

60N40TP7/60N40TP4

主要参数 MAIN CHARACTERISTICS

I_D	60A
V_{DS}	400V
$R_{ds(on)} (V_{GS}=10V)$	60m Ω

用途

- 负载开关
- 脉宽调制
- 电源管理

APPLICATIONS

- Load Switch
- PWM Application
- Power Management

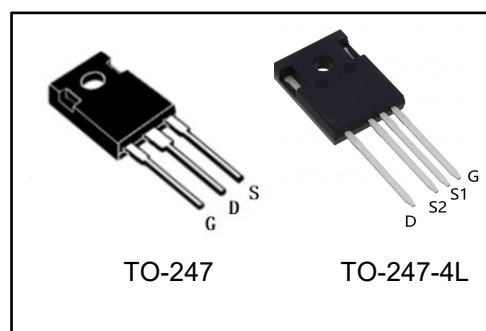
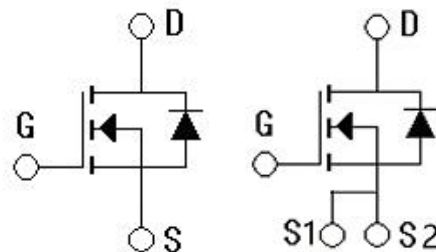
产品特性

- 先进沟槽技术
- 符合环保标准
- 产品无卤素
- 湿敏等级3级

FEATURES

- Advanced Trench Technology
- RoHS and Reach Compliant
- Halogen and Antimony Free
- Moisture Sensitivity Level 3

封装 Package



产品中有毒有害物质或元素的名称及含量

部件名称	有害物质或元素					
	铅 (Pb)	汞 (Hg)	镉 (Cd)	六价铬 (Cr(VI))	多溴联苯 (PBB)	多溴二苯醚 (PBDE)
(含量要求)	≤0.1%	≤0.1%	≤0.01%	≤0.1%	≤0.1%	≤0.1%
引线框	○	○	○	○	○	○
塑封树脂	○	○	○	○	○	○
管 芯	○	○	○	○	○	○
内引线	○	○	○	○	○	○
焊 料	×	○	○	○	○	○
说 明	○: 表示该元素的含量在 SJ/T11363-2006 标准的限量要求以下。 ×: 表示该元素的含量超出 SJ/T11363-2006 标准的限量要求。 目前产品的焊料中含有铅 (Pb) 成分, 但属于欧盟 RoHS 指令豁免范围。					

印 记 Marking	封 装 Package
60N40TP7	TO-247
60N40TP4	TO-247-4L

绝对最大额定值 **ABSOLUTE RATINGS** ($T_c=25^{\circ}\text{C}$)

项 目 Parameter	符 号 Symbol	数 值 Value	单 位 Unit
最高漏极—源极直流电压 Drain-Source Voltage	V_{DS}	400	V
连续漏极电流 Drain Current-continuous	I_D $T=25^{\circ}\text{C}$ $T=100^{\circ}\text{C}$	60 36	A
最大脉冲漏极电流 Drain Current – pulse ^{Note 1}	I_{DM}	240	A
最高栅源电压 Gate-Source Voltage	V_{GS}	± 30	V
单脉冲雪崩能量 Single Pulsed Avalanche Energy ^{Note 1}	E_{AS}	1380	mJ
耗散功率 Power Dissipation	P_D $T_c=25^{\circ}\text{C}$	325	W
最高结温及存储温度 Operating and Storage Temperature Range	T_J, T_{STG}	$-55\sim+150$	$^{\circ}\text{C}$

电特性 ELECTRICAL CHARACTERISTICS

项 目 Parameter	符 号 Symbol	测试条件 Tests conditions	最小 Min	典型 Typ	最大 Max	单位 Units
关态特性 Off –Characteristics						
漏—源击穿电压 Drain-Source Voltage	BV_{DSS}	$I_D=250\mu A, V_{GS}=0V, T_J=25^\circ C$	400	-	-	V
零栅压下漏极漏电流 Zero Gate Voltage Drain Current	I_{DSS}	$V_{DS}=400V, V_{GS}=0V, T_C=25^\circ C$	-	-	10	μA
正向栅极体漏电流 Gate-body leakage current, forward	I_{GSSF}	$V_{DS}=0V, V_{GS}=30V$	-	-	100	nA
反向栅极体漏电流 Gate-body leakage current, reverse	I_{GSSR}	$V_{DS}=0V, V_{GS}=-30V$	-	-	-100	nA
通态特性 On-Characteristics						
阈值电压 Gate Threshold Voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}, I_D=250\mu A$	2.4	-	4.4	V
静态导通电阻 Static Drain-Source On-Resistance	$R_{DS(ON)}$	$V_{GS}=10V, I_D=30A$	-	60	68	m Ω
动态特性 Dynamic Characteristics						
输入电容 Input capacitance	C_{iss}	$V_{DS}=25V,$ $V_{GS}=0V,$ $f=1MHz$	-	9.0	-	nF
输出电容 Output capacitance	C_{oss}		-	806	-	pF
反向传输电容 Reverse transfer capacitance	C_{rss}		-	25	-	pF

电特性 ELECTRICAL CHARACTERISTICS

开关特性 Switching Characteristics						
延迟时间 Turn-On delay time	$t_d(\text{on})$	$V_{DD}=200V, I_D=60A, R_G=25\Omega$ $V_{GS}=10V$	-	45	-	ns
上升时间 Turn-On rise time	t_r		-	96	-	ns
延迟时间 Turn-Off delay time	$t_d(\text{off})$		-	75	-	ns
下降时间 Turn-Off Fall time	t_f		-	22	-	ns
栅极电荷总量 Total Gate Charge	Q_g	$V_{DS}=320V$, $I_D=60A$ $V_{GS} =10V$	-	139	-	nC
栅-源电荷 Gate-Source charge	Q_{gs}		-	45	-	nC
栅-漏电荷 Gate-Drain charge	Q_{gd}		-	39	-	nC
栅极电阻 Gate Resistance	R_g	$f=1MHz$	-	1.8	-	Ω
漏-源二极管特性及最大额定值 Drain-Source Diode Characteristics and Maximum Ratings						
正向压降 Drain-Source Diode Forward Voltage	V_{SD}	$V_{GS}=0V$, $I_S=30A$	-	-	1.4	V
反向恢复时间 Reverse Recovery Time	T_{RR}	$V_{GS} = 0V, I_S = 60A,$ $di_F/dt=100A/\mu s$	-	126	-	ns
反向恢复电荷 Reverse Recovery Charge	Q_{RR}		-	0.6	-	μC

热特性 THERMAL CHARACTERISTIC

项 目 Parameter	符号 Symbol	值 Value	单位 Unit
结到管壳的热阻 Thermal Resistance, Junction to Case	$R_{th(j-c)}$	0.43	$^{\circ}C/W$
结到环境的热阻 Thermal Resistance, Junction-to-Ambient	$R_{th(j-A)}$	40	$^{\circ}C/W$

NOTES:

1. L = 0.5mH, VDD = 50V, RG=25 Ω , Starting at TJ = 25 $^{\circ}C$

特征曲线 ELECTRICAL CHARACTERISTICS

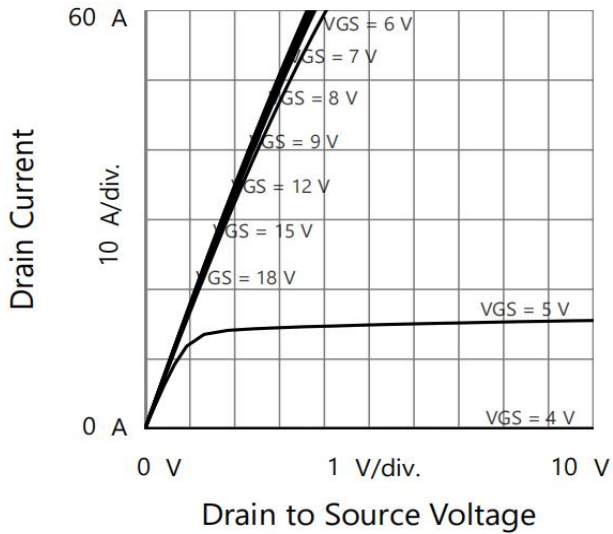


Fig1. Output characteristics TJ= 25°C

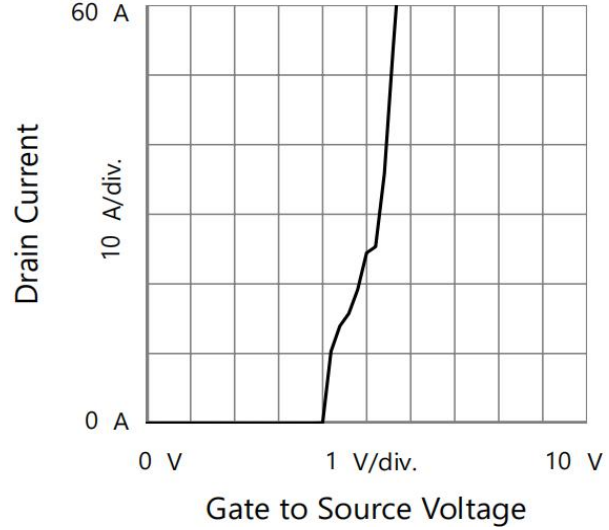


Fig2. Transfer characteristics

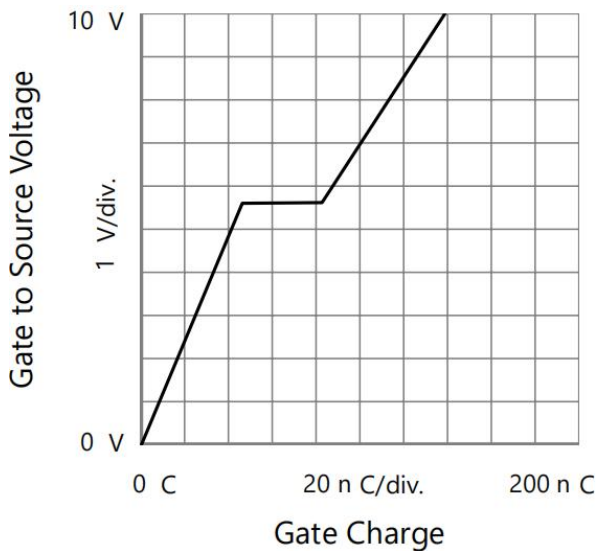


Fig3. Gate charge characteristics

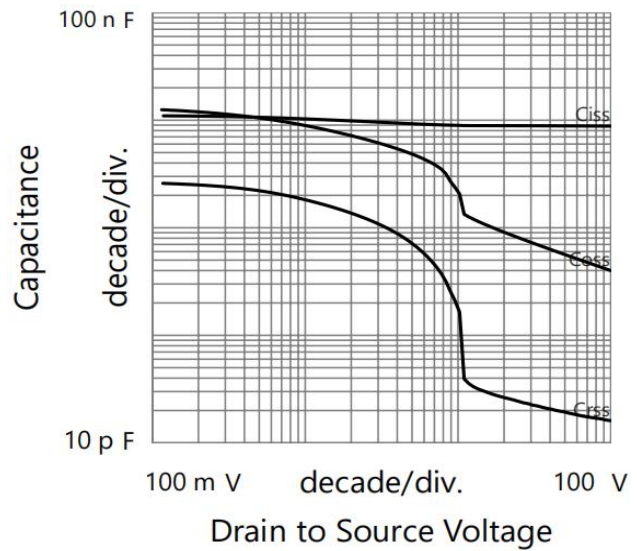


Fig 4. Capacitance Characteristics

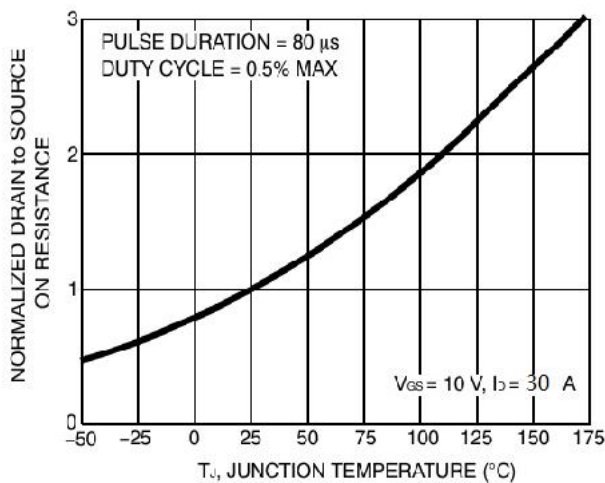


Fig 5. RDS(ON) vs junction temperature

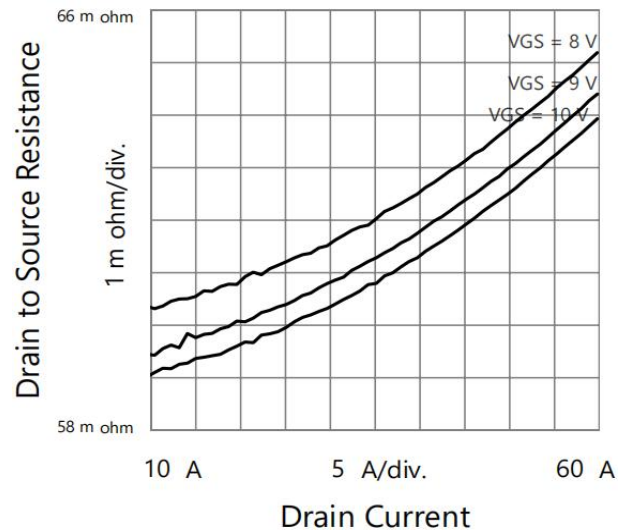


Fig 6. ID VS RDson

特征曲线 ELECTRICAL CHARACTERISTICS

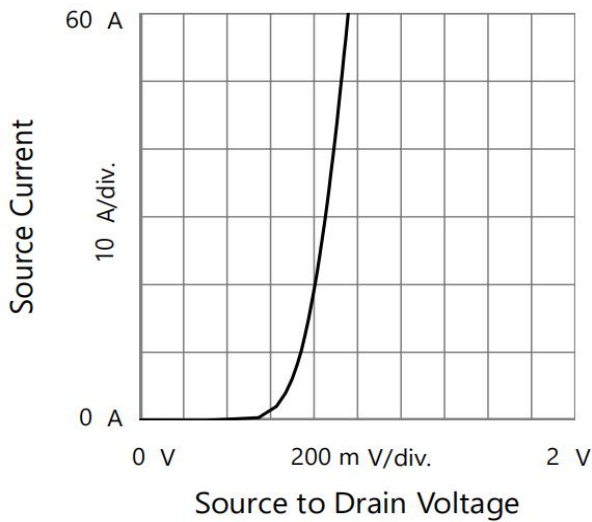


Fig 7 . Forward characteristics of reverse diode

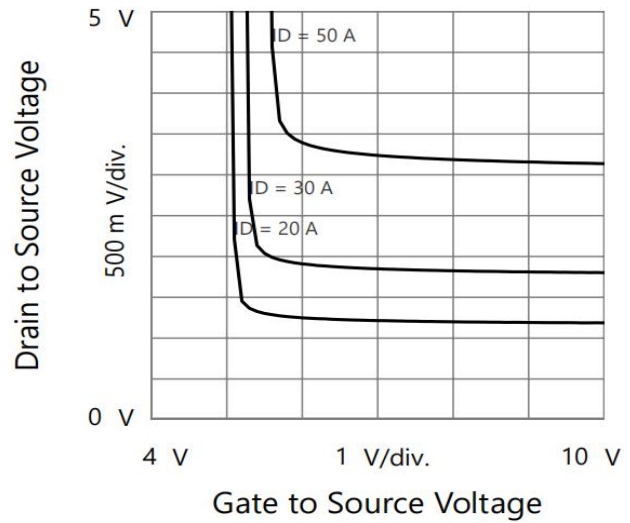


Fig 8 .Drain to Source Voltage vs. Gate to Source Voltage

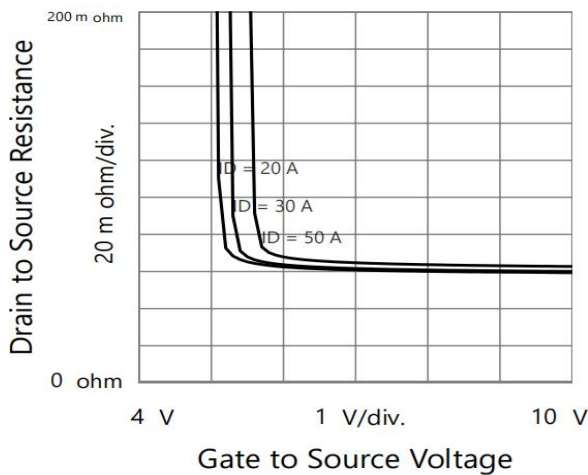


Fig 9 .Drain to Source Resistance vs. Gate to Source Voltage

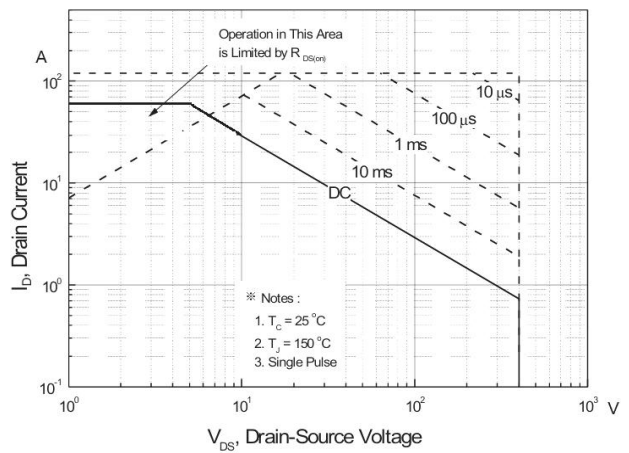


Fig 10 .Safe operating area

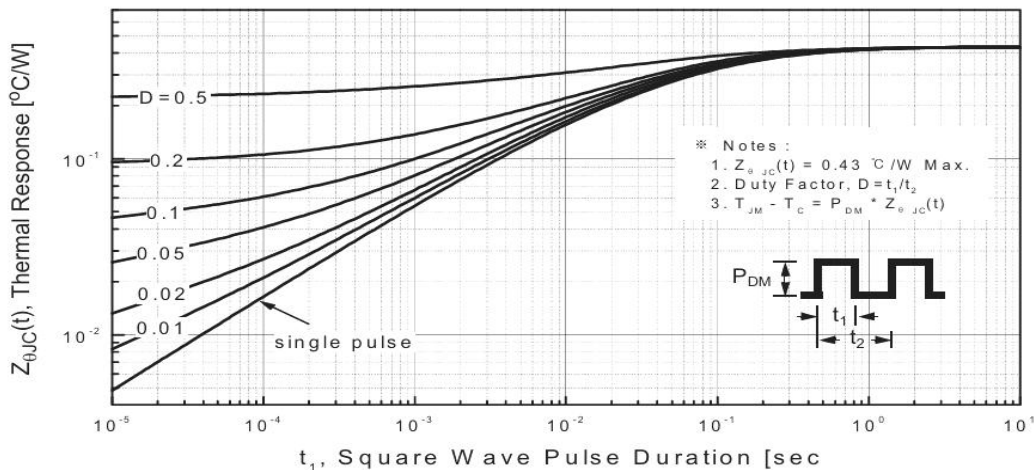
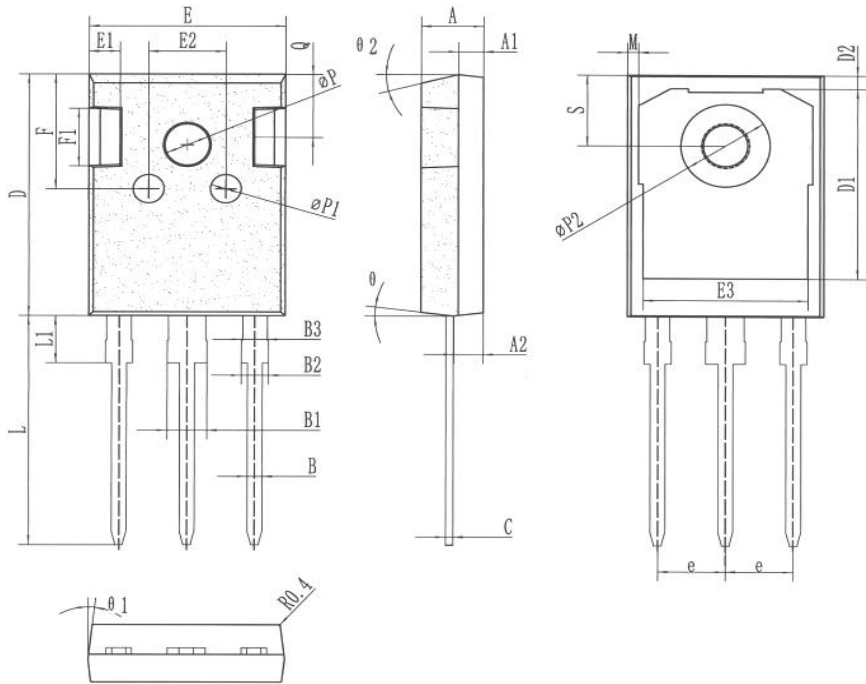


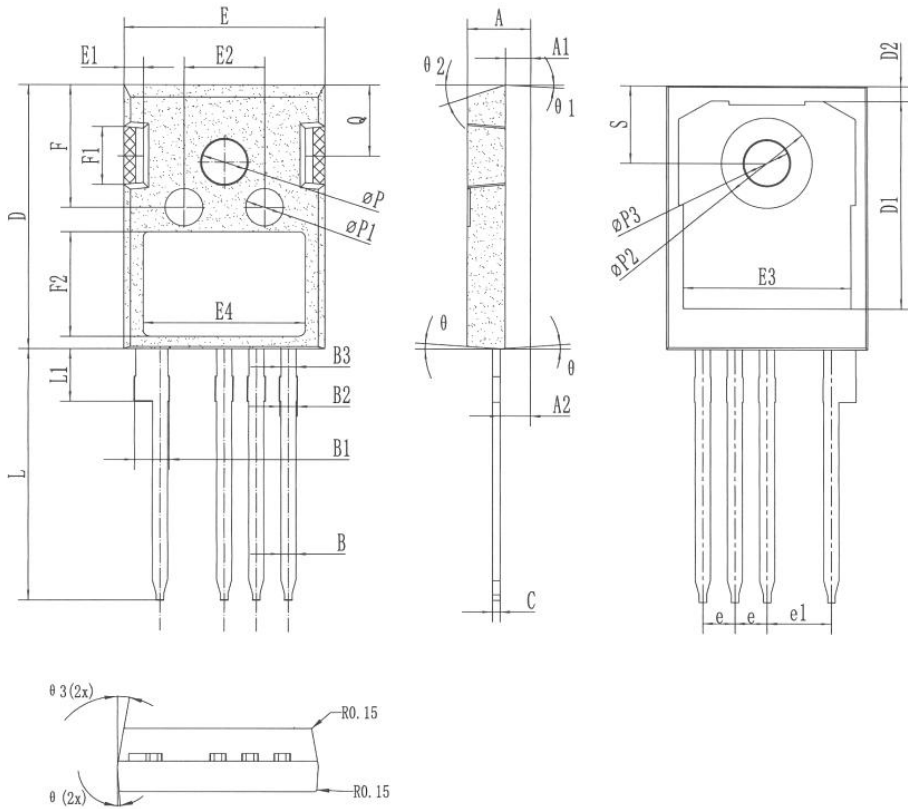
Fig 11 .Transient thermal impedance

外形尺寸 **PACKAGE MECHANICAL DATA**
TO-247



COMMON DIMENSIONS			
SYMBOL	MM		
	MIN	NOM	MAX
A	4.90	5.00	5.10
A1	1.90	2.00	2.10
A2	2.30	2.40	2.50
B	1.15	1.20	1.25
B1	3.05	3.15	3.25
B2	2.00	2.10	2.20
B3	1.90	2.00	2.10
C	0.55	0.60	0.65
D	20.90	21.00	21.10
D1	16.35	16.55	16.75
D2	1.02	1.17	1.32
E	15.70	15.80	15.90
E1	2.40	2.50	2.60
E2	6.10	6.20	6.30
E3	13.10	13.30	13.50
F	9.80	10.00	10.20
F1	4.90	5.00	5.10
e	5.44 BSC		
L	19.72	19.92	20.12
L1	3.90	4.10	4.30
ϕP	3.50	3.60	3.70
$\phi P1$	2.40	2.50	2.60
$\phi P2$	7.10	7.20	7.30
S	6.05	6.15	6.25
M	0.45	—	0.95
Q	5.60	5.80	6.00
θ	5°	7°	9°
$\theta 1$	5°	7°	9°
$\theta 2$	13°	15°	17°

TO-247-4L



COMMON DIMENSIONS			
SYMBOL	MM		
	MIN	NOM	MAX
A	4.90	5.00	5.10
A1	1.90	2.00	2.10
A2	2.31	2.41	2.51
B	1.15	1.20	1.25
B1	2.50	2.65	2.80
B2	1.20	1.35	1.45
B3	1.15	1.20	1.25
C	0.55	0.60	0.65
D	20.75	20.95	21.15
D1	16.35	16.55	16.75
D2	1.02	1.17	1.32
E	15.70	15.90	16.10
E1	1.45	1.55	1.65
E2	6.25	6.35	6.45
E3	13.05	13.25	13.45
E4	12.70	12.80	12.90
F	9.55	9.75	9.95
F1	4.50	4.60	4.70
F2	8.20	8.30	8.40
e	2.54 BSC		
e1	5.08 BSC		
L	19.80	20.00	20.20
L1	3.97	4.17	4.37
ϕP	3.70	3.80	3.90
$\phi P1$	2.90	3.00	3.10
$\phi P2$	7.10	7.20	7.30
$\phi P3$	3.50	3.60	3.70
S	6.05	6.15	6.25
Q	5.50	5.60	5.70
θ	2°	4°	6°
$\theta 1$	1°	3°	5°
$\theta 2$	16°	18°	20°
$\theta 3$	8°	10°	12°