SEMICONDUCTOR

SC45N120P4

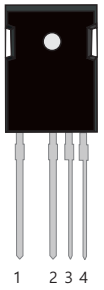
1200V 60A N-Channel SIC Power MOSFET

Features

- High blocking voltage with low on-resistance
- High speed switching with low capacitance
- Easy to Parallel
- Simple to Drive

Product Summary			
V_{DS}	$R_{DS(on)}$(mΩ)Typ	I_D(A)	Qg(Typ)
1200V	45 @ 18V 20A	60	125nc

TO-247-4L



Mechanical Data

- Case:TO-263-7L Package

Application

- Motor drivers
- Solar inverters
- Automotive DC/DC converters
- Automotive compressor inverters
- Switch mode power supplies

Block Diagram

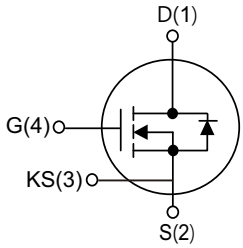


Table1 Absolute Maximum Ratings (T_C=25°C, unless otherwise specified)

Parameter		Symbol	Value	Unit
Drain-Source Voltage		V_{DS}	1200	V
Gate-Source Voltage(Max)		$V_{GS(max)}$	-10/+22	V
Gate-Source Voltage, max. transient voltage (tp≦0.5μs; D≦0.01)		$V_{GSpulse}$	-10/+25	V
Continuous Drain Current	T_C=25°C	I_D	60	A
	T_C=100°C		48	
Pulsed Drain Current (Note 1)		I_{DM}	200	A
Power Dissipation	T_C=25°C	P_D	395	W
Operating Junction and Storage Temperature		T_J/T_{STG}	-55 ~ +175	°C

Table 2.Thermal Characteristics

Parameter	Symbol	SC45N120P4	Unit
Thermal resistance Junction to Case,Typ	$R_{\theta JC}$	0.38	°C/W
Thermal resistance Junction to Ambient,Max	$R_{\theta JA}$	40	°C/W

Table 3. Electrical Characteristics (T_J=25°C, unless otherwise specified)

Parameter		Symbol	Test Conditions	Min	Typ	Max	Unit
Off Characteristics							
Drain-Source Breakdown Voltage		BV_{DSS}	V_{GS}=0V,I_D=100μA	1200	-	-	V
Drain-Source Leakage Current		I_{DSS}	V_{DS}=1200V,V_{GS}=0V,T_J=25°C	-	-	100	μA
			V_{DS}=1200V,V_{GS}=0V,T_J=175°C	-	-	3.5	mA
Gate- Source Leakage Current	Forward	I_{GSS}	V_{GS}=22V,V_{DS}=0V	-	-	250	nA
	Reverse		V_{GS}=-10V,V_{DS}=0V	-	-	-250	nA
On Characteristics							
Gate Threshold Voltage		$V_{GS(TH)}$	V_{DS}=V_{GS},I_D=10mA	2.0	3.0	4.0	V
Static Drain-Source On-State Resistance		$R_{DS(ON)}$	V_{GS}=18V,I_D=20A,T_J=25°C	-	45	52	mΩ
			V_{GS}=18V,I_D=20A,T_J=175°C	-	76	-	
Gate Resisitance		R_G	f=1MHz	-	4.2	-	Ω
Dynamic Characteristics							
Input Capacitance		C_{ISS}	V_{DS}=1000V,V_{GS}=0V, f=1MHz,V_{AC}=25mV	-	2565	-	pF
Output Capacitance		C_{OSS}		-	109	-	pF
Reverse Transfer Capacitance		C_{RSS}		-	4	-	pF
Coss stored energy		E_{OSS}	V_{DS}=1000V,f=1MHz	-	63	-	μJ
Turn-on switching energy		E_{ON}	V_{DS}=800V,I_D=20A,V_{GS}=-5/18V, R_G=2.5Ω,Load=100μH,T_J=175°C	-	611	-	μJ
Turn-off switching energy		E_{OFF}		-	103	-	μJ
Turn-On Delay Time		td(on)	V_{DS}=800V,I_D=20A V_{GS}=-5/18V,R_G=2.5Ω, Load=100μH	-	15	-	ns
Turn-On Rise Time		t_R		-	19	-	ns
Turn-Off Delay Time		td(off)		-	25	-	ns
Turn-Off Fall Time		tf		-	10	-	ns
Total Gate Charge		Q_G	V_{DD}=800V,I_D=20A, V_{GS}=-5/18V	-	125	-	nC
Gate-Source Charge		Q_{GS}		-	32	-	nC
Gate-Drain Charge		Q_{GD}		-	33	-	nC
Drain-Source Diode Characteristics and Maximum Ratings(Note 2)							
Drain-Source Diode Forward Voltage		V_{SD}	V_{GS}=0V,I_S=20A	-	4.2	-	V
Continuous Diode Forward Current		I_S	V_{GS}=0V	-	55	-	A
Reverse Recovery Time		trr	V_R=800V,di/dt=900A/μs; I_{SD}=20A,V_{GS}=-5V,T_J=175°C	-	50	-	ns
Recovered charge		Qrr		-	712	-	nC
Peak reverse recovery current		Irrm		-	19	-	A

Notes: 1 RepetitiveRating Pulse width limited by maximum junction temperature

2 Pulse Test: Pulse width ≤300μS,Duty cycle≤2%

Typical Characteristics Diagrams

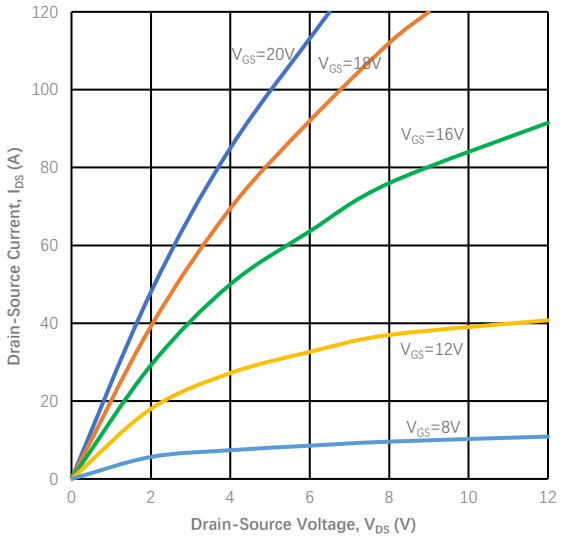


Figure 1
Output Characteristics (T_J=25°C)

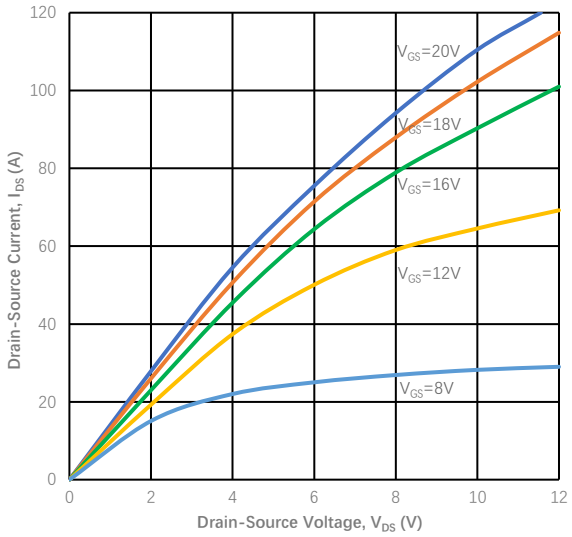


Figure 2
Output Characteristics (T_J=175°C)

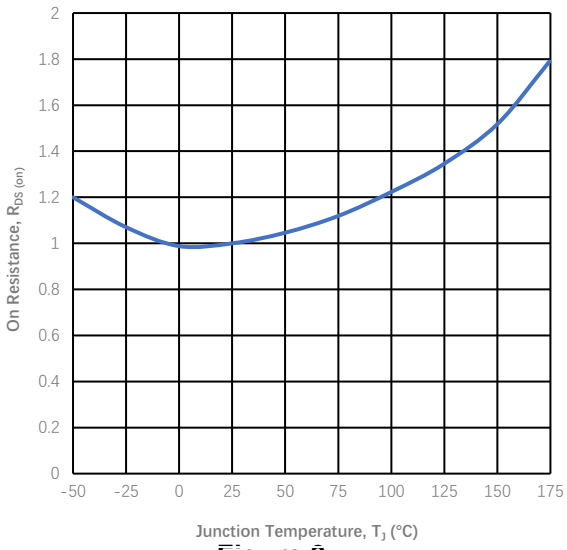


Figure 3
Normalized On-resistance vs. Temperature

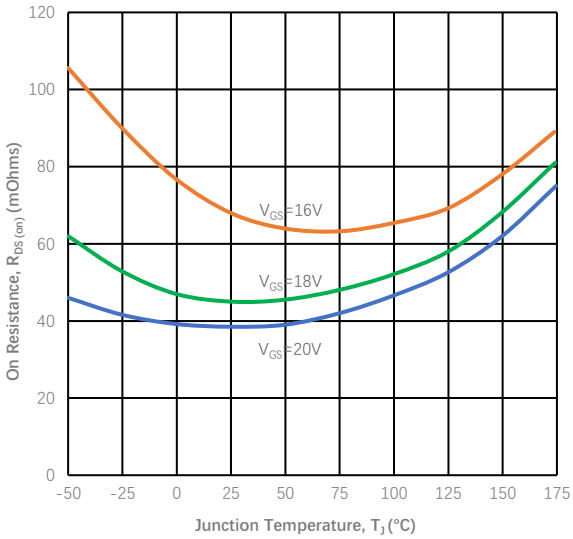


Figure 4
On-resistance vs. Temperature

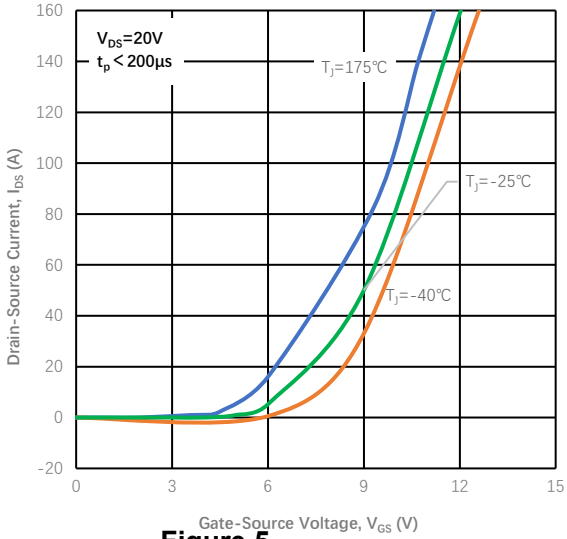


Figure 5
Transfer Characteristic

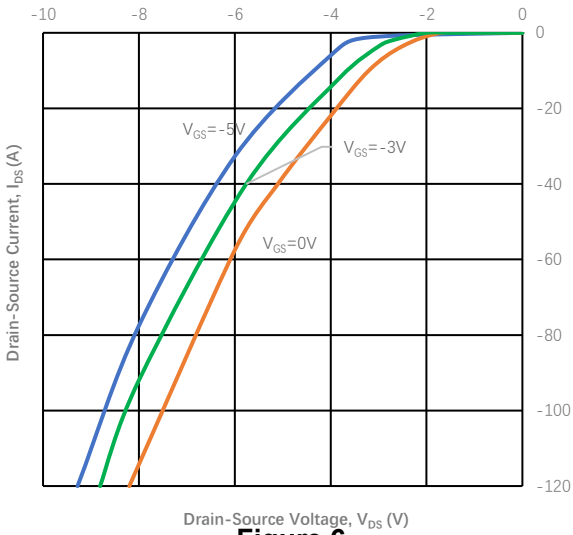


Figure 6
Body Diode Characteristic at 25°C

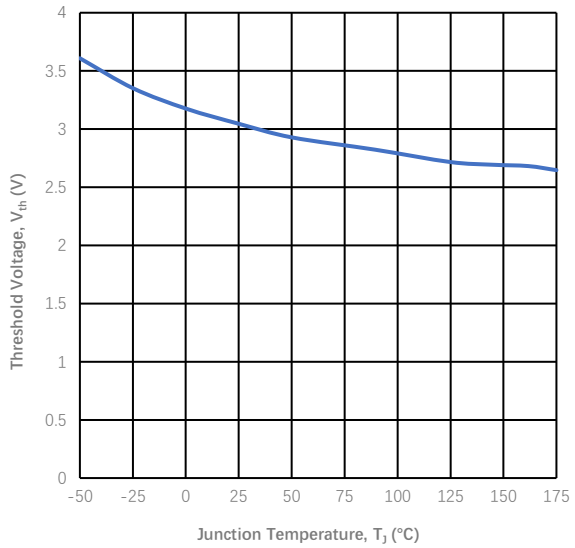


Figure 7

Threshold Voltage vs. Temperature

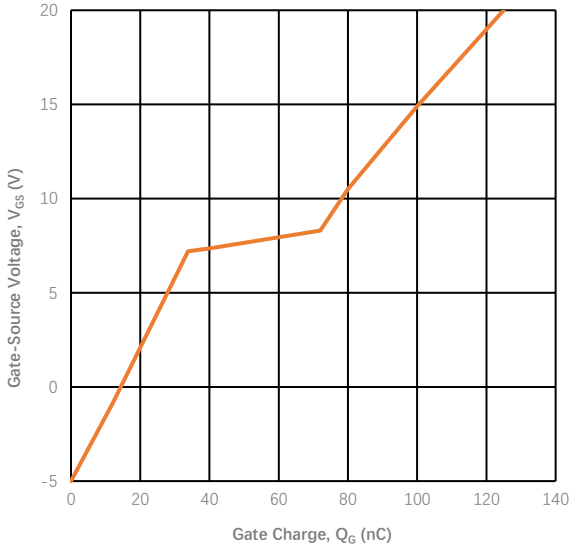


Figure 8

Gate Charge Characteristics

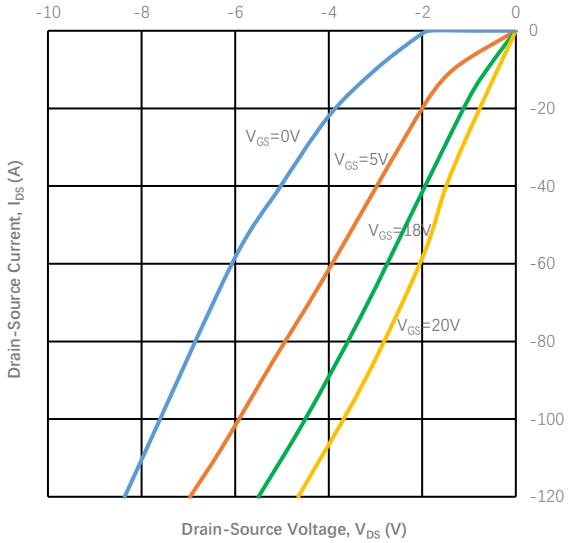


Figure 9

3rd Quadrant Characteristic at 25°C

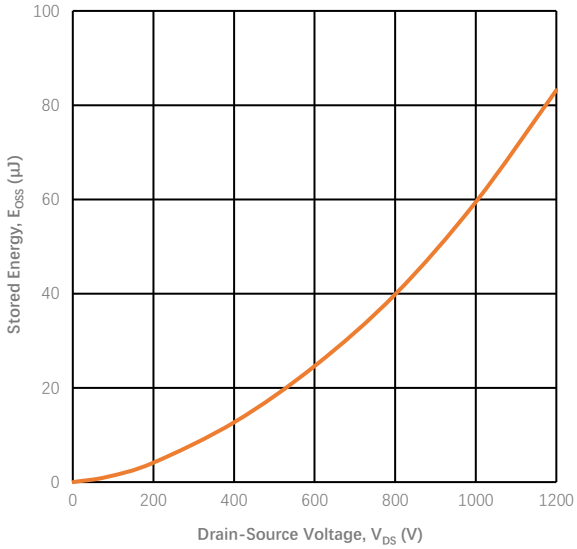


Figure 10

Output Capacitor Stored Energy

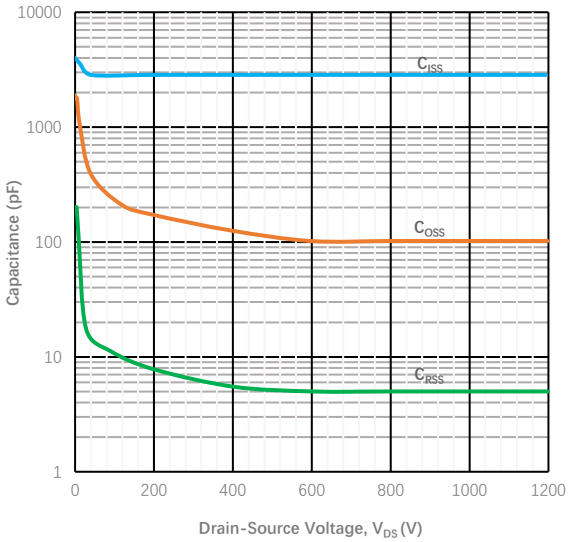


Figure 11

Capacitances vs. Drain-source

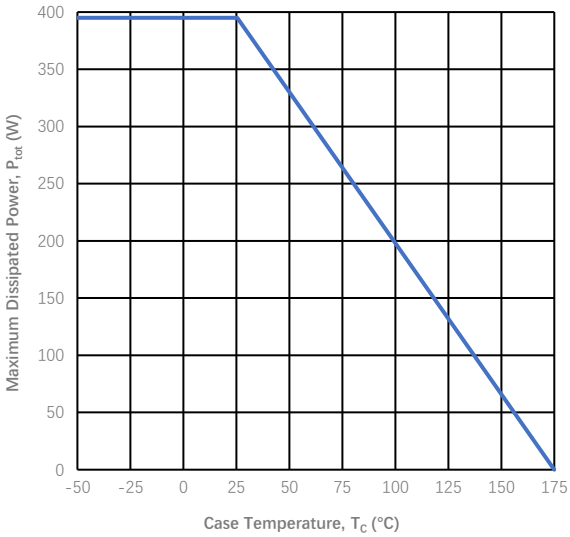


Figure 12

Max Power Dissipation Derating vs T_C

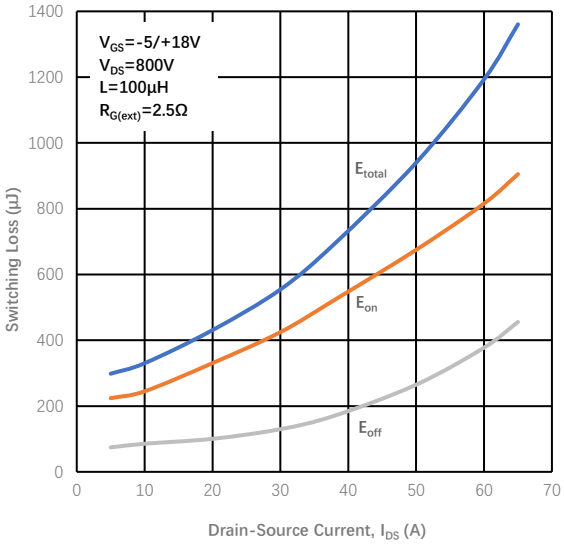


Figure 13

Switching Energy vs. Drain Current

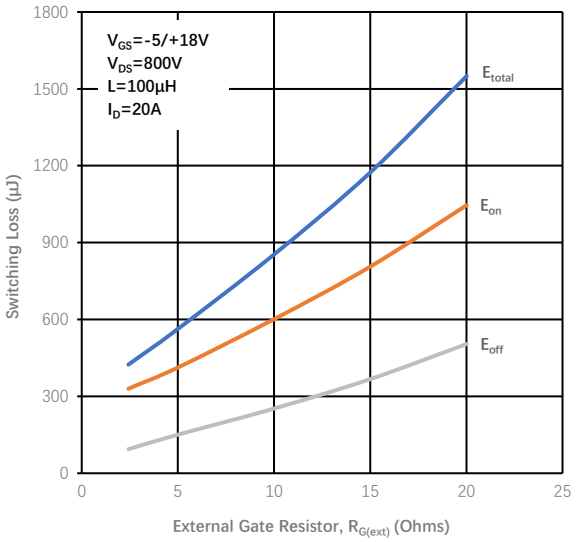


Figure 14

Switching Energy vs. $R_{G(ext)}$

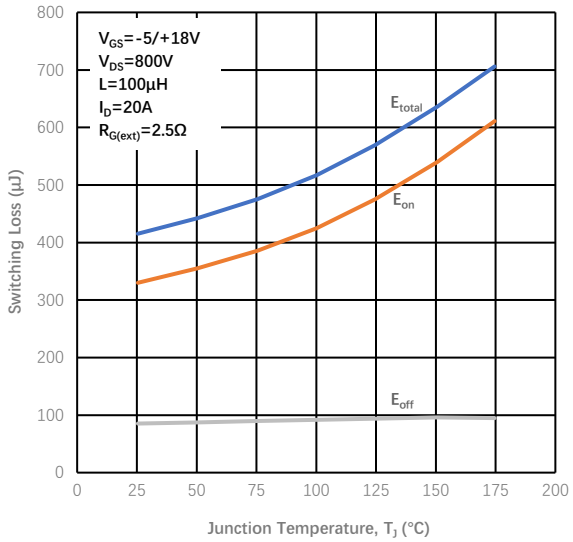


Figure 15

Switching Energy vs. Temperature

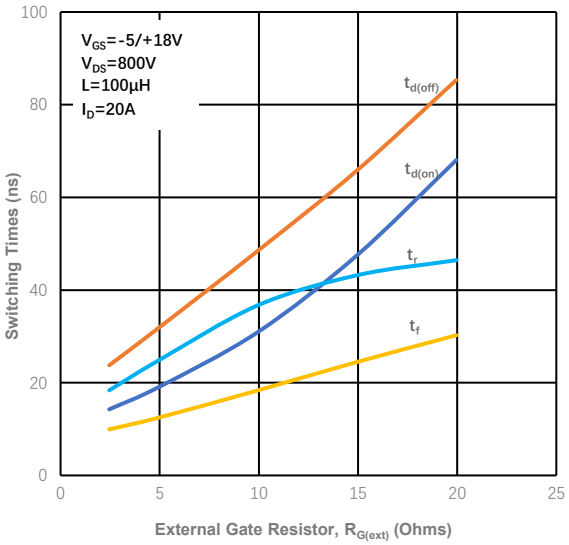


Figure 16

Switching Times vs. $R_{G(ext)}$

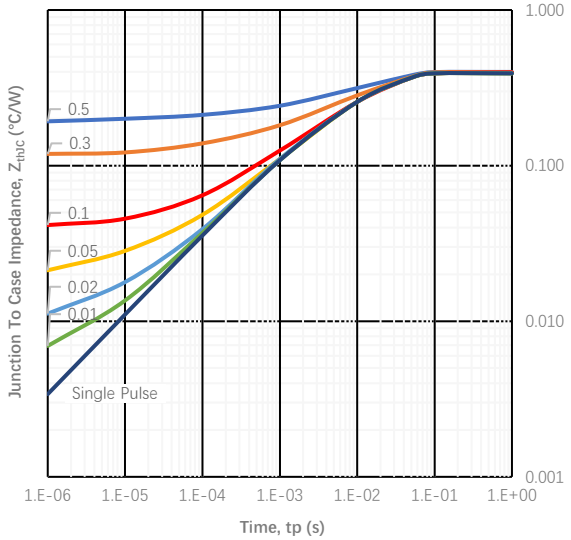


Figure 17

Transient Thermal Impedance

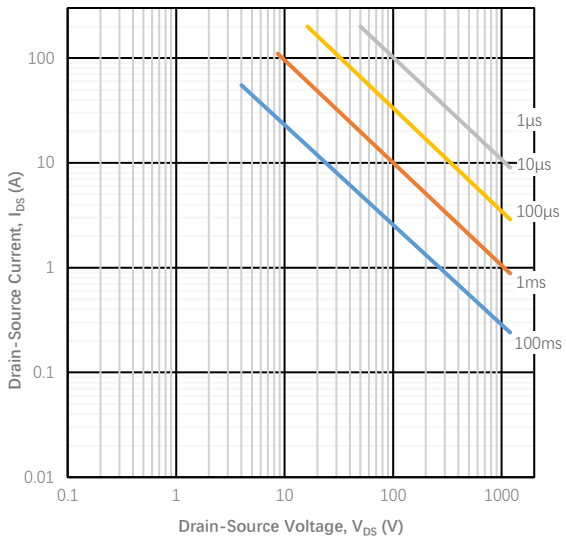
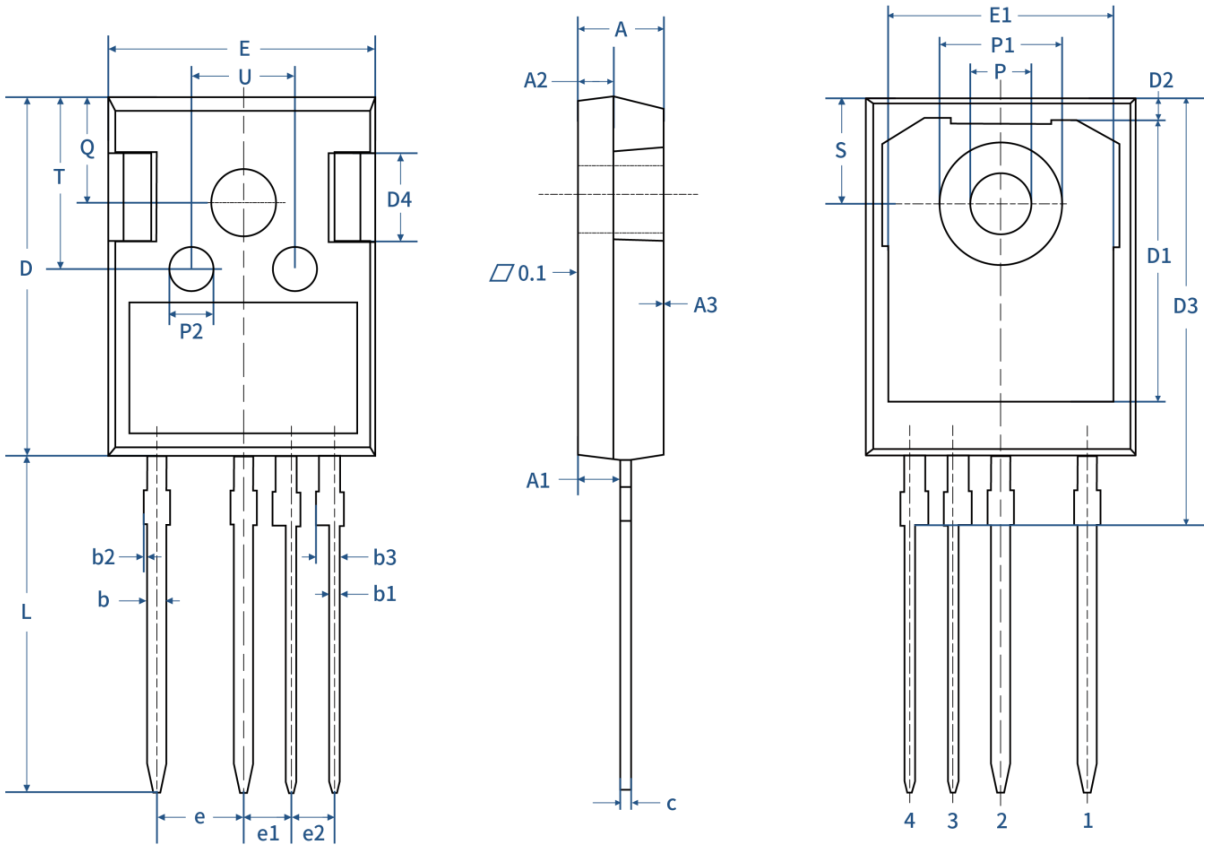


Figure 18

Safe Operating Area

Dimensions

TO-247-4L package



Symbol	Millimeters		Symbol	Millimeters	
	Min.	Max.		Min.	Max.
A	4.9	5.1	**E**	15.7	15.9
A1	2.31	2.51	**E1**	13.1	13.5
A2	1.9	2.1	**e**	5.08	
A3	0.05	0.25	**e1**	2.79	
b	1.1	1.3	**e2**	2.54	
b1	0.65	0.79	**L**	19.8	20.1
b2	-	0.2	**P**	3.5	3.7
b3	1.34	1.44	**P1**	7	7.4
c	0.58	0.66	**P2**	2.4	2.6
D	20.9	21.1	**Q**	5.6	6
D1	16.25	16.85	**S**	6.15	-
D2	1.05	1.35	**T**	9.8	10.2
D3	24.97	25.27	**U**	6	6.4
D4	4.9	5.1			

Pin	Symbol	Description
1	D	Drain
2	S	Power Source
3	S	Driver Source
4	G	Gate
5	D	Mounting Base; Connected to Drain

Note:

1. All metal surfaces are Sn plated (matte), except area of cut.
2. Burr or mold flash size (0.5 mm) is not included in the dimensions.

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