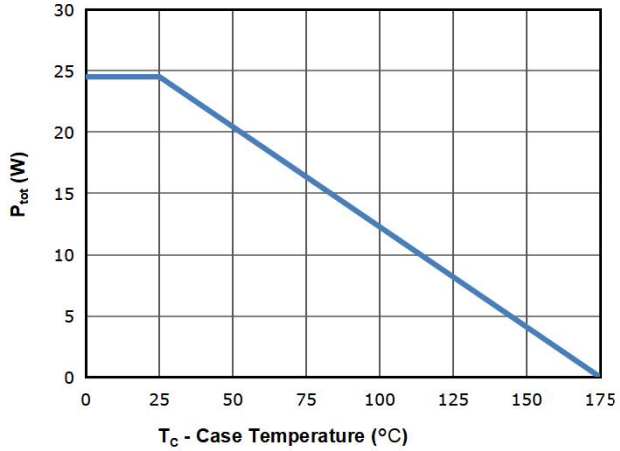
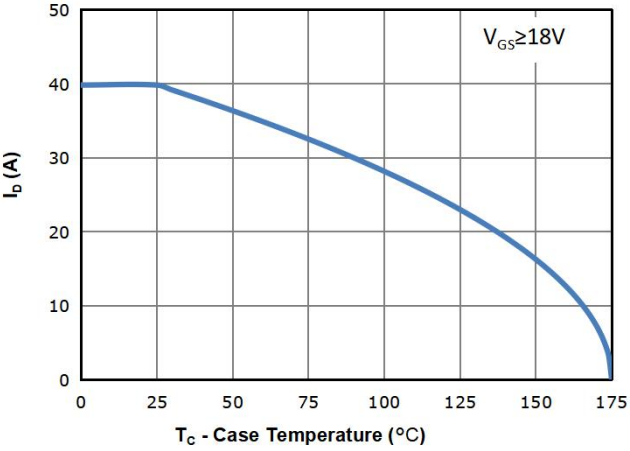


Fig 12: Drain Current Derating



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Fig 13: Safe Operating Area

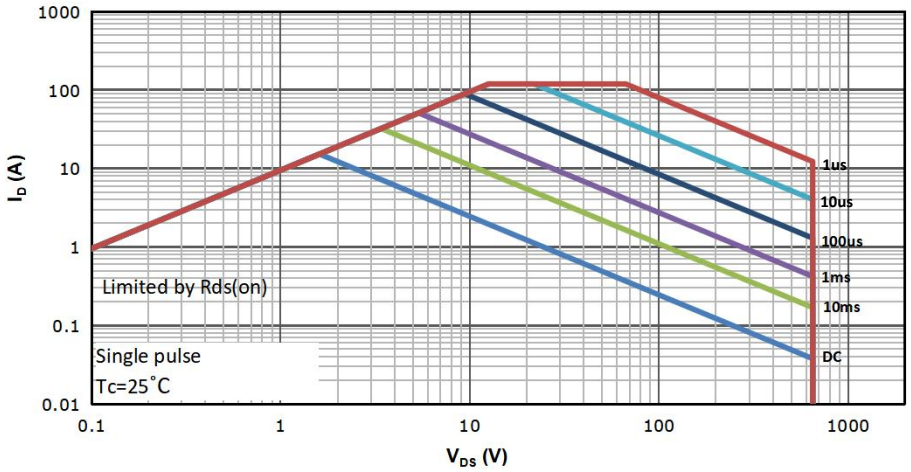
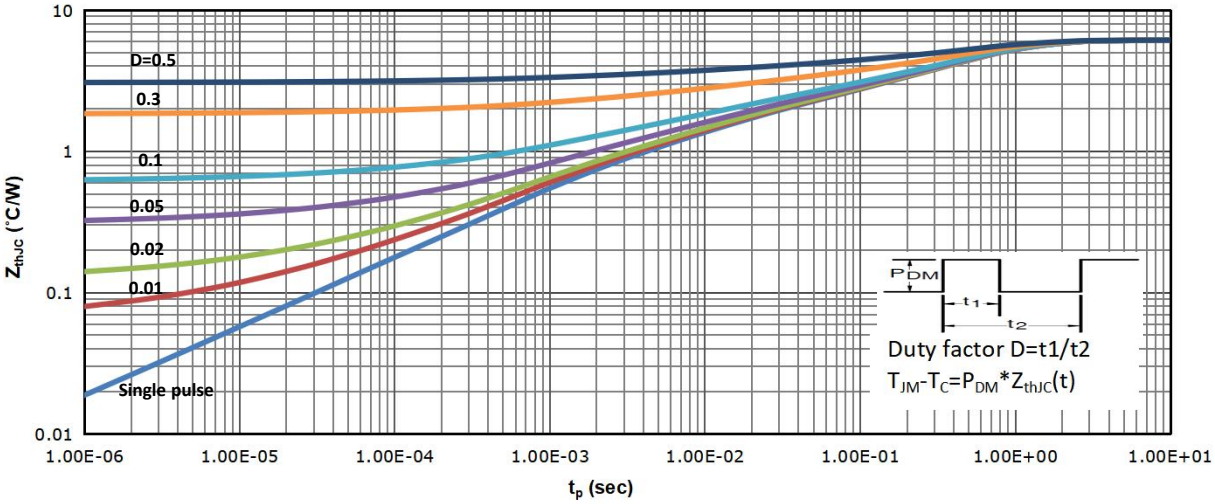


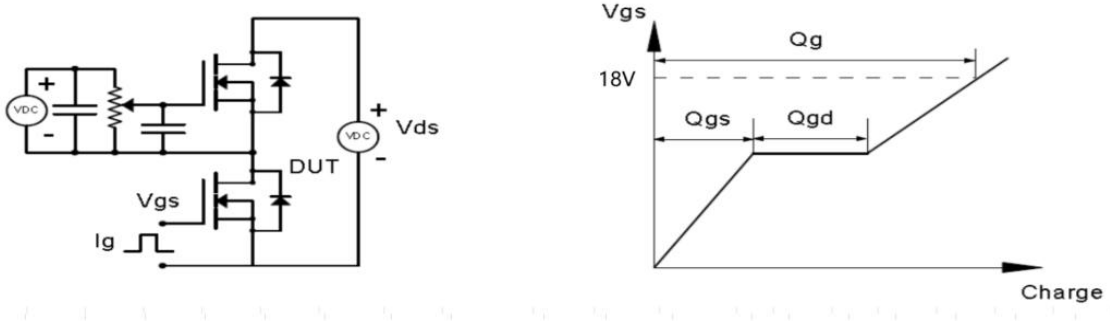
Fig 14: Max. Transient Thermal Impedance



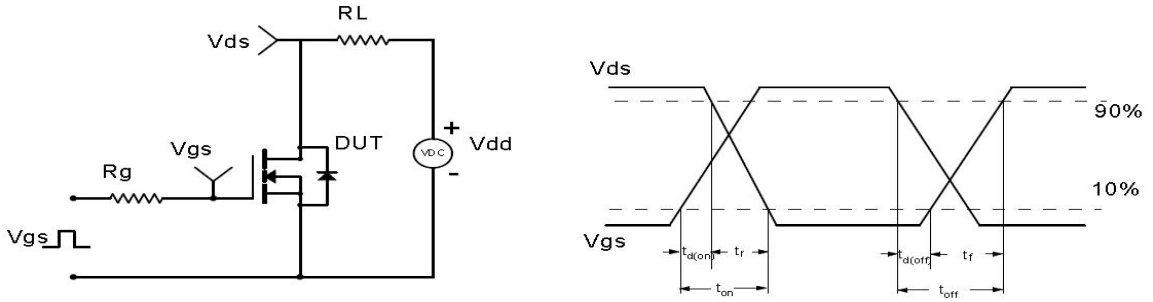
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Test Circuit & Waveform

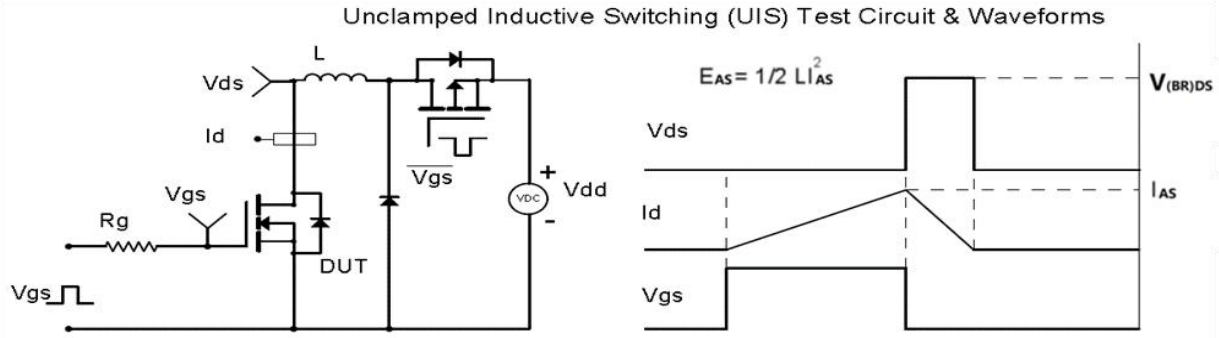
Gate Charge Test Circuit & Waveform



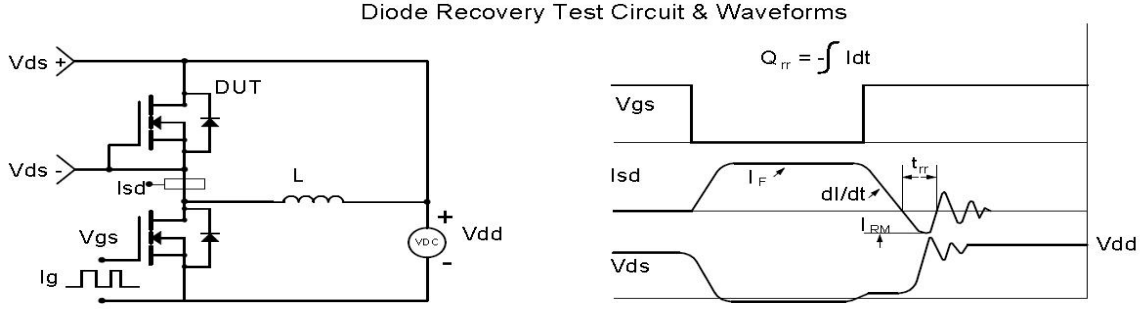
Resistive Switching Test Circuit & Waveforms



Unclamped Inductive Switching (UIS) Test Circuit & Waveforms

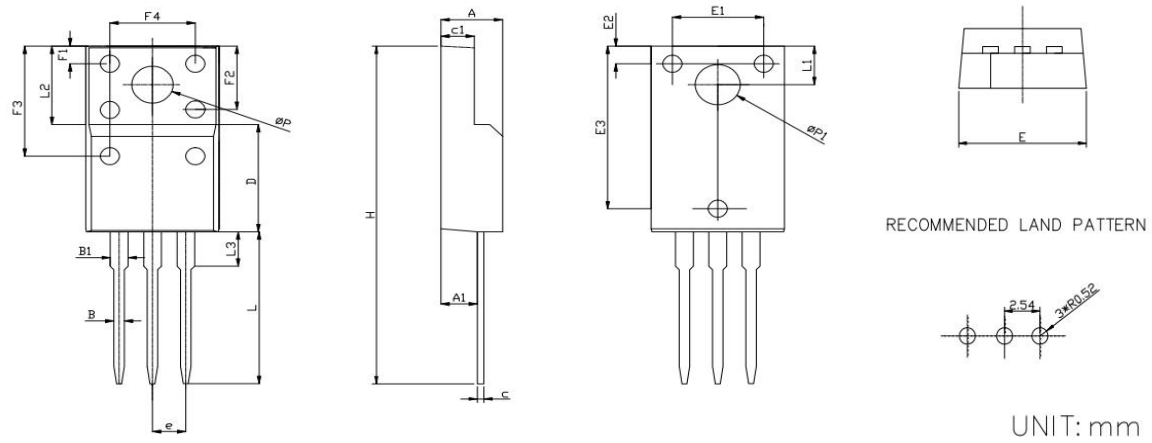


Diode Recovery Test Circuit & Waveforms



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Package Outline: TO-220TF-3L



SYMBOL	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	4.50	4.90	0.177	0.193
A1	2.63	2.89	0.104	0.114
B	0.75	0.90	0.030	0.035
B1	1.15	1.55	0.045	0.061
C	0.40	0.60	0.016	0.024
C1	2.34	2.74	0.092	0.108
e	2.54		0.100	
E	9.86	10.46	0.388	0.412
E1	6.86	7.06	0.270	0.278
E2	1.40	1.60	0.055	
E3	13.80	14.00	0.543	0.551
F1	1.40	1.60	0.055	
F2	5.15	5.65	0.203	0.222
F3	9.10	9.70	0.358	0.382
F4	6.70	7.30	0.264	0.287
H	28.50	29.50	1.122	1.161
L	12.58	13.38	0.495	0.527
L1	3.15	3.45	0.124	0.136
L2	6.70		0.264	
L3	2.63	3.23	0.104	0.127
φP	2.90	3.48	0.114	0.137
φP1	3.15	3.75	0.124	0.148

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