SEMICONDUCTOR

SC20N65P4

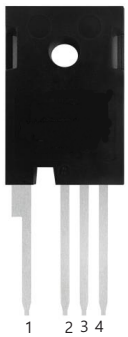
650V 92A N-Channel SIC Power MOSFET

Features

- High blocking voltage with low on-resistance
- High speed switching with low capacitance
- High operating junction temperature capability
- Wide bandgap SiC MOSFET technology
- Halogen free, RoHs compliant

Product Summary			
V_{DS}	$R_{DS(on)}$(mΩ)Typ	I_D(A)	Qg(Typ)
650V	20@ 18V 50A	92	49nc

TO-247-4L



Mechanical Data

- Case:TO-247-4L Package

Application

- Motor drivers
- Renewable energy
- Automotive DC/DC converters
- Switch mode power supplies

Block Diagram

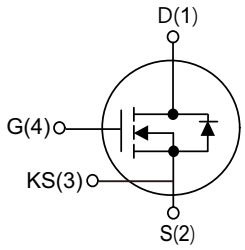


Table1 Absolute Maximum Ratings (T_C=25°C, unless otherwise specified)

Parameter		Symbol	Value	Unit
Drain-Source Voltage		V_{DS}	650	V
Gate-Source Voltage(Max)		$V_{GS(max)}$	-8/+22	V
Recommend Gate-Source Voltage		V_{GSop}	-4/+18	V
Continuous Drain Current	T_C=25°C	I_D	92	A
	T_C=100°C		64	
Pulsed Drain Current (Note 1)		I_{DM}	257	A
Power Dissipation	T_C=25°C	P_D	312	W
Operating Junction and Storage Temperature		T_J/T_{STG}	-55 ~ +175	°C

Table 2.Thermal Characteristics

Parameter	Symbol	SC20N65P4	Unit
Thermal resistance Junction to Case	$R_{\theta JC}$	0.48	°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	650	-	-	V
Drain-Source Leakage Current		I_{DSS}	V_{DS}=650V,V_{GS}=0V	-	1	100	μA
Gate- Source Leakage Current	Forward	I_{GSS}	V_{GS}=22V,V_{DS}=0V	-	10	250	nA
	Reverse		V_{GS}=-8V,V_{DS}=0V	-	-10	-250	nA
On Characteristics							
Gate Threshold Voltage		$V_{GS(TH)}$	V_{DS}=V_{GS},I_D=15mA	1.9	2.6	4.0	V
Static Drain-Source On-State Resistance		$R_{DS(ON)}$	V_{GS}=18V,I_D=50A,T_J=25°C	-	20	30	mΩ
			V_{GS}=18V,I_D=50A,T_J=175°C	-	28	-	
Gate Resisitance		R_G	f=1MHz	-	3.2	-	Ω
Dynamic Characteristics							
Input Capacitance		C_{ISS}	V_{DS}=600V,V_{GS}=0V, f=1MHz,V_{AC}=25mV	-	3180	-	pF
Output Capacitance		C_{OSS}		-	281	-	pF
Reverse Transfer Capacitance		C_{RSS}		-	33	-	pF
Total Gate Charge		Q_G	V_{DD}=400V,I_D=40A, V_{GS}=-4/18V	-	49	-	nC
Gate-Source Charge		Q_{GS}		-	31	-	nC
Gate-Drain Charge		Q_{GD}		-	187	-	nC
Drain-Source Diode Characteristics and Maximum Ratings (Note 2)							
Drain-Source Diode Forward Voltage		V_{SD}	V_{GS}=-4V,I_S=25A	-	4.2	-	V
Continuous Diode Forward Current		I_S		-	-	92	A
Reverse Recovery Time		trr	V_{GS}=-4V, V_R=400V, I_{SD}=40A	-	26	-	ns
Recovered charge		Qrr		-	58	-	nC
Peak reverse recovery current		Irrm		-	3.4	-	A

Notes: 1 RepetitiveRating Pulse width limited by maximum junction temperature

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

Typical Characteristics Diagrams

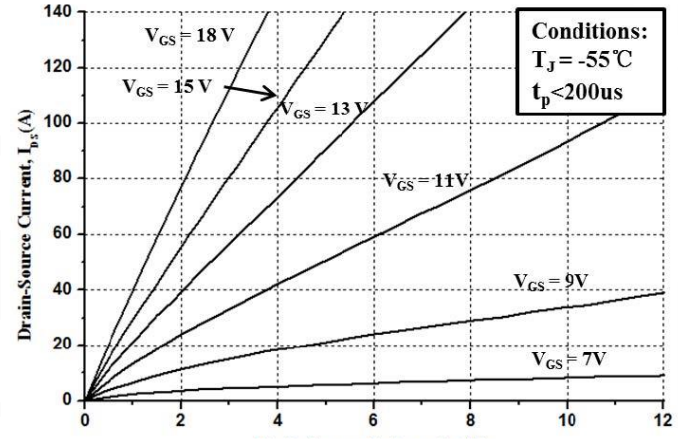


Figure 1. Output Characteristics T_J = -55 ºC

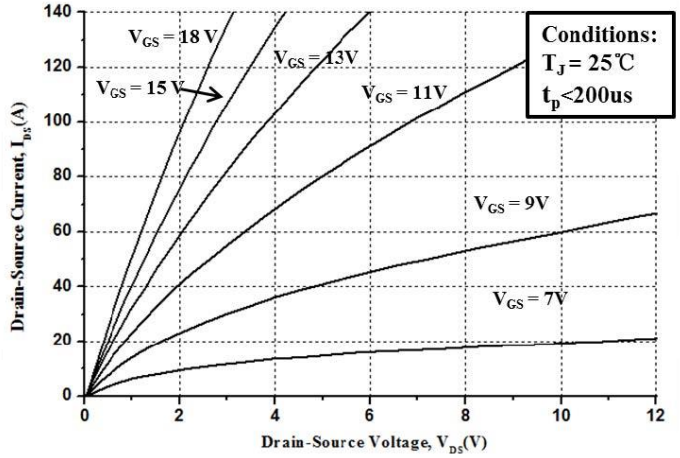


Figure 2. Output Characteristics T_J = 25 ºC

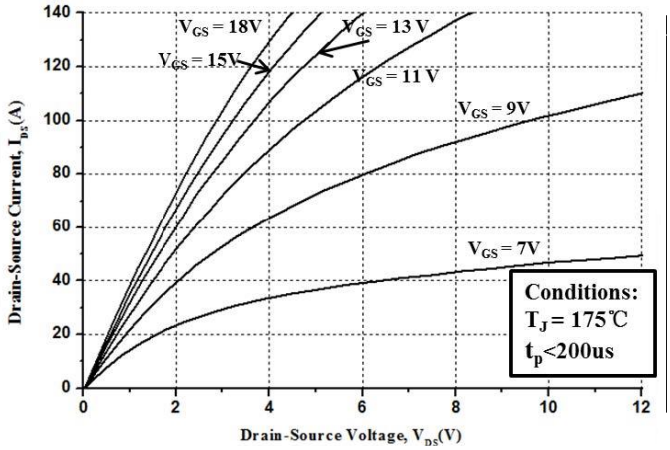


Figure 3. Output Characteristics T_J = 175 ºC

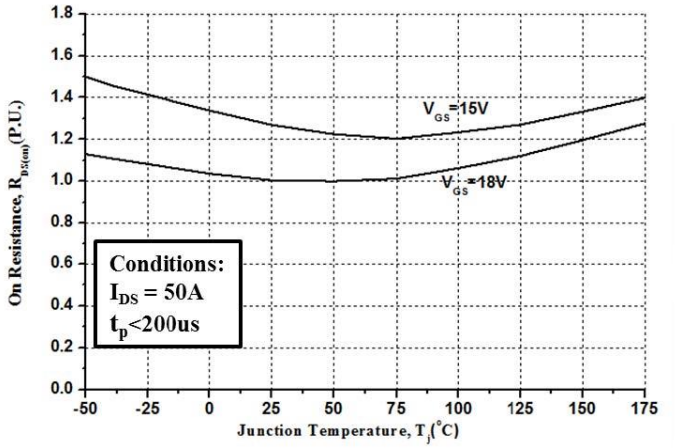


Figure 4. Normalized On-Resistance vs. Temperature

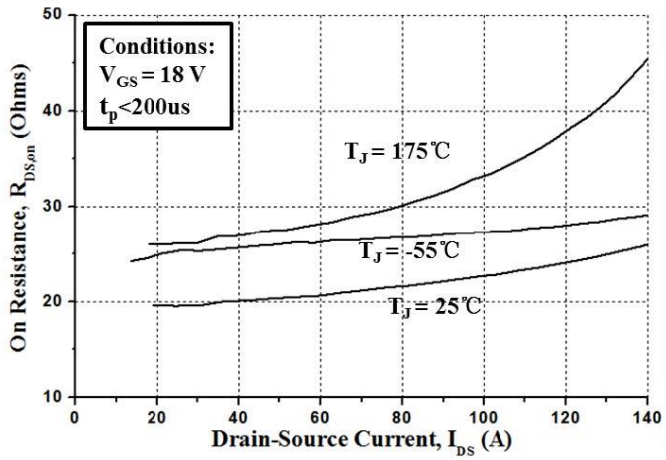


Figure 5. On-Resistance vs. Drain Current for Various Temperatures

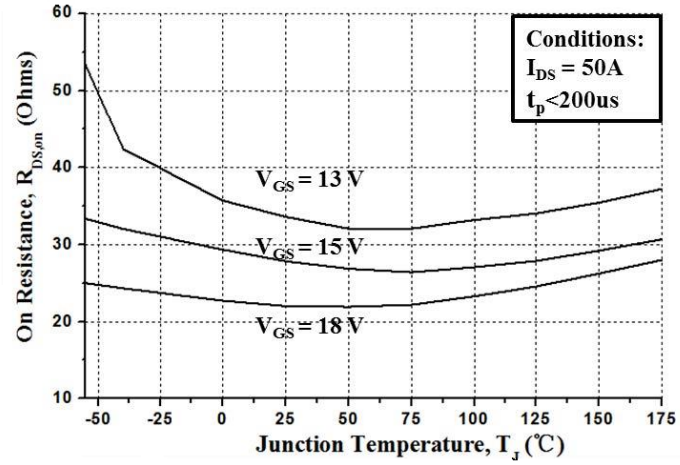


Figure 6. On-Resistance vs. Temperature for Various Gate Voltages

Typical Characteristics Diagrams

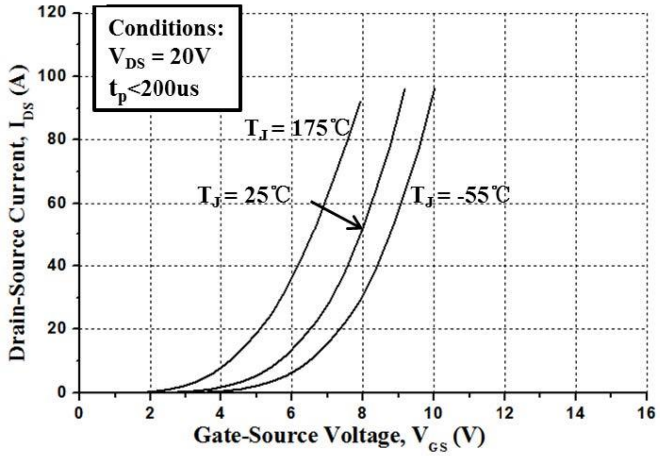


Figure 7. Transfer Characteristics for Various Junction Temperatures

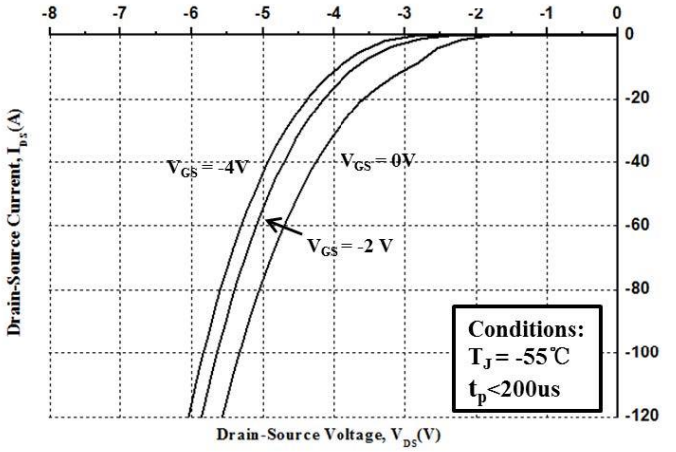


Figure 8. Body Diode Characteristics at -55 ºC

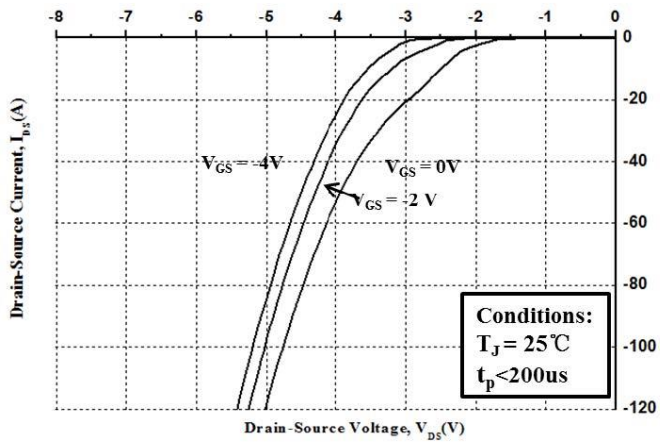


Figure 9. Body Diode Characteristics at 25 ºC

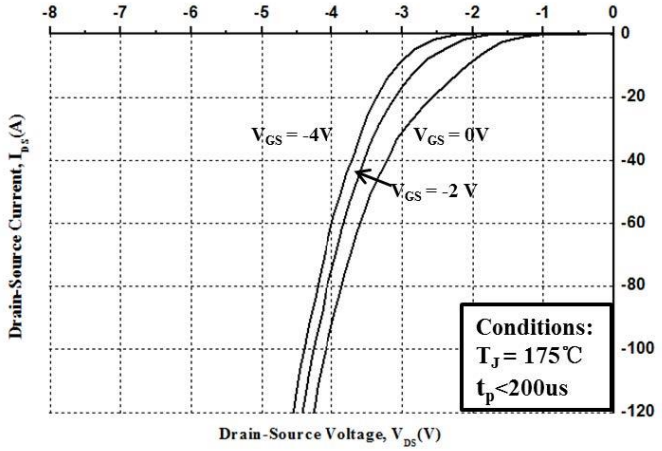


Figure 10. Body Diode Characteristics at 175 ºC

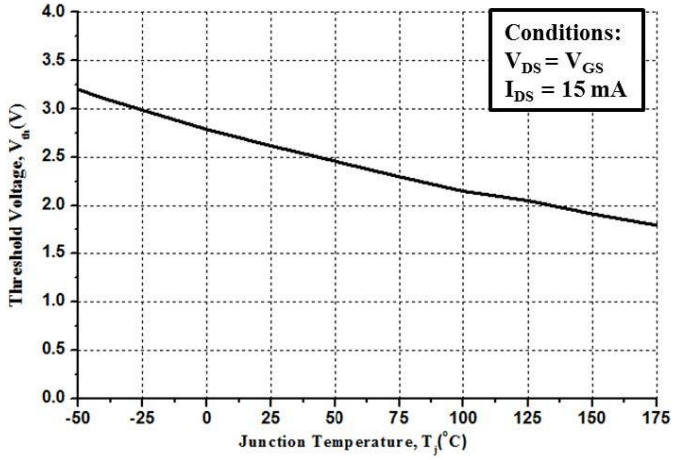


Figure 11. Threshold Voltage vs. Temperature

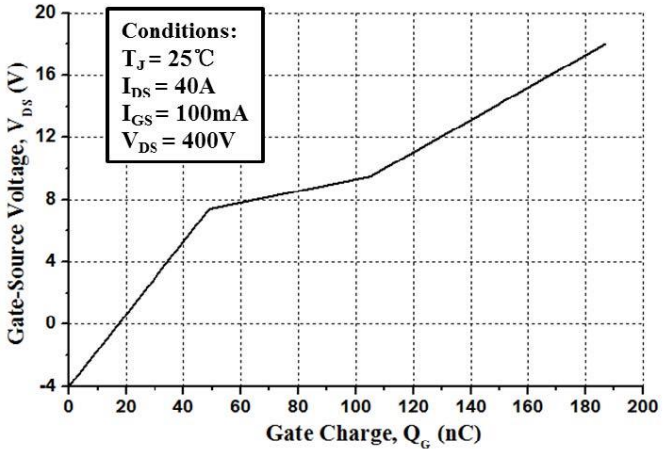


Figure 12. Gate Charge Characteristics

Typical Characteristics Diagrams

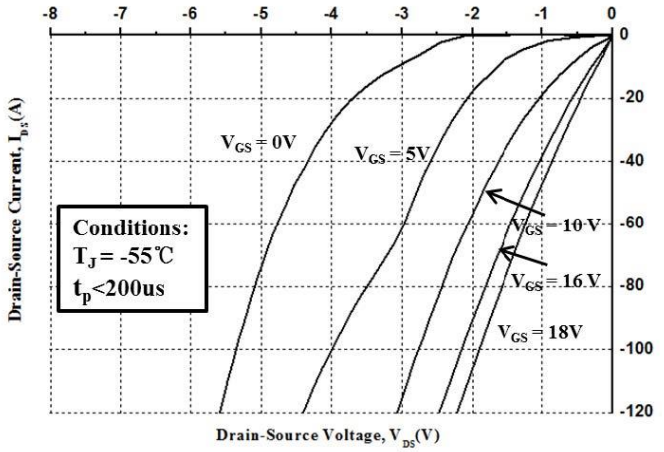


Figure 13. 3rd Quadrant Characteristics at -55 ºC

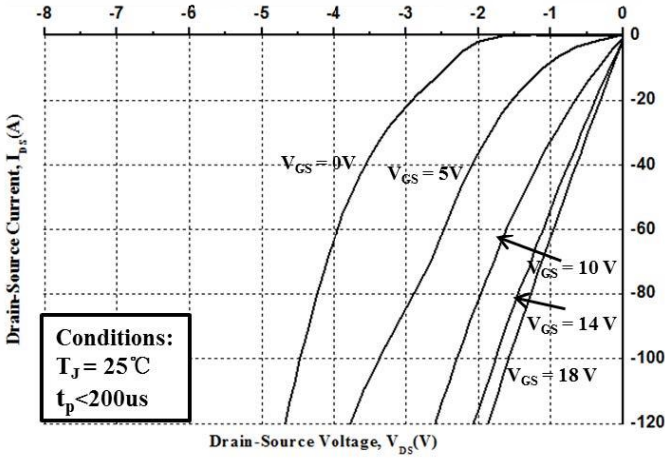


Figure 14. 3rd Quadrant Characteristics at 25 ºC

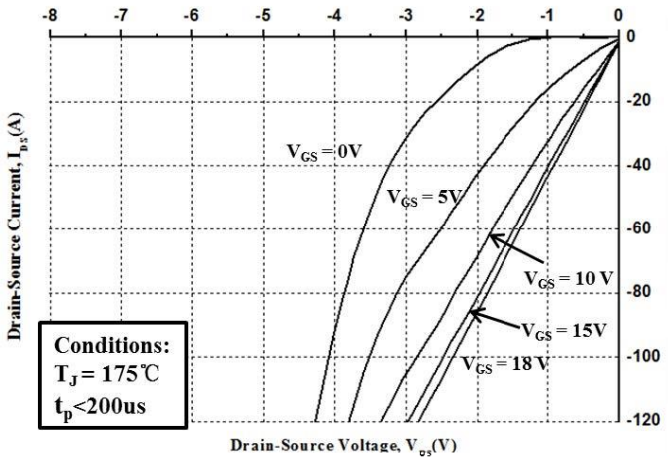


Figure 15. 3rd Quadrant Characteristics at 175 ºC

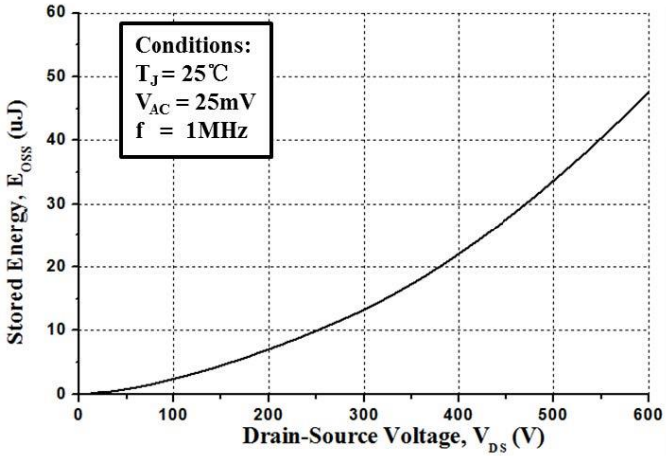


Figure 16. Output Capacitor Stored Energy

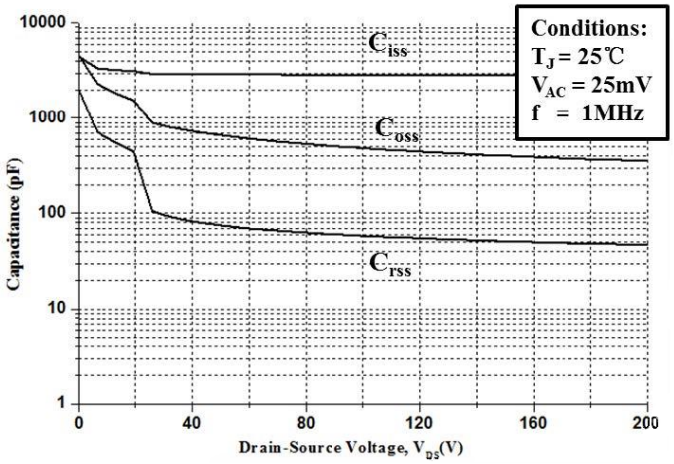


Figure 17. Capacitances vs. Drain-Source

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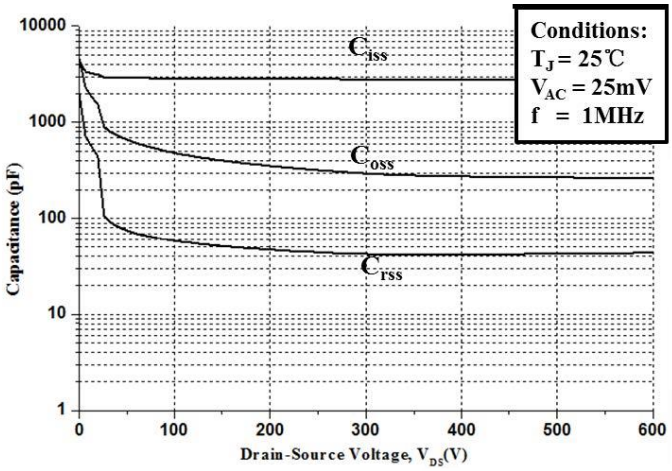
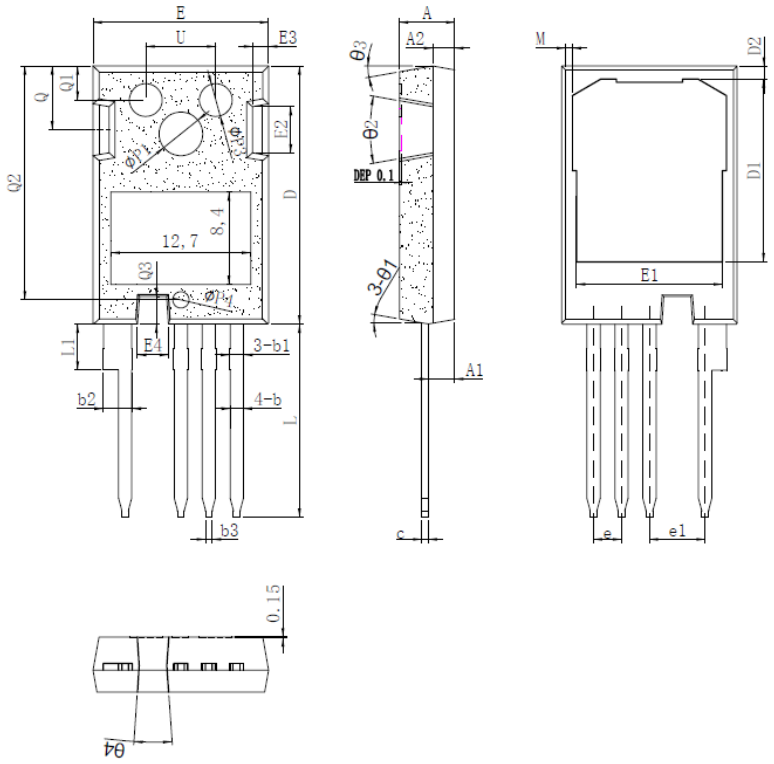


Figure 18. Capacitances vs. Drain-Source

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Dimensions

TO-247-4L package



	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	13.05	13.25	13.45
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
ϕP1	3.80	4.00	4.20
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
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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