SEMICONDUCTOR

SC21N120P4

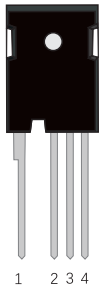
1200V 100A N-Channel SIC Power MOSFET

Features

- High blocking voltage with low on-resistance
- High speed switching with low capacitance
- High operating junction temperature capability
- Kelvin gate input easing driver circuit design

Product Summary			
V_{DS}	$R_{DS(on)}$(mΩ)Typ	I_D(A)	Qg(Typ)
1200V	21 @ 18V 50A	100	198nc

TO-247-4L



Mechanical Data

- Case:TO-247-4L Package

Application

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

Block Diagram

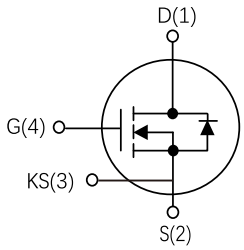


Table1 Absolute Maximum Ratings (T_C=25°C, unless otherwise specified)

Parameter		Symbol	Value	Unit
Drain-Source Voltage		V_{DS}	1200	V
Gate-Source Voltage(Max)		$V_{GS(max)}$	-10/+22	V
Recommend Gate-Source Voltage		V_{GSop}	-5/+18	V
Continuous Drain Current	T_C=25°C	I_D	100	A
	T_C=100°C		68	
Pulsed Drain Current (Note 1)		I_{DM}	250	A
Power Dissipation	T_C=25°C	P_D	469	W
Operating Junction and Storage Temperature		T_J/T_{STG}	-55 ~ +175	°C

Table 2.Thermal Characteristics

Parameter	Symbol	SC21N120P4	Unit
Thermal resistance Junction to Case	$R_{\theta JC}$	0.32	°C/W
Thermal resistance Junction to Ambient	$R_{\theta JA}$	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	-	1	100	μA
Gate- Source Leakage Current	Forward	I_{GSS}	V_{GS}=22V,V_{DS}=0V	-	-	100	nA
	Reverse		V_{GS}=-10V,V_{DS}=0V	-	-	-100	nA
On Characteristics							
Gate Threshold Voltage		$V_{GS(TH)}$	V_{DS}=V_{GS},I_D=17mA	2.0	3.0	4.5	V
Static Drain-Source On-State Resistance		$R_{DS(ON)}$	V_{GS}=18V,I_D=50A,T_J=25°C	-	21	29	mΩ
			V_{GS}=18V,I_D=30A,T_J=175°C	-	28	-	
Gate Resisitance		R_G	f=1MHz, V_{AS}=30mV	-	3.0	-	Ω
Dynamic Characteristics							
Input Capacitance		C_{ISS}	V_{DS}=800V,V_{GS}=0V, f=1MHz	-	3798	-	pF
Output Capacitance		C_{OSS}		-	225	-	pF
Reverse Transfer Capacitance		C_{RSS}		-	14	-	pF
Coss stored energy		E_{OSS}		-	93	-	μJ
Turn-on switching energy		E_{ON}	V_{DS}=800V,I_D=50A V_{GS}=-5/18V,R_G=2Ω, T_J=25°C	-	477	-	μJ
Turn-off switching energy		E_{OFF}		-	342	-	μJ
Turn-On Delay Time		td(on)		-	29	-	ns
Turn-On Rise Time		t_R		-	29	-	ns
Turn-Off Delay Time		td(off)		-	62	-	ns
Turn-Off Fall Time		tf		-	12	-	ns
Total Gate Charge		Q_G	V_{DD}=800V,I_D=50A, V_{GS}=-5/18V	-	198	-	nC
Gate-Source Charge		Q_{GS}		-	48	-	nC
Gate-Drain Charge		Q_{GD}		-	65	-	nC
Drain-Source Diode Characteristics and Maximum Ratings(Note 2)							
Drain-Source Diode Forward Voltage		V_{SD}	V_{GS}=-5V,I_S=50A	-	4.2	-	V
Reverse Recovery Time		trr	VR=800V, I_{SD}=50A,diF/dt=3000A/μs	-	22	-	ns
Recovered charge		Qrr		-	482	-	nC
Continuous Diode Forward Current		Is		-	-	100	A

Notes: 1 RepetitiveRating Pulse width limited by maximum junction temperature

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

Typical Characteristics Diagrams

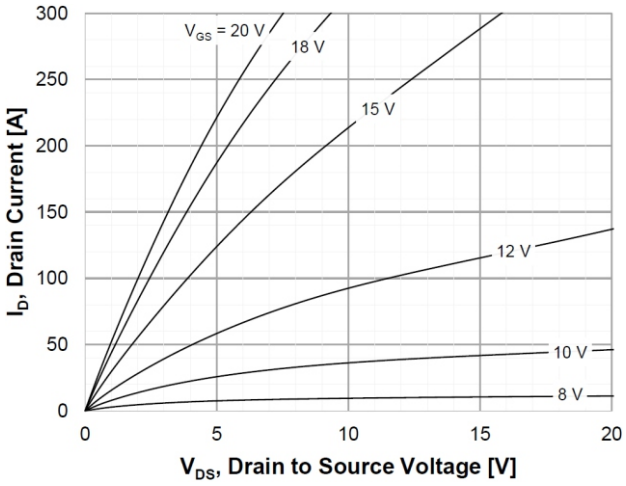


Figure 1. Output Characteristics T_J = -40 °C

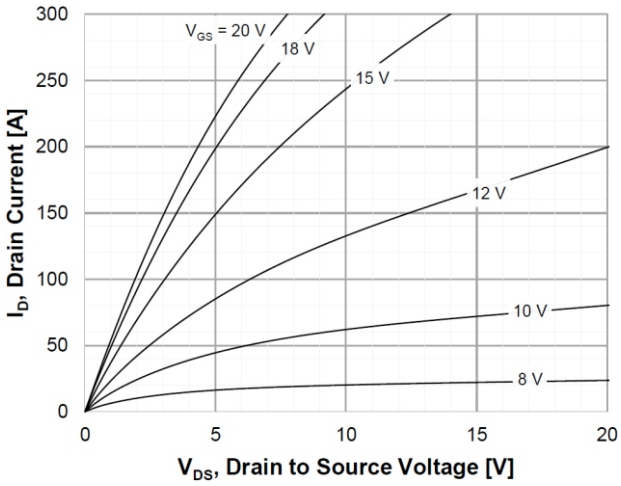


Figure 2. Output Characteristics T_J=25 °C

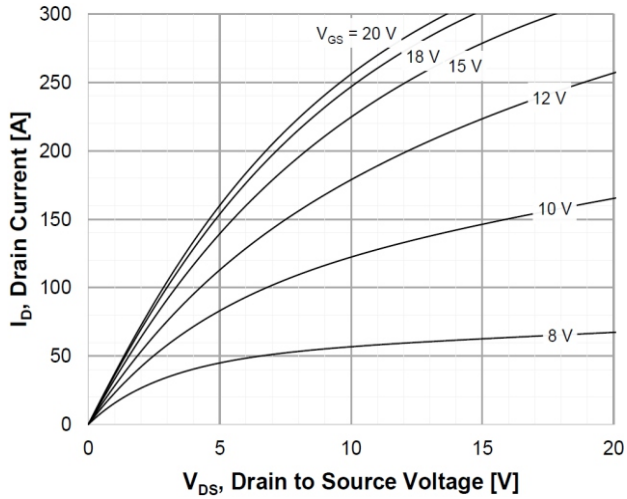


Figure 3. Output Characteristics T_J = 175 °C

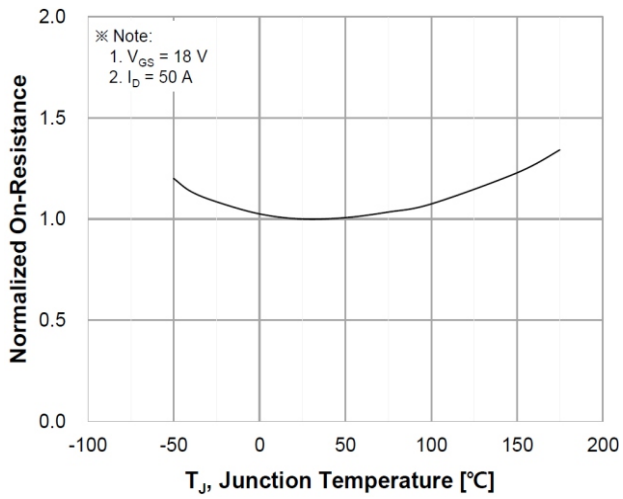


Figure 4. Normalized On - Resistance vs. Temperature

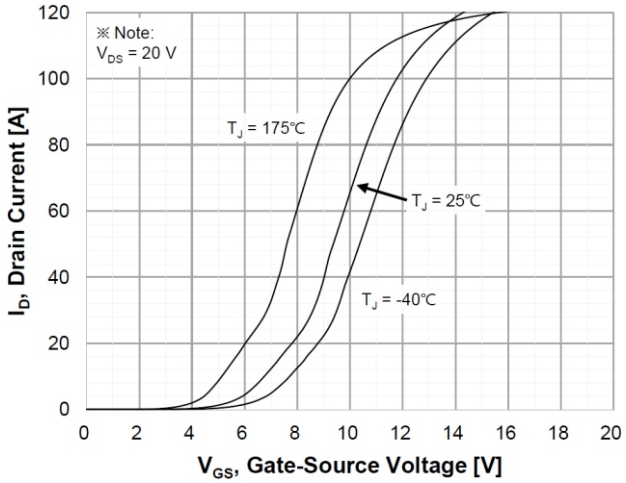


Figure 5. Transfer Characteristics for Various Junction Temperatures

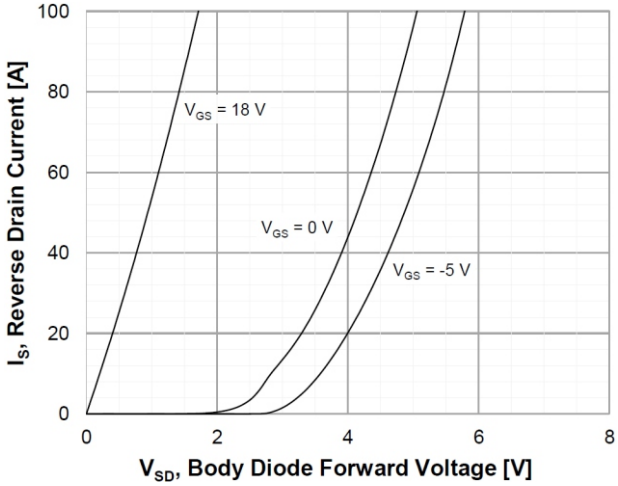


Figure 6. Body Diode Characteristics at - 40°C

Typical Characteristics Diagrams

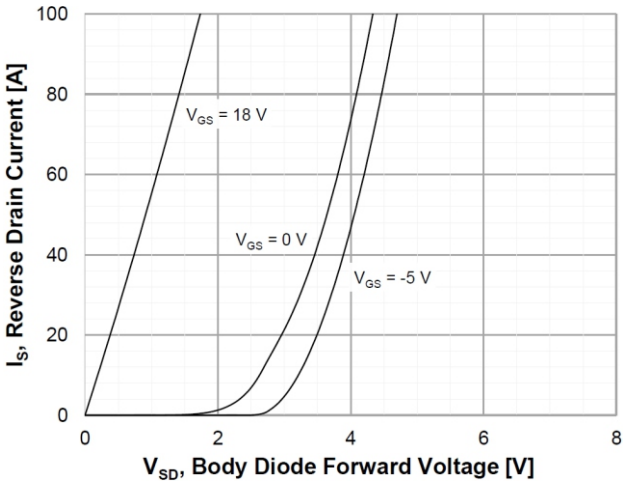


Figure 7. Body Diode Characteristics at 25 °C

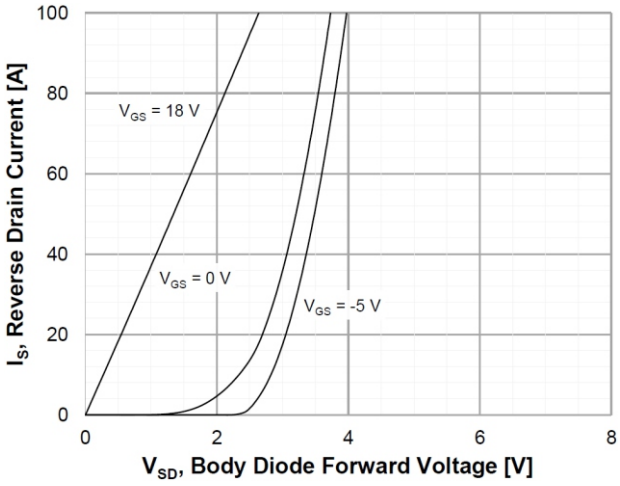


Figure 8. Body Diode Characteristics at 175 °C

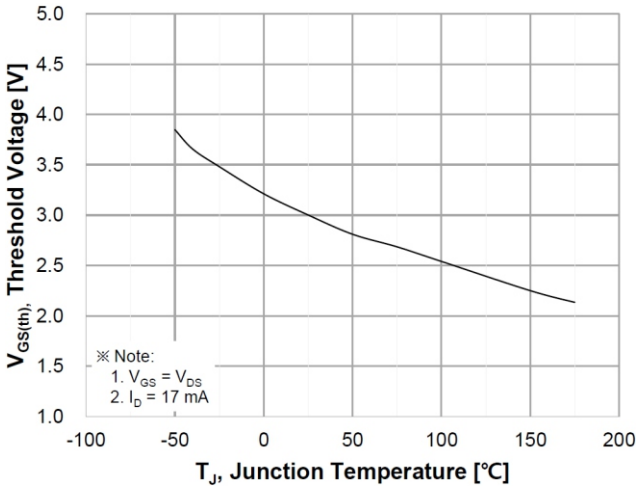


Figure 9. Threshold Voltage vs. Temperature

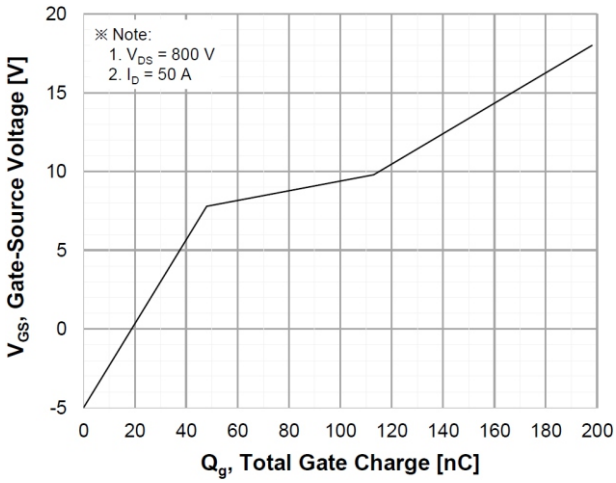


Figure 10. Gate Charge Characteristics

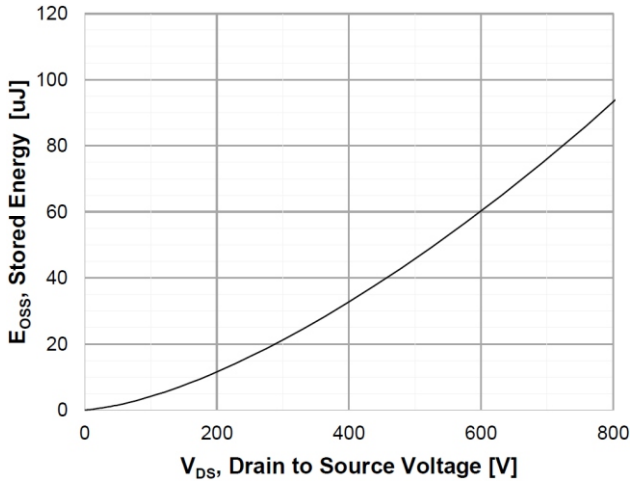


Figure 11. Output Capacitor Stored Energy

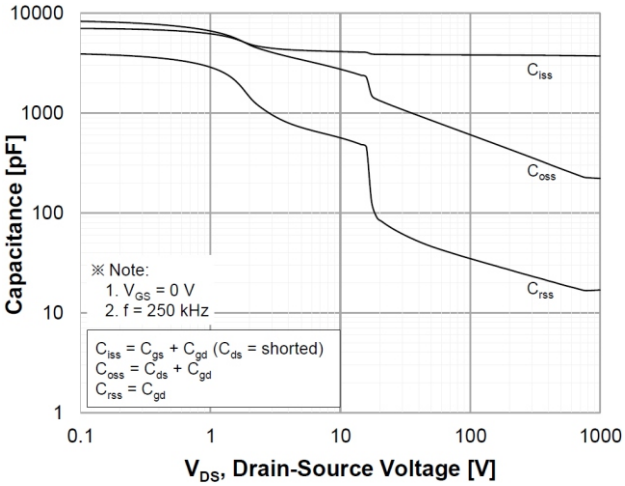


Figure 12. Capacitances vs. Drain -Source Voltage (0 - 1000V)

Typical Characteristics Diagrams

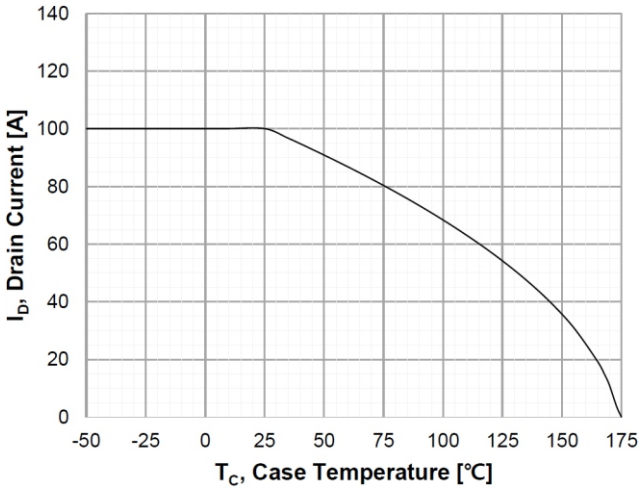


Figure 13. Continuous Drain Current Derating vs. Case Temperature

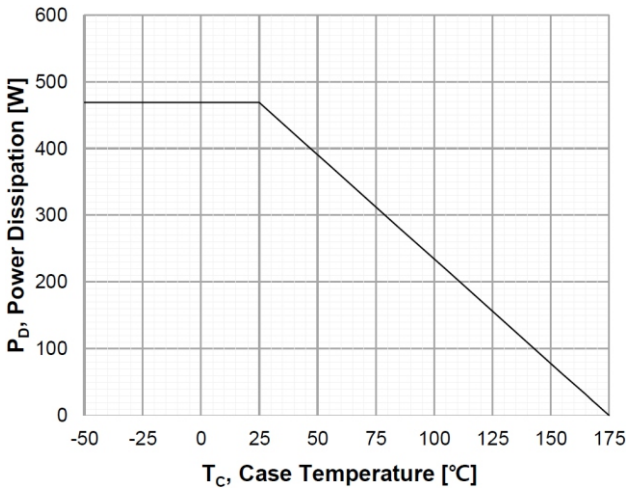


Figure 14. Maximum Power Dissipation Derating vs. Case Temperature

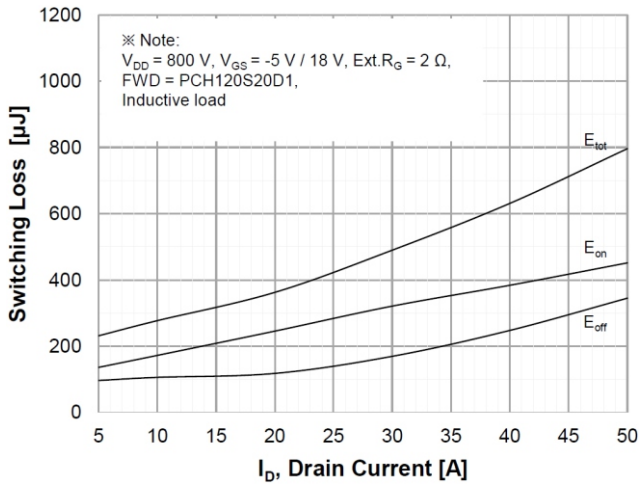


Figure 15. Switching Losses vs. Drain Current

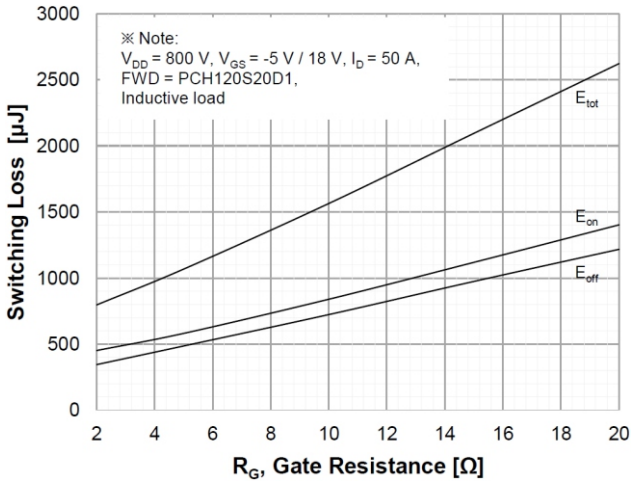


Figure 16. Switching Losse s vs. Gate Resistance

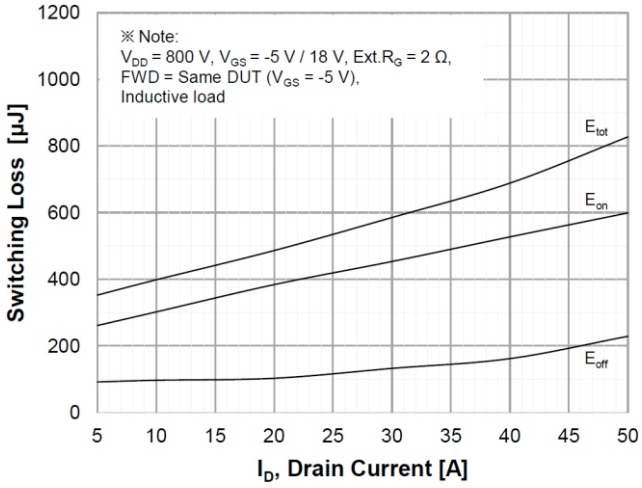


Figure 17. Switching Losses vs. Drain Current

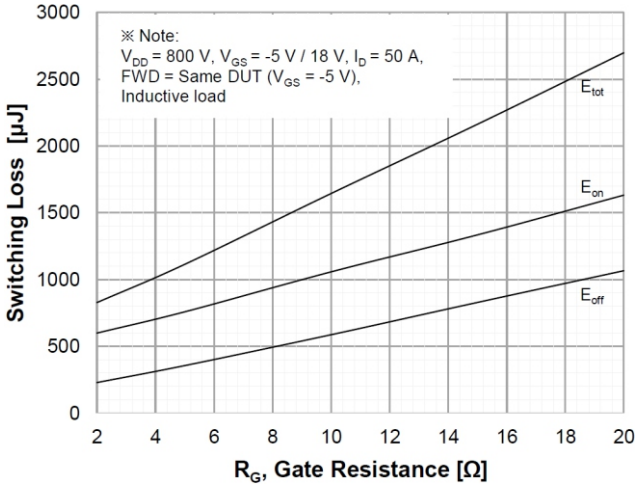


Figure 18. Switching Losse s vs. Gate Resistance

Typical Characteristics Diagrams

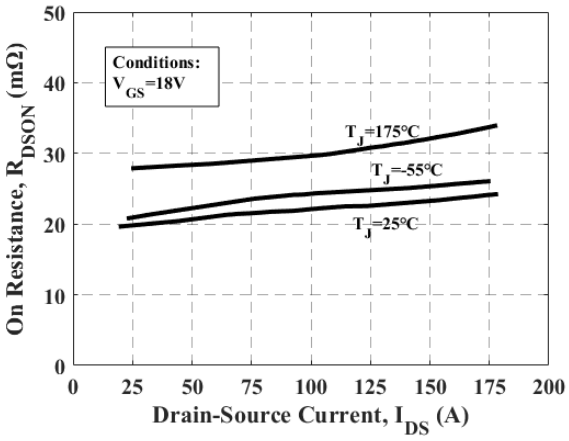


Figure 19. On-Resistance vs. Drain Current
For Various Temperatures

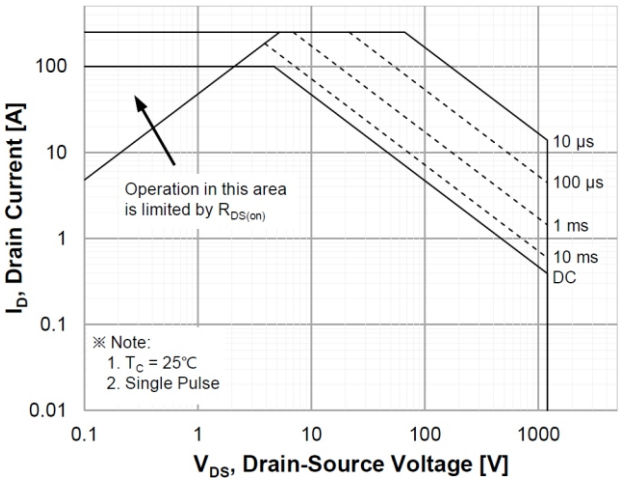


Figure 20. Safe Operating Area

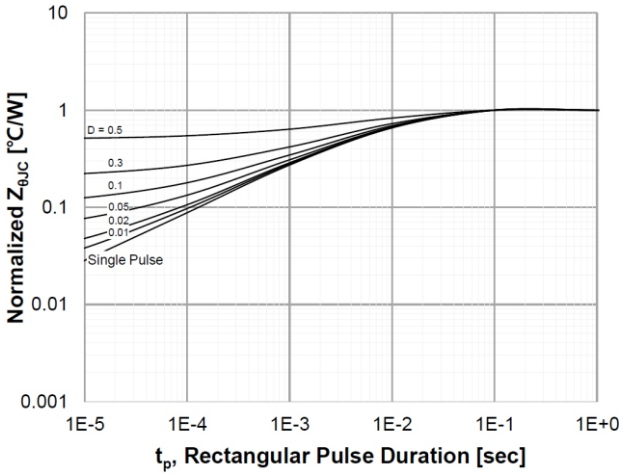
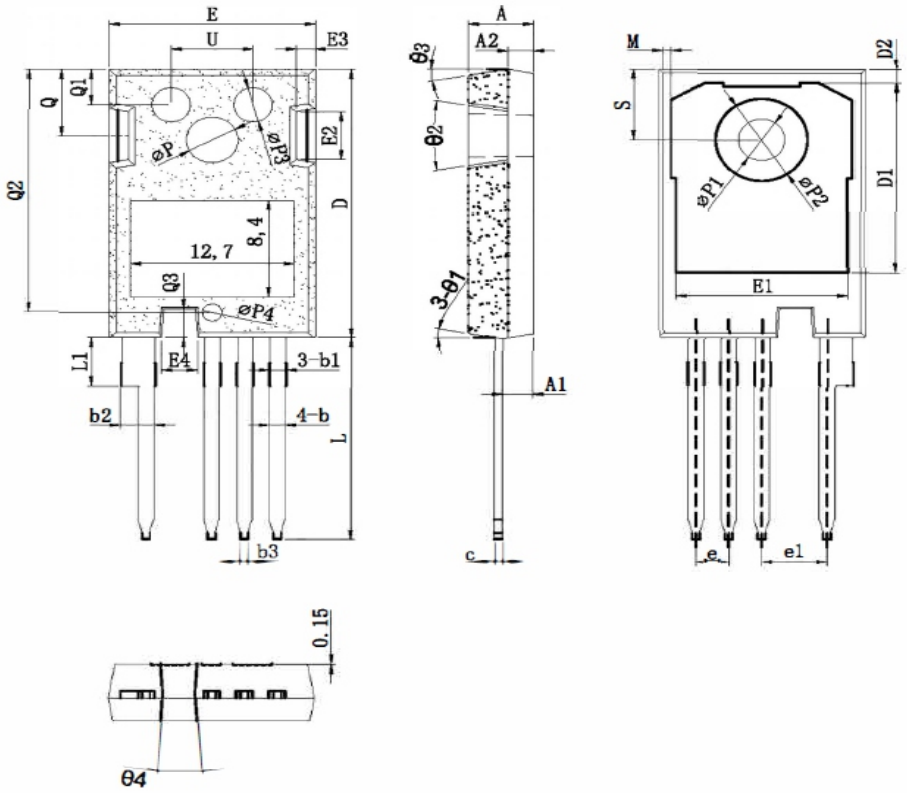


Figure 21. Transient Thermal Impedance
(Junction - Case)

Dimensions

TO-247-4L package

Package TO -247-4L



SYMBOL	mm		
	MIN	NOM	MAX
A	4.83	5.02	5.21
A1	2.29	2.42	2.54
A2	1.91	2.00	2.16
b	1.07	1.20	1.33
b1	1.15	1.30	1.45
b2	2.39	2.67	2.94
b3	0.45	0.60	0.75
c	0.55	0.60	0.68
D	23.30	23.45	23.60
D1	16.35	16.65	16.95
D2	0.95	1.19	1.25
E	15.75	15.94	16.13
E1	13.10	13.25	13.40
E2	4.00	4.40	4.80
E3	1.00	1.45	1.90
E4	2.40	2.80	3.20
e	2.50	2.54	2.58
e1	5.03	5.08	5.13
L	17.31	17.57	17.82
L1	—	—	4.37
M	0.40	0.60	0.80
φP	3.90	4.00	4.10
φP1	3.51	3.61	3.71
φP2	7.03	7.18	7.33
φP3	2.80	3.00	3.20
φP4	1.30	1.50	1.70
Q	5.49	5.79	6.00
Q1	2.80	3.10	3.40
Q2	19.95	21.25	21.55
Q3	2.35	2.50	2.65
S	6.04	6.17	6.30
U	6.05	6.35	6.55
θ1	6°	10°	13°
θ2	16°	20°	24°
θ3	6°	10°	13°
θ4	5°	8°	11°

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