

PWS2YC040N120PR

Silicon Carbide MOSFET 1200V, 40mΩ, 46A



重庆平伟半导体股份有限公司

Features

- Low switching losses
- Extremely low on-resistance $R_{DS(on)}$
- Robust body diode operation under hard commutation events
- Easy to Parallel and Simple to Drive
- Qualified according to JEDEC criteria

Applications

- High Voltage DC/DC Converters
- EV Charging
- Online UPS / Industrial UPS
- String inverter
- Energy storage systems (ESS)

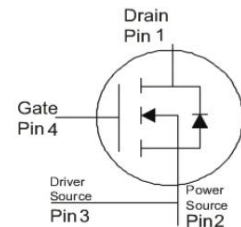


100% DVDS Tested
100%
Avalanche Tested

Product Summary

V_{DS}	1200V
$R_{DS(on)}$ typ.	40mΩ
I_D	46A

TO-247-4L



Package Marking and Ordering Information

Part #	Marking	Package	Packing	Reel Size	Tape Width	Qty
PWS2YC040N120PR	S2040N120P	TO-247-4L	Tube	N/A	N/A	30pcs

Absolute Maximum Ratings

Parameter	Symbol	Value	Unit
Drain-source voltage	V_{DS}	1200	V
Continuous drain current $T_C = 25^\circ\text{C}$ $T_C = 100^\circ\text{C}$	I_D	46 33	A
Pulsed drain current ($T_C = 25^\circ\text{C}$)	$I_{D \text{ pulse}}$	138	A
Avalanche energy, single pulse ($L=5\text{mH}$)	E_{AS}	250	mJ
Gate-Source voltage,max.transient voltage	V_{GSmax}	-10/+22	V
Recommended operating values	V_{GSsop}	-4/+18	V
Power dissipation $T_C = 25^\circ\text{C}$	P_{tot}	182	W
Operating junction and storage temperature	T_j, T_{stg}	-55...+175	$^\circ\text{C}$

Thermal Resistance

Parameter	Symbol	Value			Unit	Test Condition
		min.	typ.	max.		
Thermal resistance, junction – case.	R_{thJC}	-	0.55	0.8	°C/W	-
Thermal resistance, junction - ambient(min.)	R_{thJA}	-	-	50.0	°C/W	-

Electrical Characteristic (at $T_j = 25\text{ }^{\circ}\text{C}$, unless otherwise specified)

Parameter	Symbol	Value			Unit	Test Condition
		min.	typ.	max.		

Static Characteristic

Drain-source breakdown voltage	BV_{DSS}	1200	-	-	V	$V_{GS}=0V, I_D=500\mu A$
Gate threshold voltage	$V_{GS(th)}$	2.0	3.0	4.0	V	$V_{DS}=V_{GS}, I_D=9mA$
Zero gate voltage drain current	I_{DSS}	-	-	10	μA	$V_{DS}=1200V, V_{GS}=0V$ $T_j=25^{\circ}C$
			-	100		$T_j=175^{\circ}C$
Gate-source leakage current	I_{GSS}	-	-	100	μA	$V_{GS}=22V, V_{DS}=0V$
		-	-	-200	nA	$V_{GS}=-10V, V_{DS}=0V$
Drain-source on-state resistance	$R_{DS(on)}$	-	40	52	mΩ	$V_{GS}=18V, I_D=25A, T_j=25^{\circ}C$
Drain-source on-state resistance	$R_{DS(on)}$	-	75	-	mΩ	$V_{GS}=18V, I_D=25A, T_j=175^{\circ}C$
Transconductance	g_{fs}	-	15.0	-	S	$V_{DS}=20V, I_D=20A$

Dynamic Characteristic

Input Capacitance	C_{iss}	-	2000	-	pF	$V_{GS}=0V, V_{DS}=30V, f=1MHz$
Output Capacitance	C_{oss}	-	359	-		
Reverse Transfer Capacitance	C_{rss}	-	19	-		
Gate Total Charge	Q_G	-	63	-	nC	$V_{DS}=600V, I_D=40A, V_{GS}=-4/18V$
Gate-Source charge	Q_{gs}	-	21	-		
Gate-Drain charge	Q_{gd}	-	32	-		
Turn-on delay time	$t_{d(on)}$	-	19	-	ns	$V_{GS}=-4/18V, V_{DD}=600V, R_G=10\Omega, I_D=40A$
Rise time	t_r	-	27	-		
Turn-off delay time	$t_{d(off)}$	-	26	-		
Fall time	t_f	-	10	-		
Turn-on energy	E_{on}	-	291	-	μJ	
Turn-off energy	E_{off}	-	303	-		
Gate resistance	R_G	-	1.0	-	Ω	$V_{GS}=0V, f=1MHz$

Body Diode Characteristic

Parameter	Symbol	Value			Unit	Test Condition
		min.	typ.	max.		
Body Diode Forward Voltage	V_{SD}	-	4.5	-	V	$V_{GS} = -4V, I_{SD} = 20A$
		-	4	-		$T_j = 25^{\circ}C$ $T_j = 175^{\circ}C$
Body Diode Continuous Forward Current	I_S	-	46		A	$T_C = 25^{\circ}C$
		-	33		A	$T_C = 100^{\circ}C$
Body Diode Reverse Recovery Time	t_{rr}	-	43	-	ns	$I_{SD} = 40A, V_R = 600V$ $V_{GS} = -4V$ $di/dt = 1200A/\mu s$
Body Diode Reverse Recovery Charge	Q_{rr}	-	165	-	nC	
Peak Reverse Recovery Current	I_{RRM}	-	7.6	-	A	

Typical Performance Characteristics

Fig 1: Output Characteristics $T_j=25^\circ\text{C}$

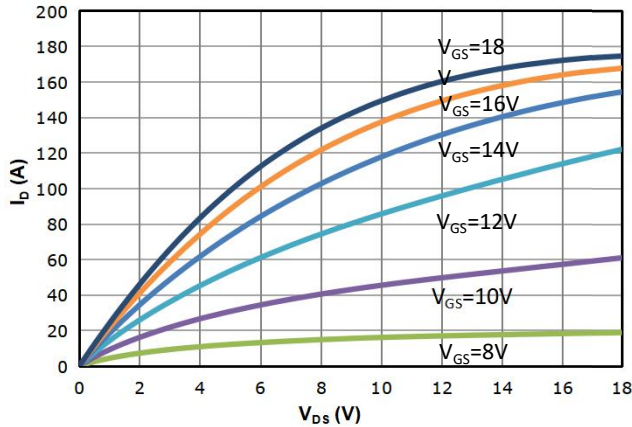


Fig 2: Output Characteristics $T_j=175^\circ\text{C}$

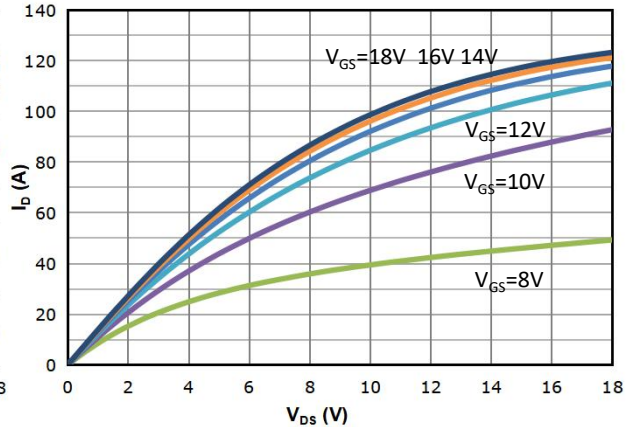


Fig 3: Transfer Characteristics

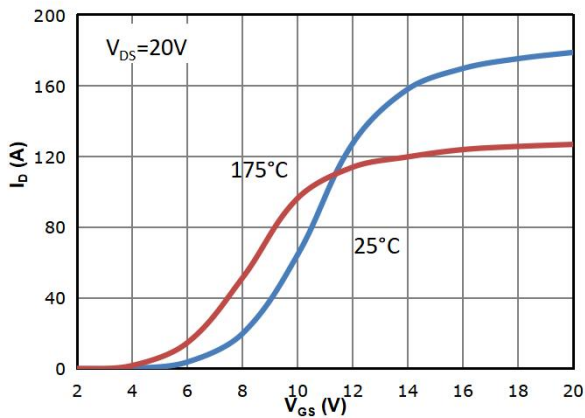


Fig 4: $R_{ds(on)}$ vs Drain Current and Gate Voltage

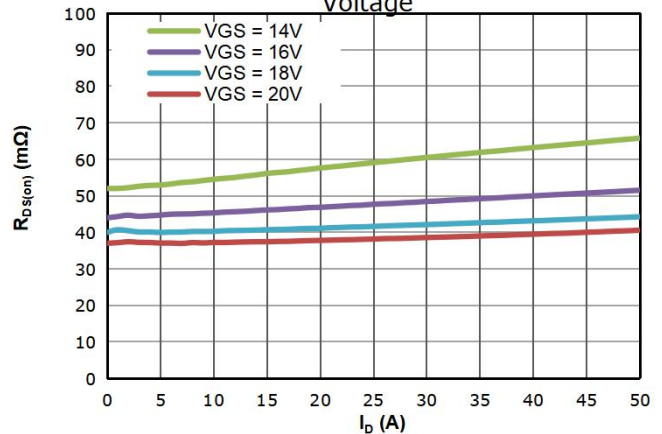


Fig 5: $R_{ds(on)}$ vs. Temperature

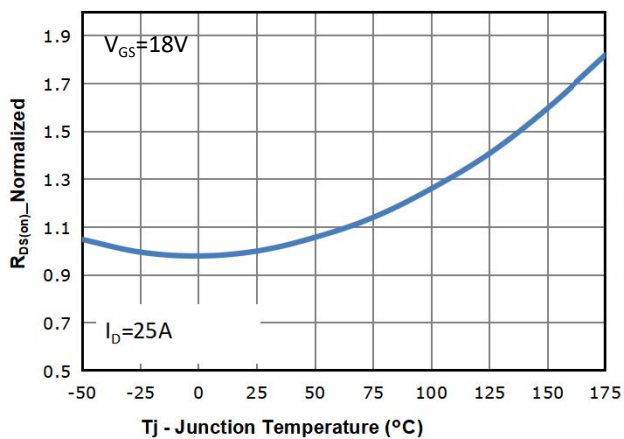


Fig 6: $V_{gs(th)}$ vs. Temperature

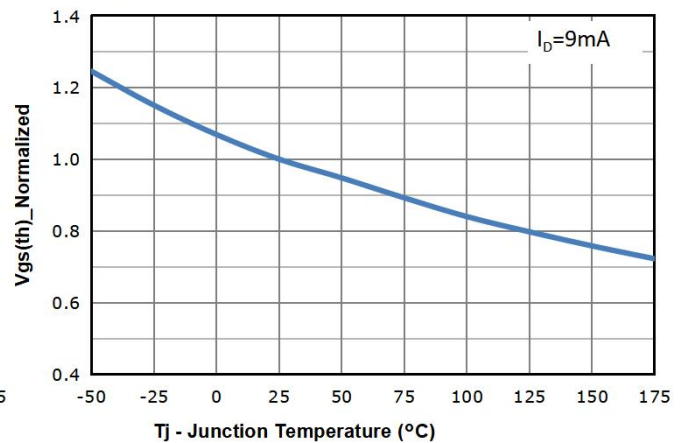


Fig 7: BVdss vs. Temperature

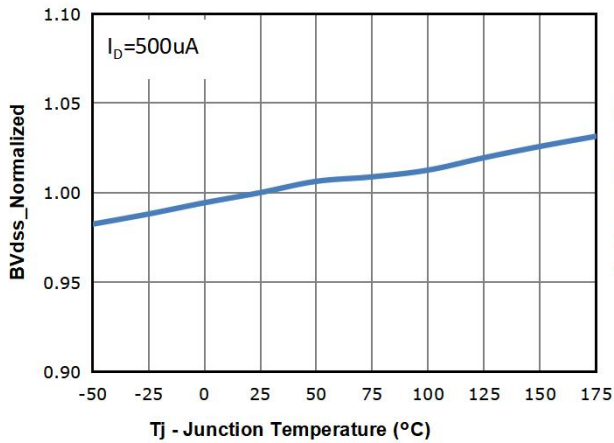


Fig 8: Capacitance Characteristics

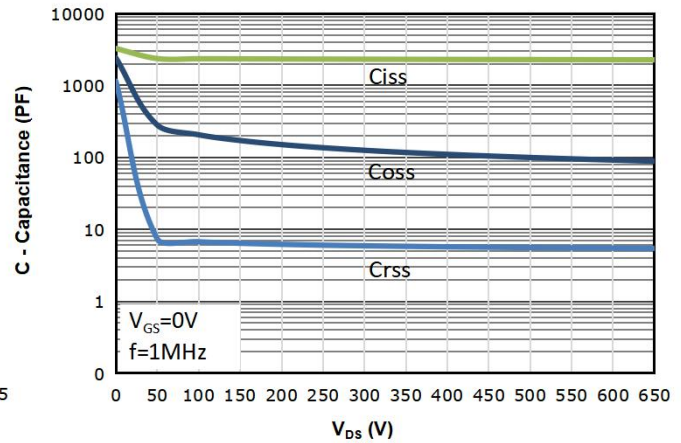


Fig 9: Gate Charge Characteristics

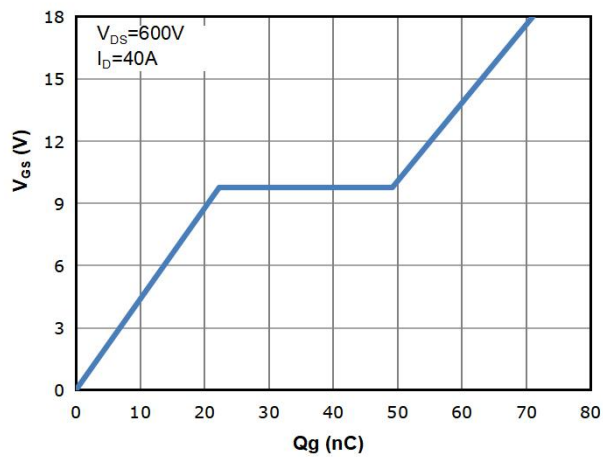


Fig 10: Body-diode Forward Characteristics

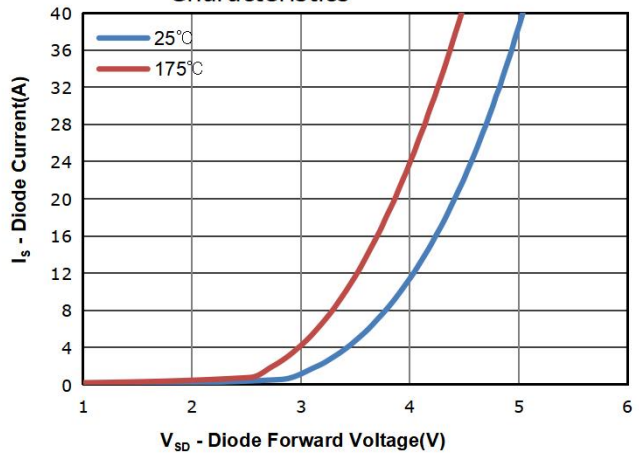


Fig 11: Power Dissipation

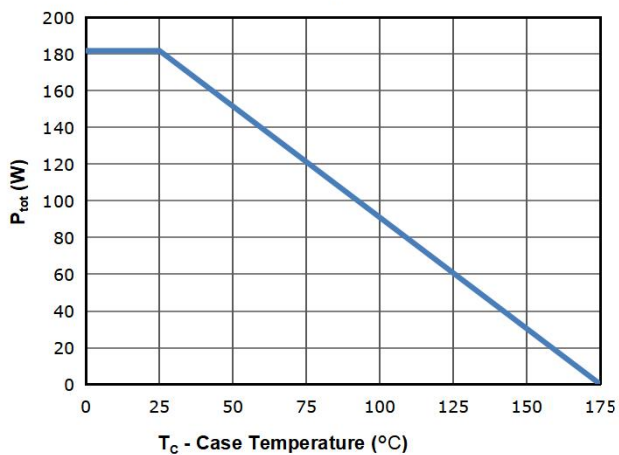


Fig 12: Drain Current Derating

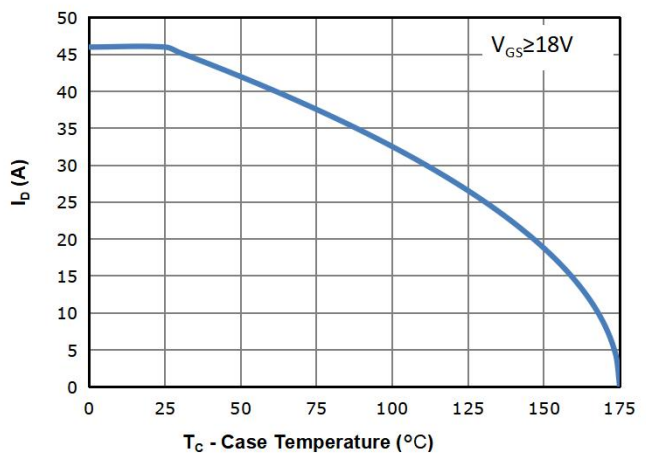




Fig 13: Safe Operating Area

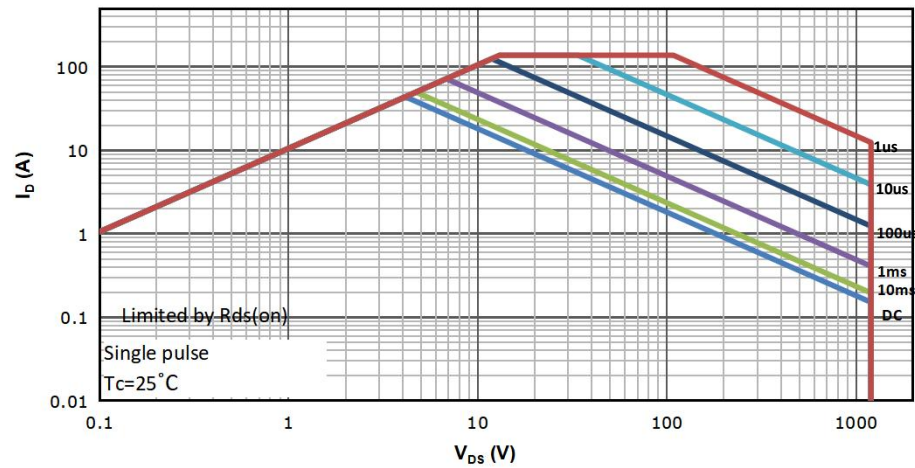
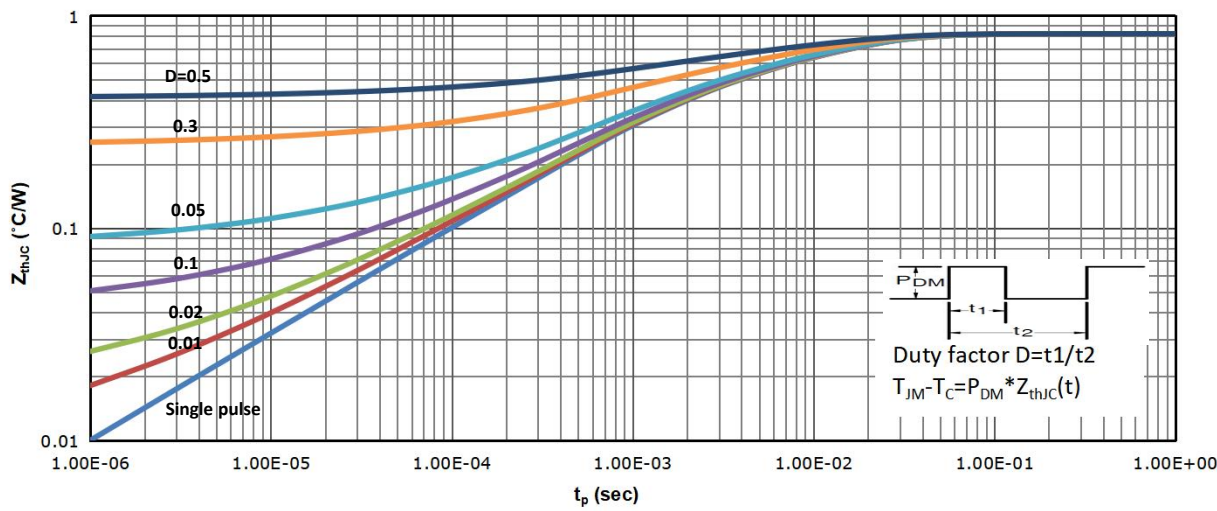
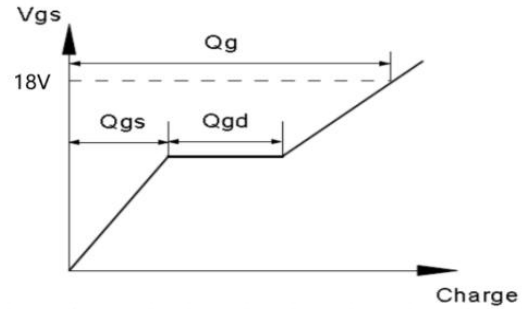
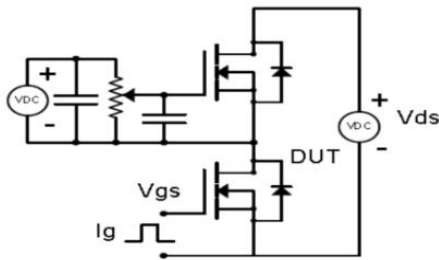


Fig 14: Max. Transient Thermal Impedance

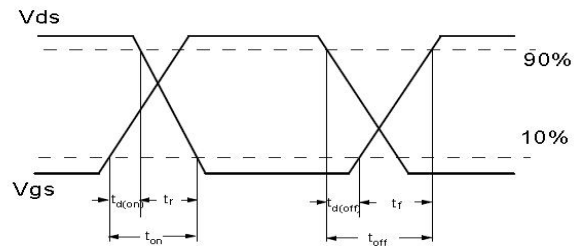
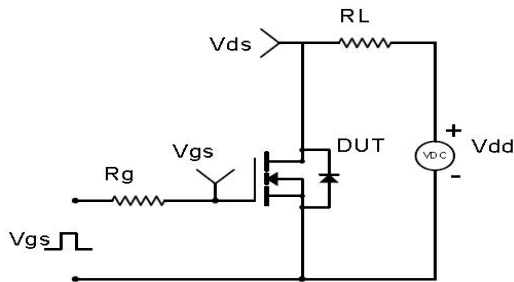


Test Circuit & Waveform

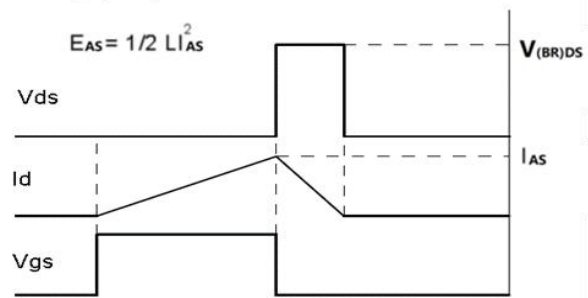
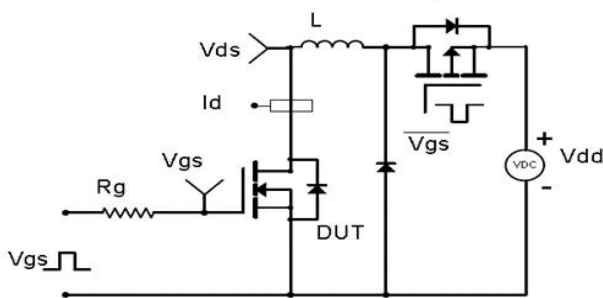
Gate Charge Test Circuit & Waveform



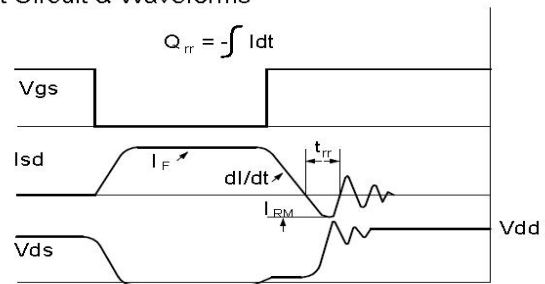
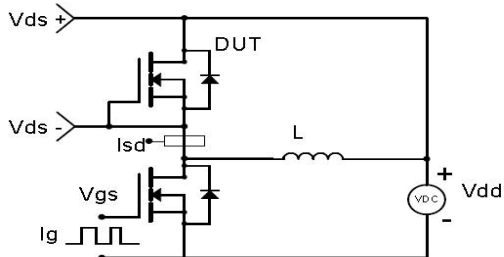
Resistive Switching Test Circuit & Waveforms



Unclamped Inductive Switching (UIS) Test Circuit & Waveforms



Diode Recovery Test Circuit & Waveforms



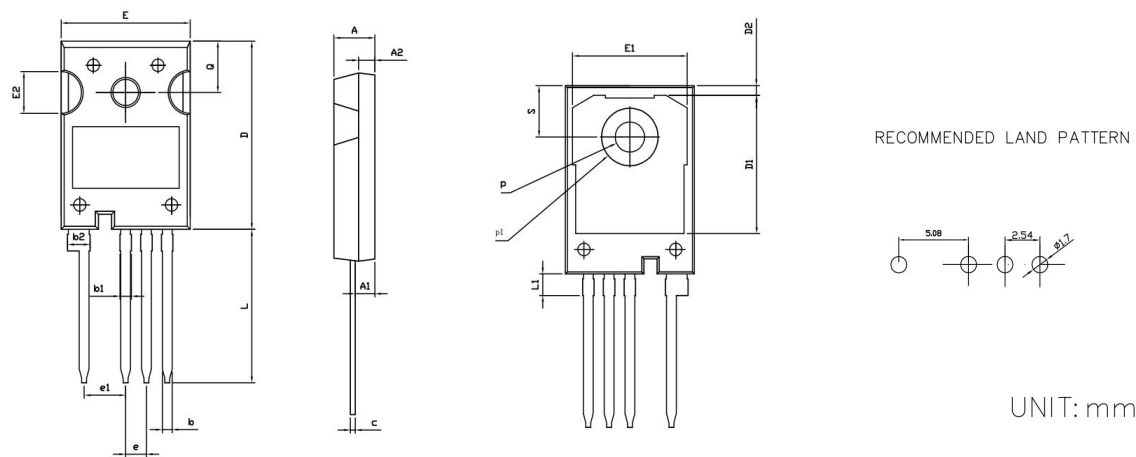
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Package Outline: TO-247-4L



SYMBOL	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	4.80	5.20	0.189	0.205
A1	2.25	2.45	0.089	0.096
A2	1.85	2.15	0.073	0.085
b	1.05	1.35	0.041	0.053
b1	1.00	1.60	0.039	0.063
b2	2.35	2.95	0.093	0.116
c	0.50	0.70	0.020	0.028
D	22.34	22.74	0.880	0.895
D1	16.00	17.00	0.630	0.669
D2	0.97	1.37	0.038	0.054
e	2.34	2.74	0.092	0.108
e1	4.88	5.28	0.192	0.208
E	15.60	16.00	0.614	0.630
E1	13.50	14.50	0.531	0.571
E2	4.80	5.20	0.189	0.205
L	18.08	18.68	0.712	0.735
L1	2.38	2.78	0.094	0.109
p	3.50	3.70	0.138	0.146
p1	6.60	7.00	0.260	0.276
Q	6.00	6.30	0.236	0.248
S	6.00	6.30	0.236	0.248

Disclaimer

Any and all semiconductor products have certain probability to fail or malfunction, which may result in personal injury, death or property damage. Customer are solely responsible for providing adequate safe measures when design their systems.

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