

SC045N65Y4-R

Silicon Carbide MOSFET 650V, 45mΩ, 57A



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
- .XT interconnection technology for best-in-class thermal performance
- Qualified according to JEDEC criteria

Applications

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

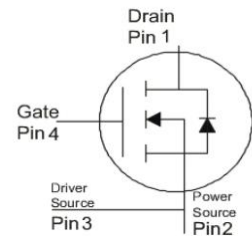
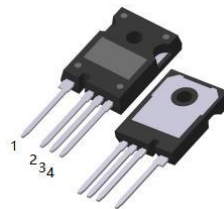


100% DVDS Tested
100% Avalanche Tested

Product Summary

V_{DS}	650V
$R_{DS(on)}$ typ.	45mΩ
I_D	57A

TO-247-4L



Package Marking and Ordering Information

Part #	Marking	Package	Packing	Reel Size	Tape Width	Qty
SC045N65Y4-R	SC045N65Y4	TO-247-4L	Tube	N/A	N/A	30pcs

Absolute Maximum Ratings

Parameter	Symbol	Value	Unit
Drain-source voltage	V_{DS}	650	V
Continuous drain current $T_C = 25^\circ\text{C}$ $T_C = 100^\circ\text{C}$	I_D	57 40	A
Pulsed drain current ($T_C = 25^\circ\text{C}$)	$I_{D \text{ pulse}}$	229	A
Avalanche energy, single pulse ($L=0.5\text{mH}$)	E_{AS}	105	mJ
Gate-Source voltage, max. transient voltage	V_{GSmax}	-10/+22	V
Recommended operating values	V_{GSsop}	-5/+18	V
Power dissipation $T_C = 25^\circ\text{C}$	P_{tot}	100	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}	-	0.9	1.5	°C/W	-
Thermal resistance, junction - ambient(min. footprint)	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}	650	-	-	V	$V_{GS}=0V, I_D=1mA$
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}	-	0.5	10	μA	$V_{DS}=650V, V_{GS}=0V$ $T_j=25^{\circ}C$ $T_j=175^{\circ}C$
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	$R_{DS(on)}$	-	45	55	mΩ	$V_{GS}=18V, I_D=20A$
Transconductance	g_{fs}	-	13	-	S	$V_{DS}=20V, I_D=15A$

Dynamic Characteristic

Input Capacitance	C_{iss}	-	1611	-	pF	$V_{GS}=0V, V_{DS}=400V,$ $f=1MHz$
Output Capacitance	C_{oss}	-	107	-		
Reverse Transfer Capacitance	C_{rss}	-	9	-		
Gate Total Charge	Q_G	-	70	-	nC	$V_{DS}=400V, I_D=20A$ $V_{GS}=-5/18V$
Gate-Source charge	Q_{gs}	-	29	-		
Gate-Drain charge	Q_{gd}	-	16	-		
Turn-on delay time	$t_{d(on)}$	-	8	-	ns	$V_{GS}=-5/18V,$ $V_{DD}=400V,$ $R_G=15\Omega, I_D=20A$
Rise time	t_r	-	20	-		
Turn-off delay time	$t_{d(off)}$	-	35	-		
Fall time	t_f	-	15	-		
Gate resistance	R_G	-	4.1	-	Ω	$V_{GS}=0V, f=1MHz$

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Body Diode Characteristic

Parameter	Symbol	Value			Unit	Test Condition
		min.	typ.	max.		
Body Diode Forward Voltage	V_{SD}	-	3.4	-	V	$V_{GS} = -5V, I_{SD} = 10A$ $T_j = 25^{\circ}C$
		-	3.1	-		$T_j = 175^{\circ}C$
Body Diode Continuous Forward Current	I_S	-	-	64	A	$T_C = 25^{\circ}C$
		-	-	36	A	$T_C = 100^{\circ}C$
Body Diode Reverse Recovery Time	t_{rr}	-	14	-	ns	$V_{GS} = -5V, I_{SD} = 20A,$ $V_R = 400V$ $di/dt = 1000A/\mu s$
Body Diode Reverse Recovery Charge	Q_{rr}	-	73	-	nC	
Peak Reverse Recovery Current	I_{RRM}	-	8.6	-	A	

Typical Performance Characteristics

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

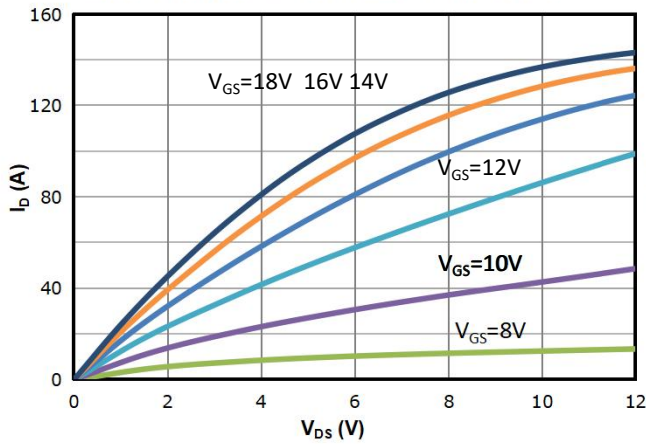


Fig 2: Output Characteristics $T_j=175^\circ\text{C}$

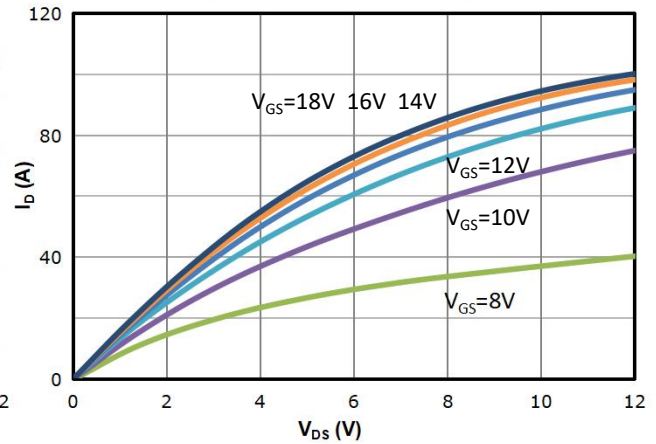


Fig 3: Transfer Characteristics

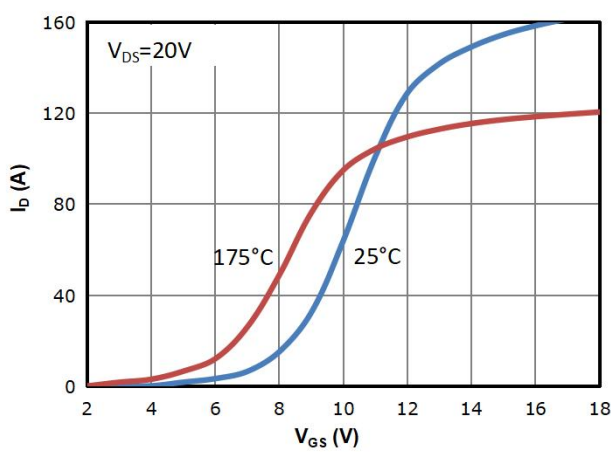


Fig 4: $R_{ds(on)}$ vs Drain Current and Gate Voltage

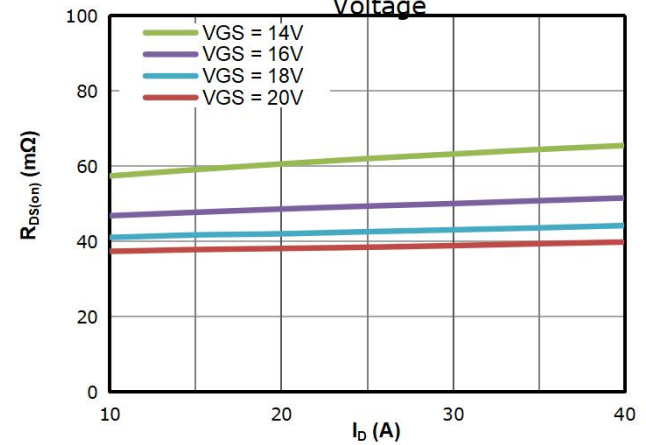


Fig 5: $R_{ds(on)}$ vs. Temperature

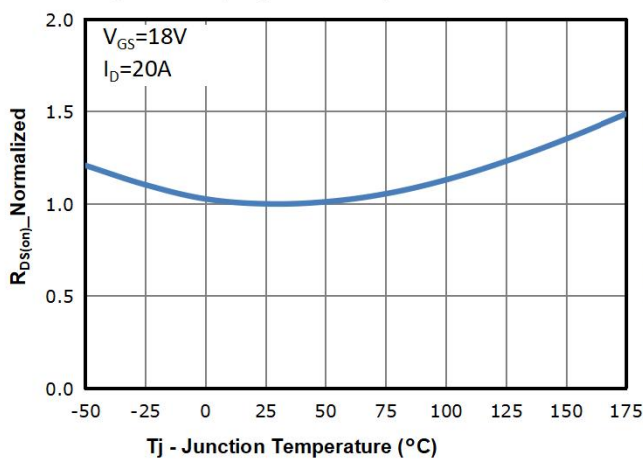


Fig 6: $V_{gs(th)}$ vs. Temperature

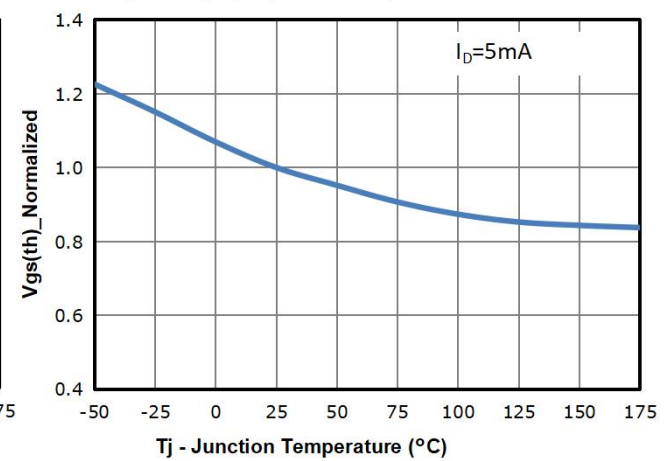


Fig 7: BVdss vs. Temperature

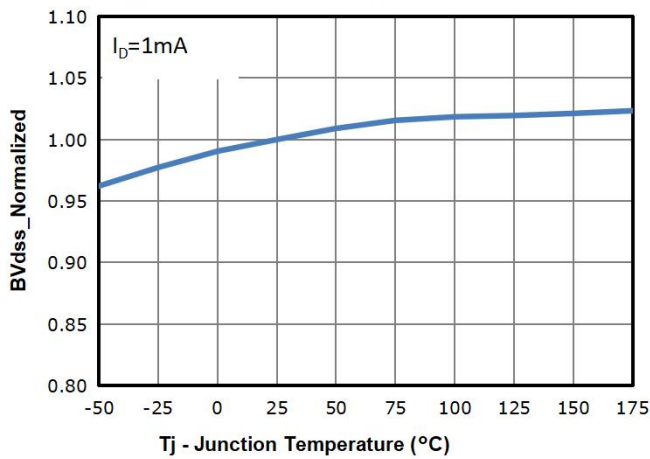


Fig 8: Capacitance Characteristics

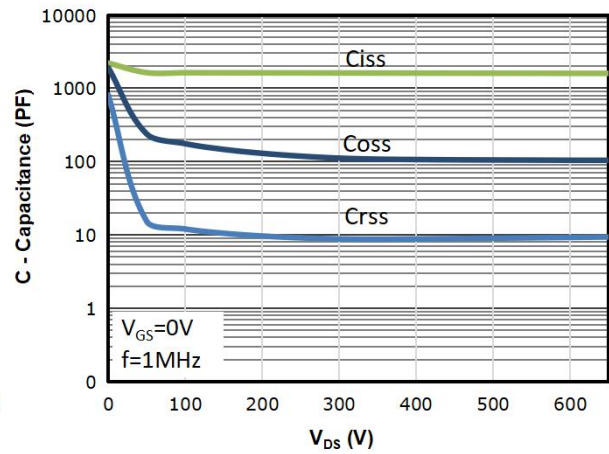


Fig 9: Gate Charge Characteristics

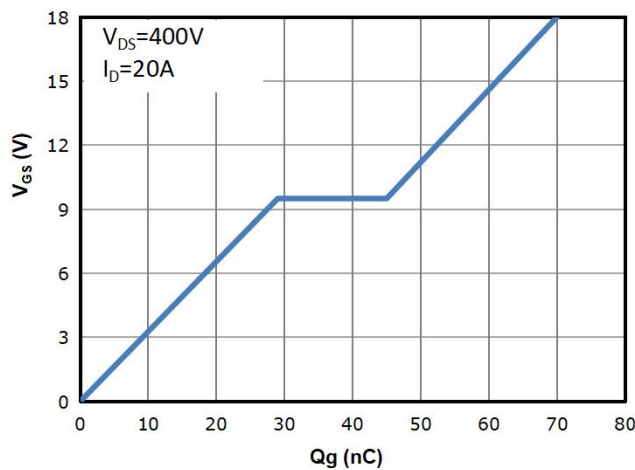


Fig 10: Body-diode Forward Characteristics

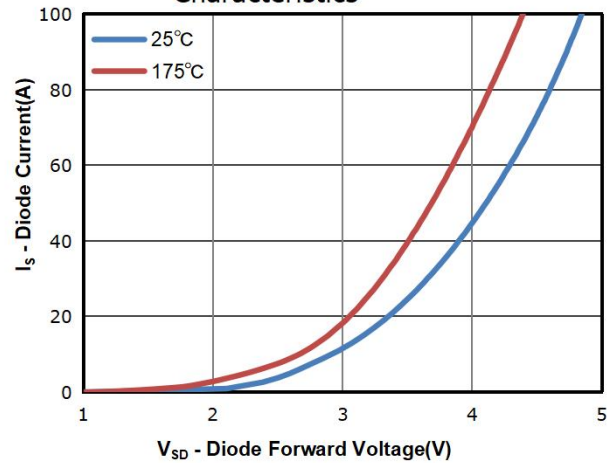


Fig 11: Power Dissipation

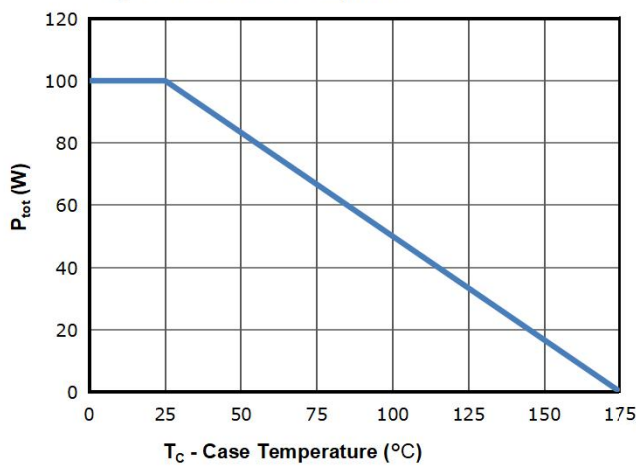
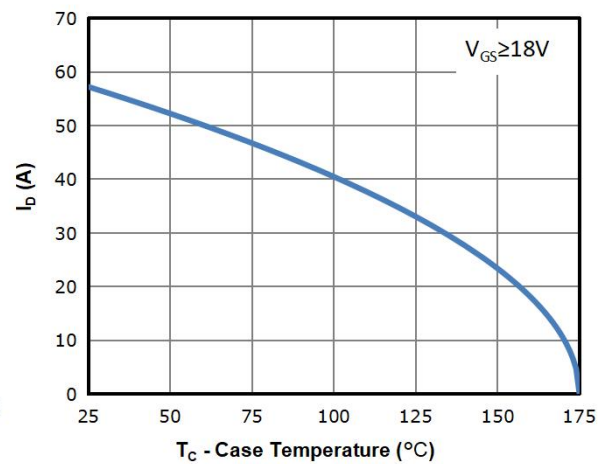


Fig 12: Drain Current Derating



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Fig 13: Safe Operating Area

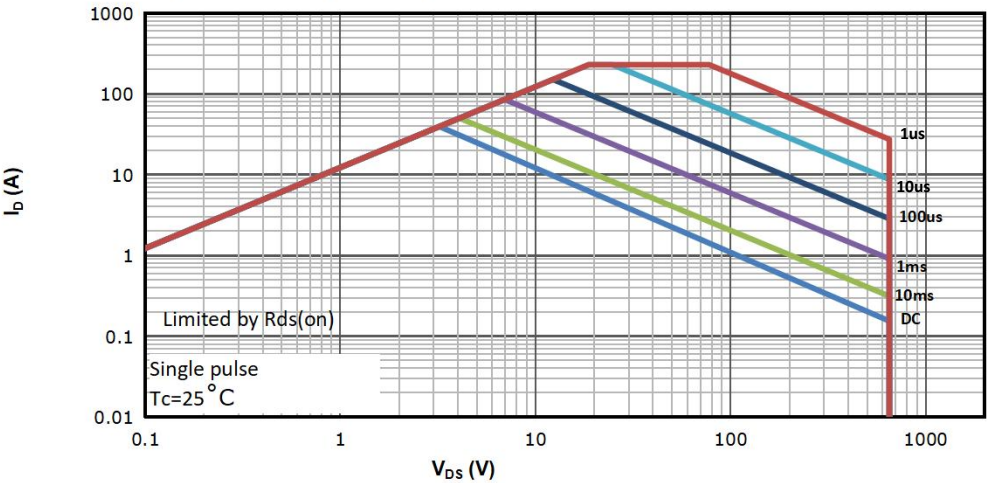
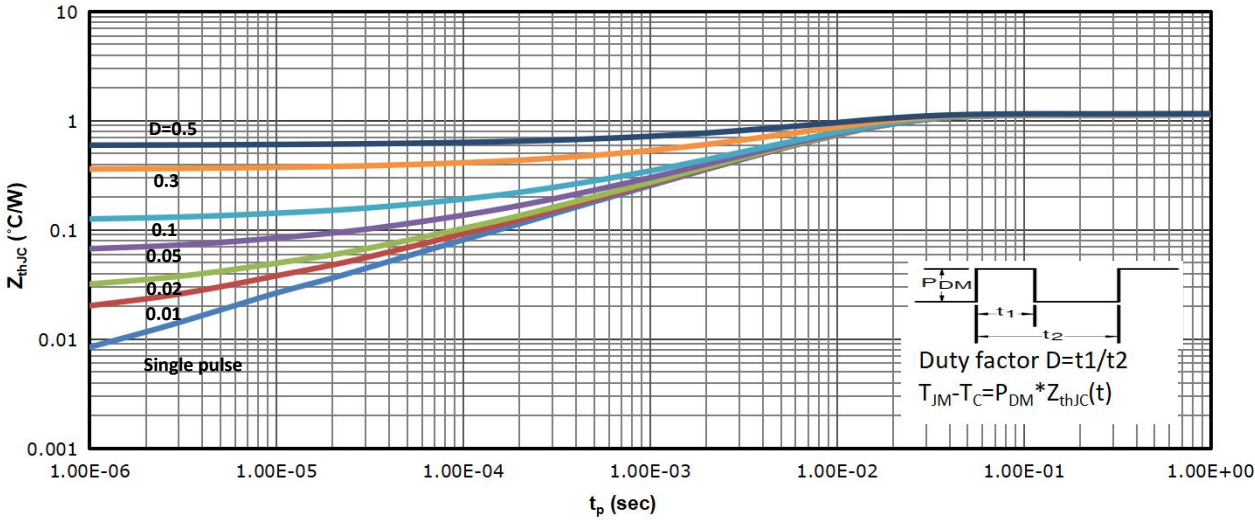
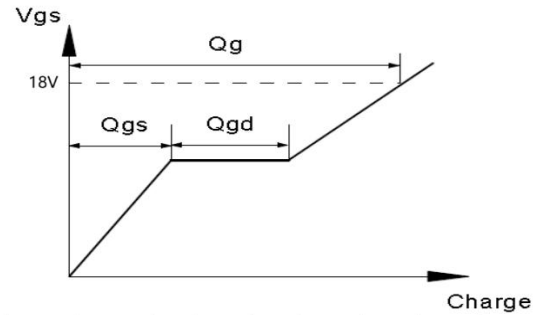
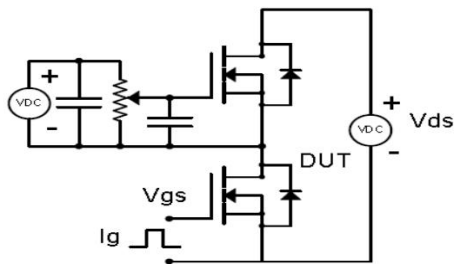


Fig 14: Max. Transient Thermal Impedance

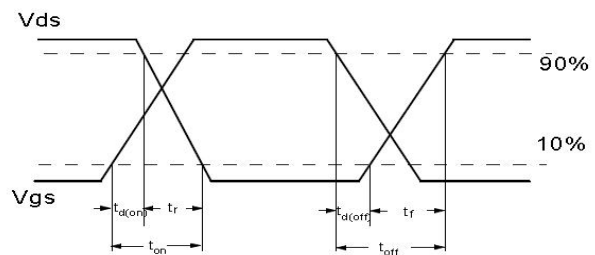
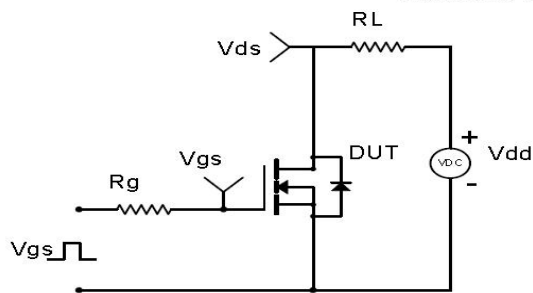


Test Circuit & Waveform

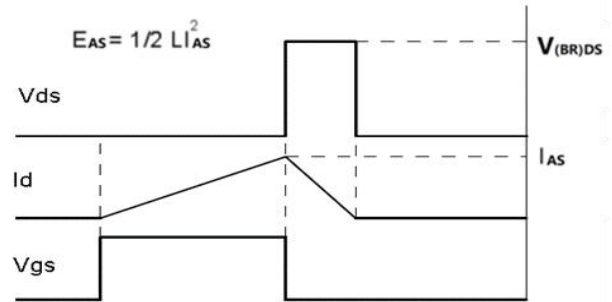
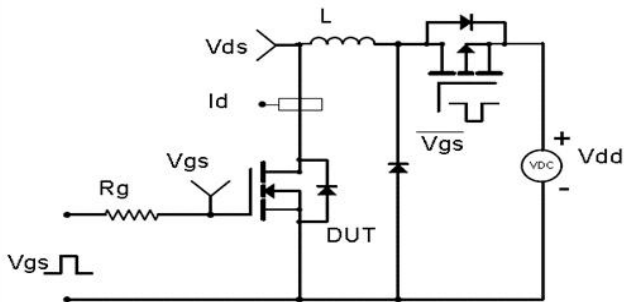
Gate Charge Test Circuit & Waveform



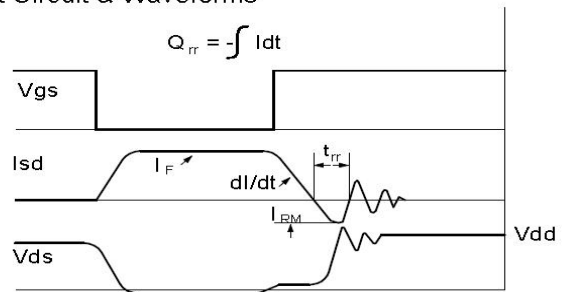
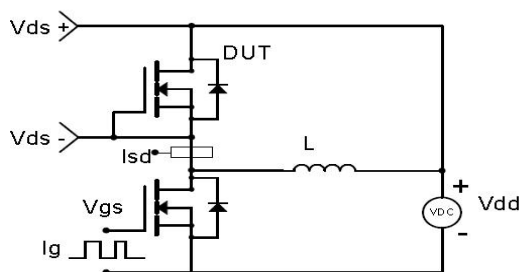
Resistive Switching Test Circuit & Waveforms



Unclamped Inductive Switching (UIS) Test Circuit & Waveforms



Diode Recovery Test Circuit & Waveforms



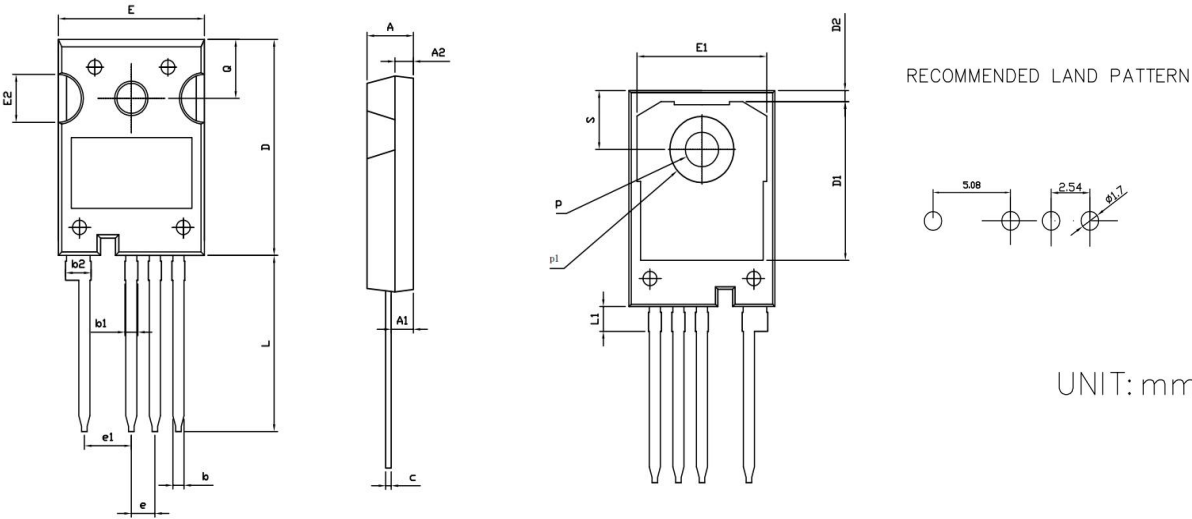
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Package Outline: TO-247-4L



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

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