

## SC1R0N170Y

### 5 Amps, 1700 Volts N-Channel Sic Power MOSFET

#### Features

- 5A, 1700V,  $R_{DS(ON)MAX}=1.3\ \Omega @V_{GS}=20V/2A$
- High Blocking Voltage with low On-Resistance
- High Speed Switching with Low Capacitance
- Easy to Parallel and Simple to Drive
- Ultra-low Drain-gate capacitance
- Avalanche Ruggedness

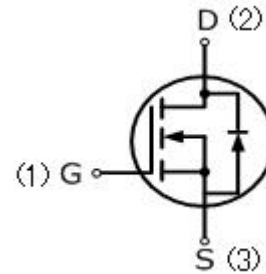
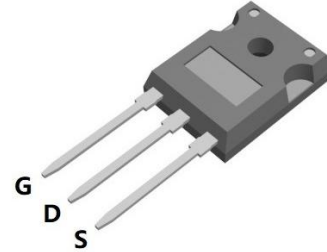
#### Benefits

- Higher System Efficiency
- Reduced Cooling Requirements
- Increased Power Density
- Increased System Switching Frequency

#### Applications

- Auxiliary Power Supplies
- Switch Mode Power Supplies

TO-247-3L



#### Absolute Maximum Ratings ( $T_c=25^\circ\text{C}$ , unless otherwise noted)

Parameter	Symbol	Value	UNIT	Test Conditions
Drain-Source Voltage	$V_{DSmax}$	1700	V	$V_{GS}=0V, I_{DS}=100\mu A$
Gate-Source Voltage (dynamic)	$V_{GSmax}$	-10/+25		Absolute maximum values
Gate-Source Voltage (static)	$V_{GSop}$	-5/+20		Recommended operational values
Continuous Drain Current	$I_D$	5	A	$V_{GS}=20V, T_c=25^\circ\text{C}$
		3.5	A	$V_{GS}=20V, T_c=100^\circ\text{C}$
Pulsed Drain Current	$I_{D(pulse)}$	6	A	Pulse width $t_p$ limited by $T_{Jmax}$
Power Dissipation	$P_D$	69	W	$T_c=25^\circ\text{C}, T_J=150^\circ\text{C}$
Operating Junction and Storage Temperature Range	$T_J, T_{STG}$	-55 to +150	$^\circ\text{C}$	
Solder Temperature	$T_L$	260	$^\circ\text{C}$	1.6mm(0.063") from case for 10s

#### Thermal Characteristics

Parameter	Symbol	Typ.	Max.	Units
Maximum Junction-to-Case	$R_{thJC}$	1.8	2.0	$^\circ\text{C}/\text{W}$

<b>Electrical Characteristics</b> ( $T_c=25^\circ\text{C}$ , unless otherwise noted)						
Parameter	Symbol	Test Conditions	Min	Typ	Max	Units
Drain-Source Breakdown Voltage	$BV_{DSS}$	$V_{GS}=0V, I_D=100\mu A$	1700	—	—	V
Zero Gate Voltage Drain Current	$I_{DSS}$	$V_{DS}=1700V, V_{GS}=0V$	—	1	100	$\mu A$
Gate-Body Leakage Current, Forward	$I_{GSSF}$	$V_{GS}=20V, V_{DS}=0V$	—	—	250	nA
Gate-Source Threshold Voltage	$V_{GS(th)}$	$V_{DS}=V_{GS}, I_D=1mA$	2.5	3.0	4.5	V
		$V_{DS}=V_{GS}, I_D=1mA, T_J=150^\circ\text{C}$	—	2.2	—	
Drain-Source On-State Resistance	$R_{DS(on)}$	$V_{GS}=20V, I_D=2A$	—	1.0	1.3	$\Omega$
		$V_{GS}=20V, I_D=2A, T_J=150^\circ\text{C}$	—	1.5	—	
Transconductance	$g_{fs}$	$V_{DS}=20V, I_D=2A$	—	1.15	—	S
		$V_{DS}=20V, I_D=2A, T_J=150^\circ\text{C}$	—	1.30	—	
Input Capacitance	$C_{iss}$	$V_{DS}=1000V,$	—	186	—	pF
Output Capacitance	$C_{oss}$	$V_{GS}=0V,$	—	12	—	pF
Reverse Transfer Capacitance	$C_{rss}$	$f=1.0\text{MHz},$	—	1.6	—	pF
Coss Stored Energy	$E_{oss}$	$V_{AC}=25mV$	—	6.2	—	$\mu J$
Turn-On Delay Time	$t_{d(on)}$	$V_{DS}=1200V, V_{GS}=-5V/20V,$ $I_D=30A, R_g=2.5\Omega, R_L=600\Omega$	—	5.2	—	ns
Turn-On Rise Time	$t_r$		—	9.4	—	ns
Turn-Off Delay Time	$t_{d(off)}$		—	13.2	—	ns
Turn-Off Fall Time	$t_f$		—	22.0	—	ns
Turn-On Switching Energy	$E_{ON}$	$V_{DS}=1200V, V_{GS}=-5V/20V$	—	48	—	$\mu J$
Turn-Off Switching Energy	$E_{OFF}$	$I_D=2A, R_g=2.5\Omega, L=1500\mu H$	—	18	—	$\mu J$
Internal Gate Resistance	$R_G$	$f=1\text{MHz}$ open drain	—	22	—	$\Omega$
Total Gate Charge	$Q_g$	$V_{DS}=1200V, I_D=2A,$ $V_{GS}=-5V/20V$	—	21.8	—	nC
Gate-Source Charge	$Q_{gs}$		—	5.2	—	
Gate-Drain Charge	$Q_{gd}$		—	7.3	—	
<b>Reverse Diode Characteristics</b>						
Diode Forward Voltage	$V_{SD}$	$V_{GS}=-5V, I_F=1A$	—	4.2	—	V
		$V_{GS}=-5V, I_F=1A, T_J=150^\circ\text{C}$	—	3.9	—	
Continuous Diode Forward Current	$I_S$	$T_C=25^\circ\text{C}$	—	—	4.0	A
Reverse Recover Time	$t_{rr}$	$V_{GS}=-5V, I_{SD}=2A, V_R=1200V$	—	25	—	ns
Reverse Recovery Charge	$Q_{rr}$		—	15	—	nC
Peak Reverse Recovery Current	$I_{rrm}$		—	2.8	—	A

## RATING AND CHARACTERISTIC CURVES

Figure.1 Output Characteristics  $T_j=25^\circ\text{C}$

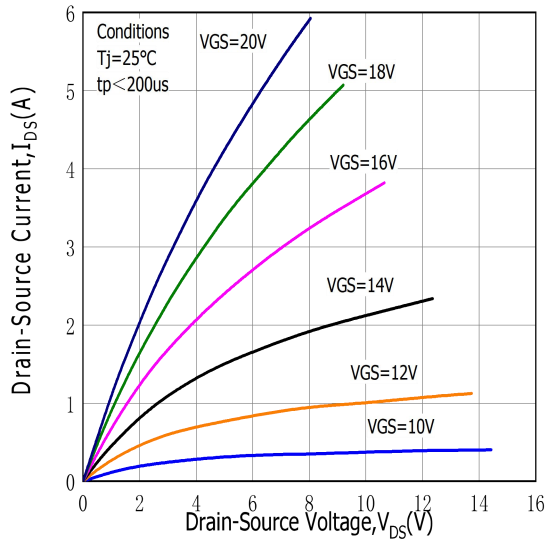


Figure.2 Output Characteristics  $T_j=150^\circ\text{C}$

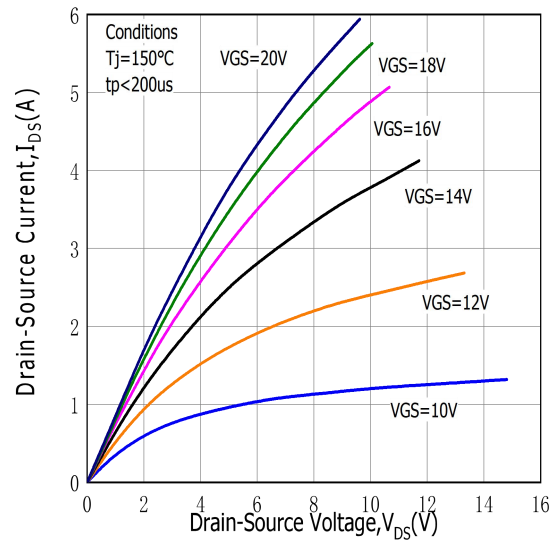


Figure.3 On-Resistance vs. Temperature

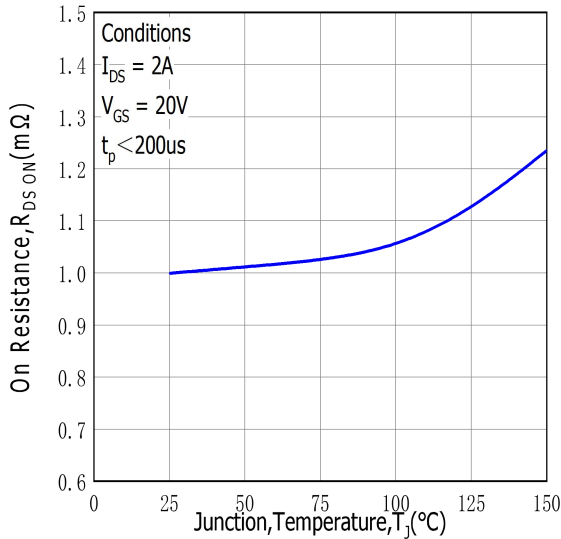


Figure.4 On-Resistance vs. Drain Current for Various Temperatures

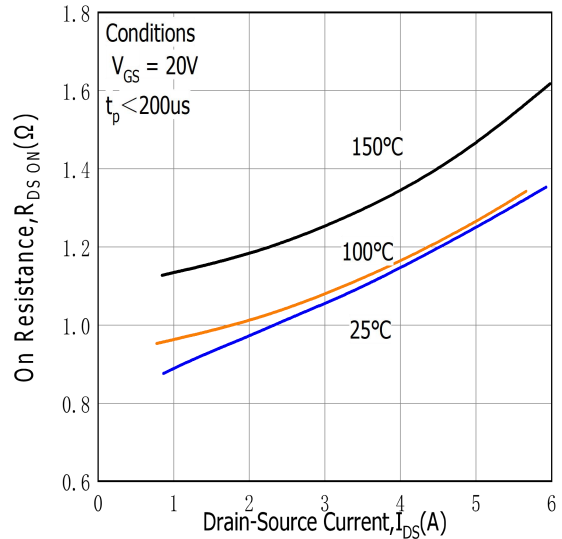


Figure.5 On-Resistance vs. Temperature for Various Gate Voltage

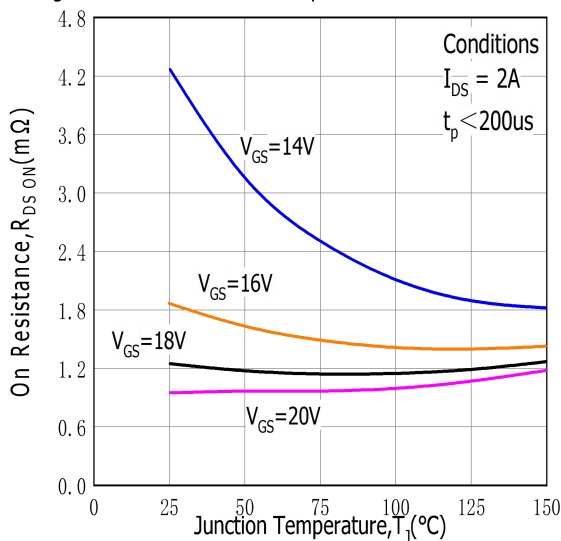


Figure.6 Transfer Characteristic for Various Junction Temperatures

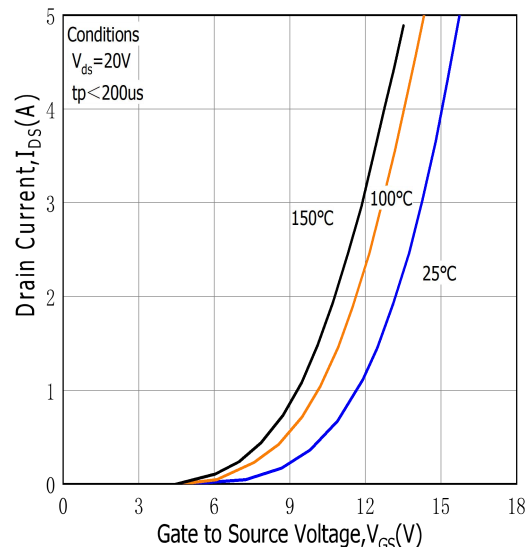


Figure.7 Body Diode Characteristic at 25°C

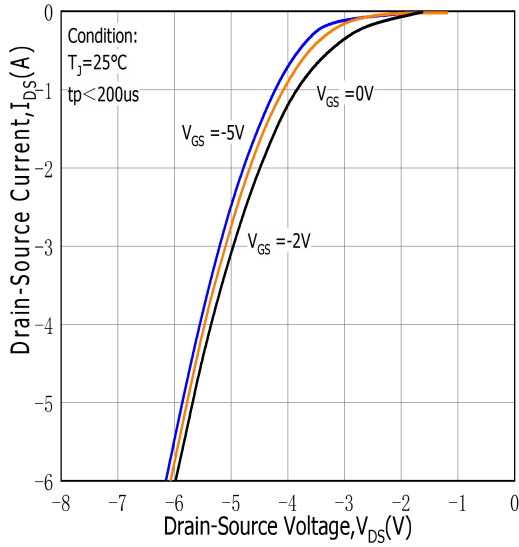


Figure.8 Body Diode Characteristic at 150°C

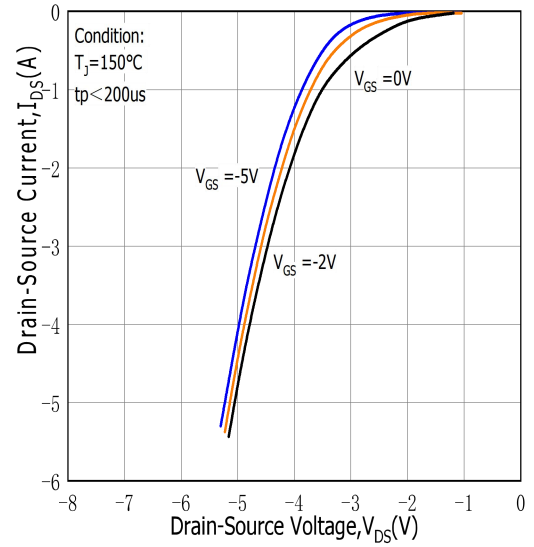


Figure.9 Threshold Voltage vs. Temperature

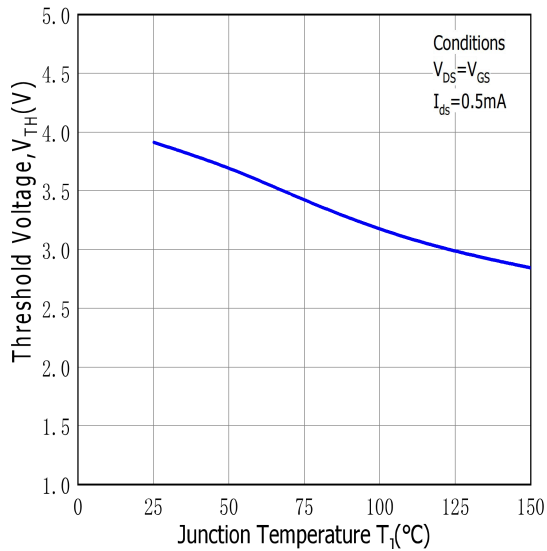


Figure.10 Gate Charge Characteristic

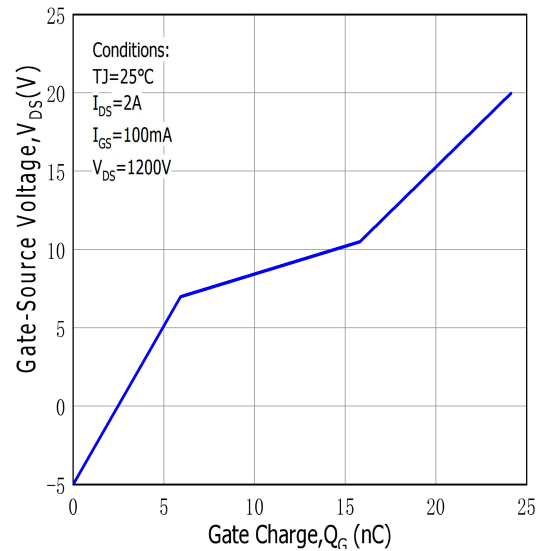


Figure.11 3rd Quadrant Characteristic at 25°C

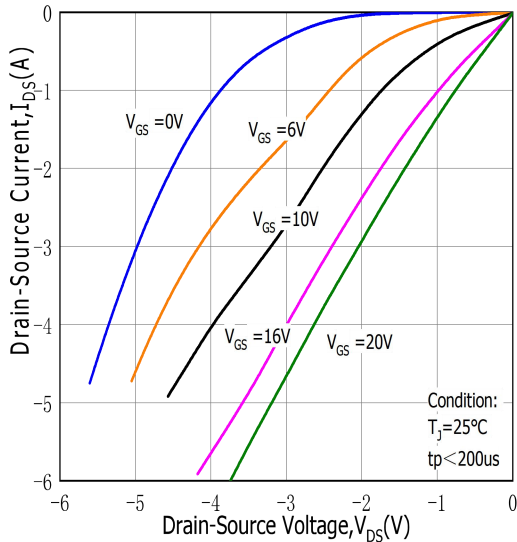


Figure.12 3rd Quadrant Characteristic at 150°C

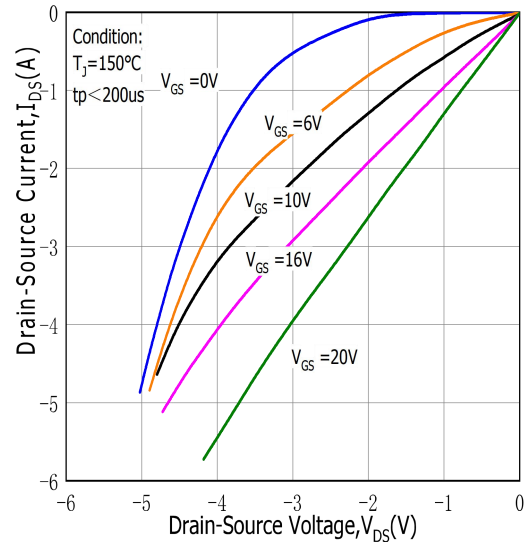


Figure.13 Output Capacitor Stored Energy

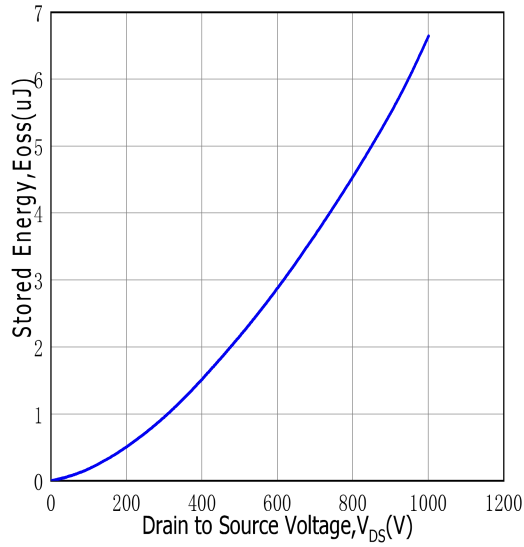


Figure.14 Capacitances vs. Drain-Source Voltage(0-200V)

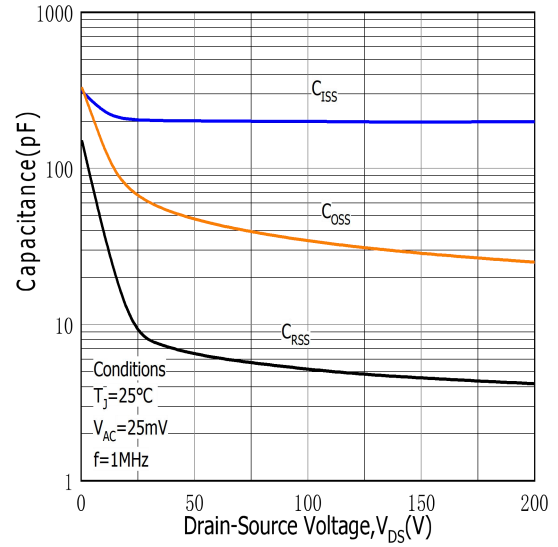
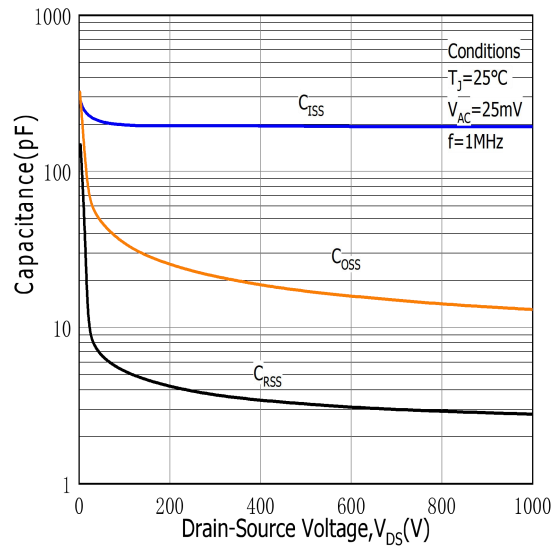
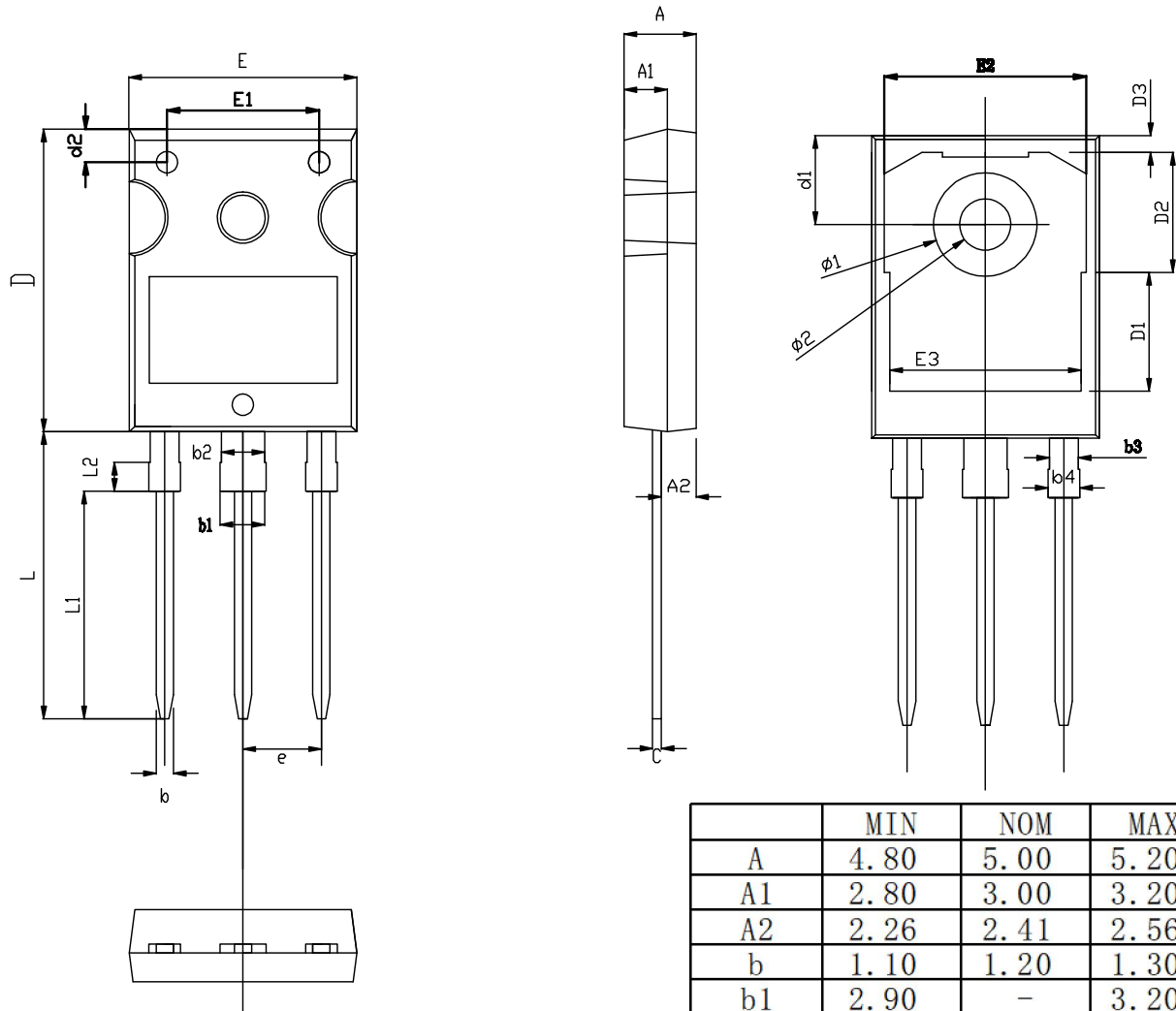


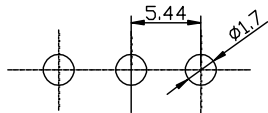
Figure.15 Capacitances vs. Drain-Source Voltage(0-1000V)



# TO-247-3L PACKAGE OUTLINE



RECOMMENDED LAND PATTERN



UNIT: mm

	MIN	NOM	MAX
A	4.80	5.00	5.20
A1	2.80	3.00	3.20
A2	2.26	2.41	2.56
b	1.10	1.20	1.30
b1	2.90	-	3.20
b2	2.90	3.00	3.10
b3	1.90	2.00	2.10
b4	2.00	-	2.20
c	0.50	0.60	0.70
D	20.80	21.00	21.20
D1		8.23	
D2		8.32	
D3		1.17	
d1	6.00	6.15	6.30
d2	2.20	2.30	2.40
E	15.60	15.80	16.00
E1		10.50	
E2		14.02	
E3		13.50	
e	5.34	5.44	5.54
L	19.72	19.92	20.12
L1		15.79	
L2		1.98	
$\phi 1$	7.10	7.19	7.30
$\phi 2$	3.50	3.60	3.70