

## General Description

The UV90N20Q uses advanced Trench technology and design to provide excellent  $R_{DS(on)}$  with low gate charge.

This device is suitable for use in PWM, load switching and general purpose applications.

### Features

Enhancement Mode

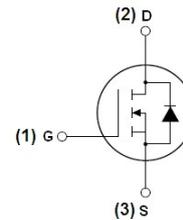
Very low on-resistance  $R_{DS(on)}$  @  $V_{GS}=10V$

100% Avalanche Tested

Pb-free lead plating; ROHS compliant



TO-247-3L Top view



Schematic diagram

VDS	200	V
$R_{DS(on)}$ TYP @ $V_{GS}=10V$	23	mΩ
$I_D$	90	A

## Applications

Power switching application

Hard Switched and High Frequency Circuits

Uninterruptible Power Supply

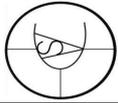
Isolated DC/DC Converters in Telecom and Industrial

## Package Marking And Ordering Information

Part ID	Package Type	Marking	Tape and Reel information
UV90N20Q	TO-247-3L	UV90N20Q	30pcs/Tube

## Maximum ratings, at $T_j=25^\circ C$ , unless otherwise specified

Symbol	Parameter	Rating	Unit
$V_{(BR)DSS}$	Drain –Source breakdown voltage	200	V
$I_S$	Diode continuous forward current	$T_c=25^\circ C$ 90	A
$I_D$	Continuous drain current @ $V_{GS}=10V$	$T_c=25^\circ C$ 90	A
		$T_c=100^\circ C$ 50	A
$I_{DM}$	Pulse drain current tested①	$T_c=25^\circ C$ 230	A
$E_{AS}$	Avalanche energy, single pulsed②	1050	mJ
$P_D$	Maximum power dissipation	$T_c=25^\circ C$ 320	W
$V_{GS}$	Gate-Source voltage	$\pm 25$	V
$T_{STG} T_J$	Storage and operating temperature range	-55 to 175	$^\circ C$



## Thermal Characteristic

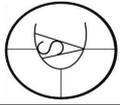
Symbol	Parameter	Typical	Unit
$R_{QJC}$	Thermal Resistance-Junction to Case	0.75	$^{\circ}\text{C}/\text{W}$
$R_{QJA}$	Thermal Resistance-Junction to Ambient	62.5	$^{\circ}\text{C}/\text{W}$

## Typical Characteristics

Symbol	Parameter	Condition	Min	Type	Max	Unit
<b>Static Electrical Characteristics @<math>T_j=25^{\circ}\text{C}</math> ( unless otherwise stated )</b>						
$V_{(BR)DSS}$	Drain-Source Breakdown Voltage	$V_{GS}=0\text{V}, I_D=250\mu\text{A}$	200			V
$I_{DSS}$	Zero Gate Voltage Drain Current	$V_{DS}=200\text{V}, V_{GS}=0\text{V}$			1	$\mu\text{A}$
$I_{GSS}$	Gate-Body Leakage Current	$V_{GS}=\pm 25\text{V}, V_{DS}=0\text{V}$			$\pm 100$	nA
$V_{GS(TH)}$	Gate Threshold Voltage	$V_{DS}=V_{GS}, I_D=250\mu\text{A}$	2		4	V
$R_{DS(ON)}$	Drain-Source On-State Resistance <sup>③</sup>	$V_{GS}=10\text{V}, I_D=50\text{A}$		23	27	m $\Omega$
<b>Dynamic Electrical Characteristics @<math>T_j=25^{\circ}\text{C}</math> ( unless otherwise stated )</b>						
$C_{iss}$	Input Capacitance	$V_{DS}=25\text{V},$		6000		PF
$C_{oss}$	Output Capacitance	$V_{GS}=0\text{V},$		540		PF
$C_{rss}$	Reverse Transfer Capacitance	$F=1\text{MHz}$		320		PF
$R_g$	Gate Resistance	$F=1\text{MHz}$		2		$\Omega$
$Q_g$	Total Gate Charge	$V_{DS}=160\text{V},$		140		nC
$Q_{gs}$	Gate-Source Charge	$I_D=56\text{A},$		26		nC
$Q_{gd}$	Gate-Drain Charge	$V_{GS}=10\text{V}$		48		nC
<b>Switching Characteristics</b>						
$t_{d(on)}$	Turn-on Delay time	$V_{DS}=100\text{V}$		28		nS
$t_r$	Turn-on Rise time	$I_D=56\text{A}$		42		nS
$t_{d(off)}$	Turn-off Delay time	$R_G=1.2\ \Omega$		75		nS
$t_f$	Turn-off Fall time	$V_{GS}=10\text{V}$		60		nS
<b>Source-Drain Diode Characteristics</b>						
$V_{SD}$	Forward on voltage	$T_j=25^{\circ}\text{C}, I_{SD}=20\text{A}, V_{GS}=0\text{V}$		0.8	1.2	V
$t_{rr}$	Reverse Recovery Time	$T_j=25^{\circ}\text{C}, I_F=50\text{A}$		50		nS
$Q_{rr}$	Reverse Recovery Charge	$V_{GS}=0\text{V}, di/dt=100\text{A}/\mu\text{s}$		100		nC

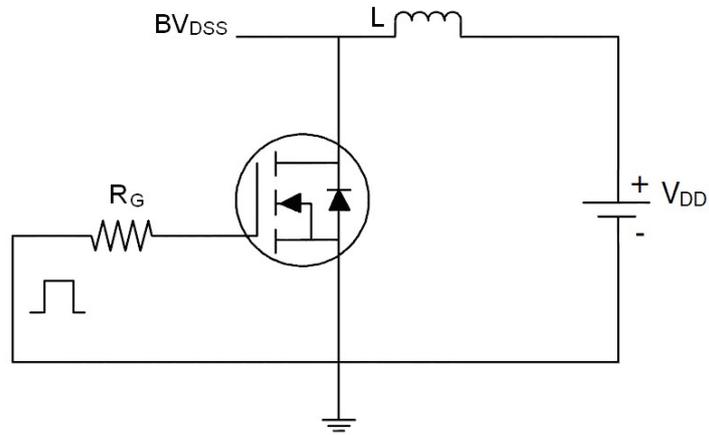
Note:

- ① Repetitive rating; pulse width limited by max. junction temperature.
- ② Limited by  $T_{jmax}$ , starting  $T_j=25^{\circ}\text{C}$ ,  $L=0.5\text{mH}$ ,  $R_G=25\ \Omega$ ,  $I_{AS}=20\text{A}$ ,  $V_{GS}=10\text{V}$ , Part not recommended for use above this value
- ③ Pulse width  $\cong 300\mu\text{s}$ ; duty cycle  $\cong 2\%$

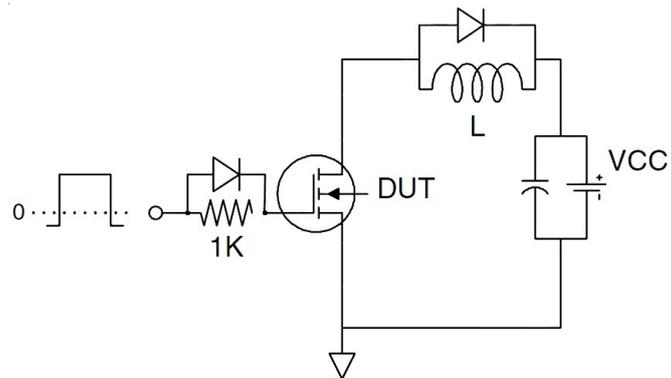


## Test circuit

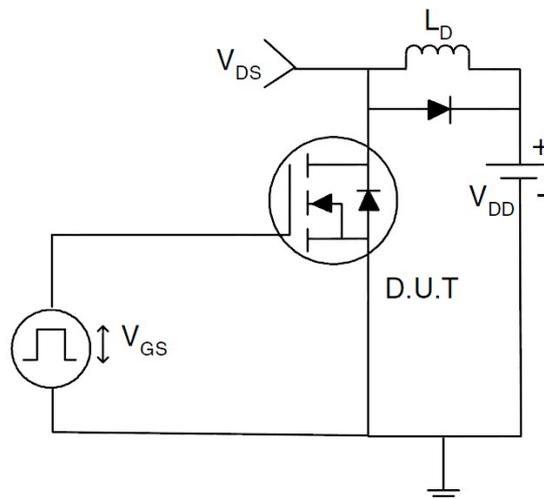
### (1) $E_{AS}$ test circuits

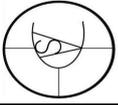


### (2) Gate charge test circuit



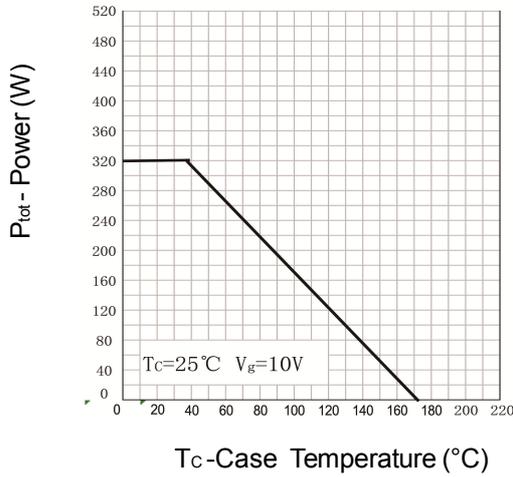
### (3) Switch time test circuit



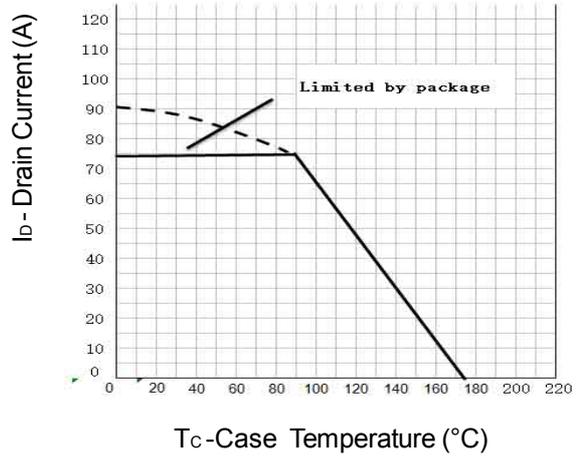


# Typical Operating Characteristics

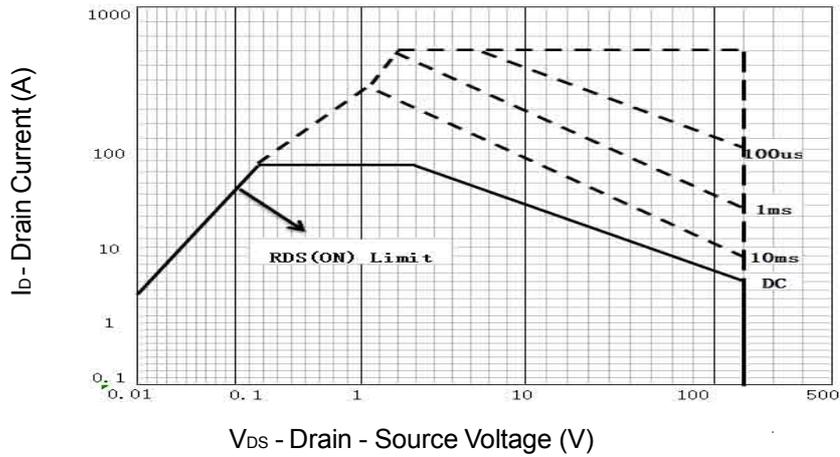
### Power Dissipation



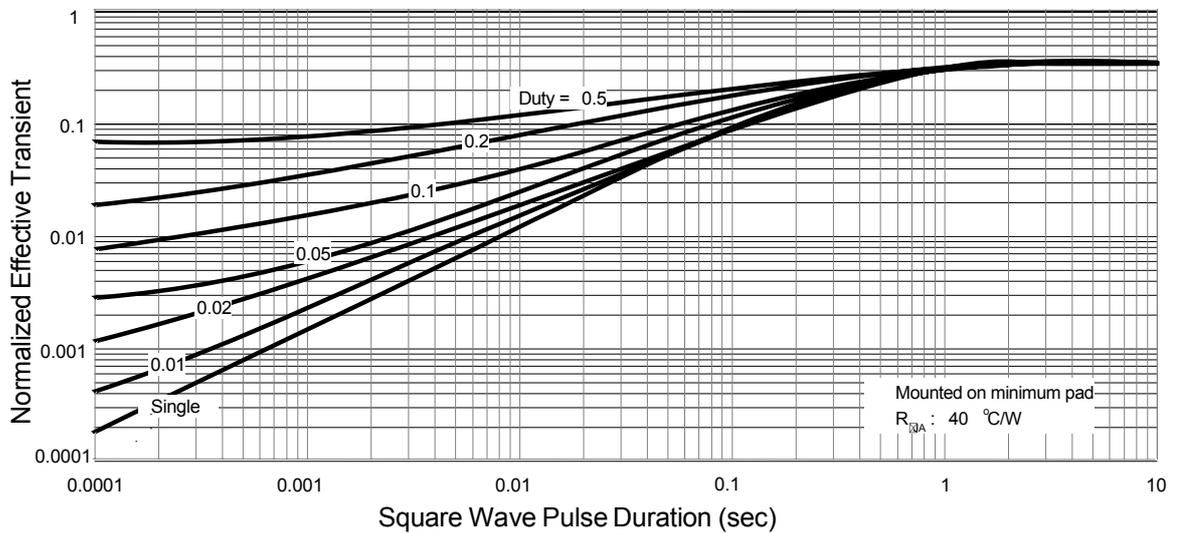
### Drain Current

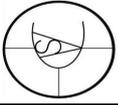


### Safe Operation Area



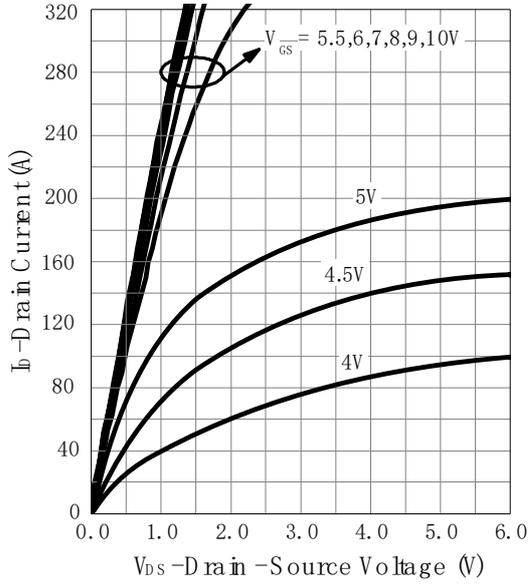
### Thermal Transient Impedance



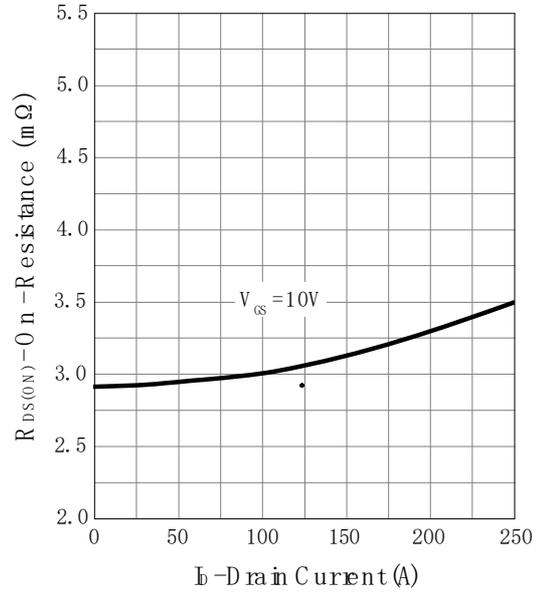


## Typical Operating Characteristics (Cont.)

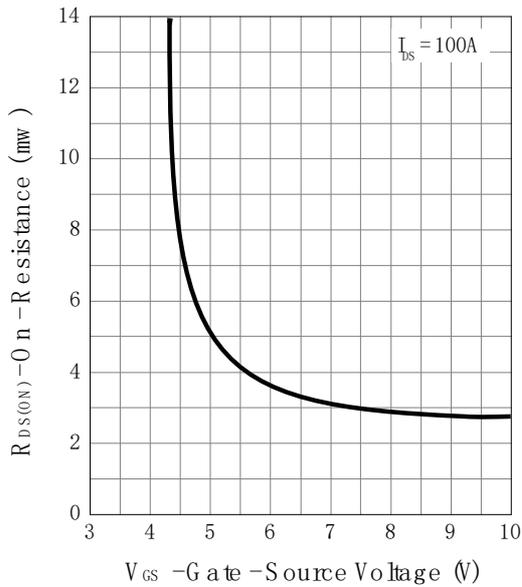
Output Characteristics



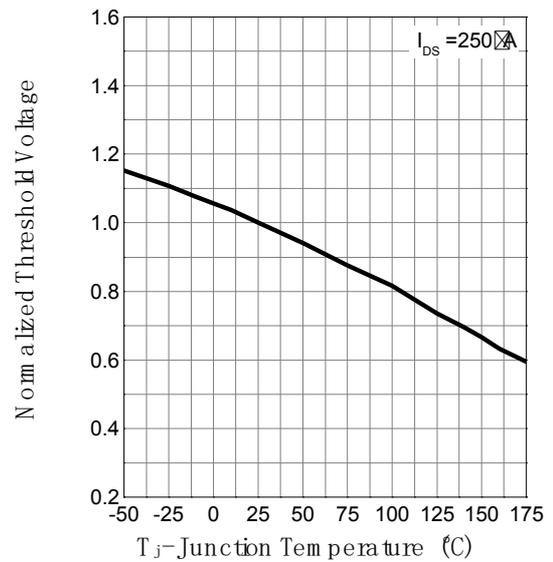
Drain-Source On Resistance

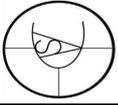


Gate-Source On Resistance

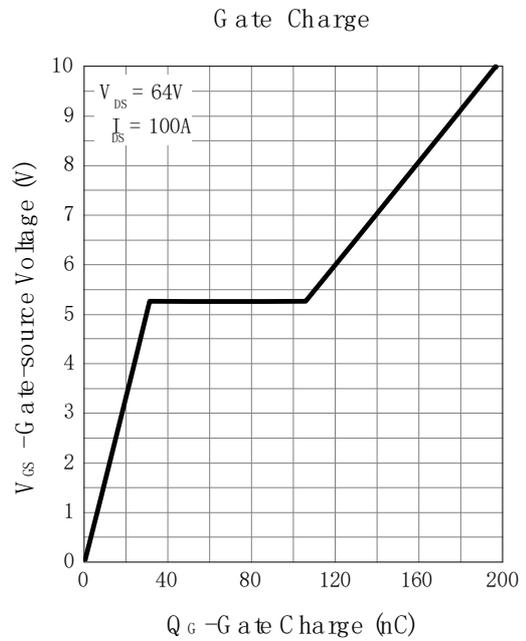
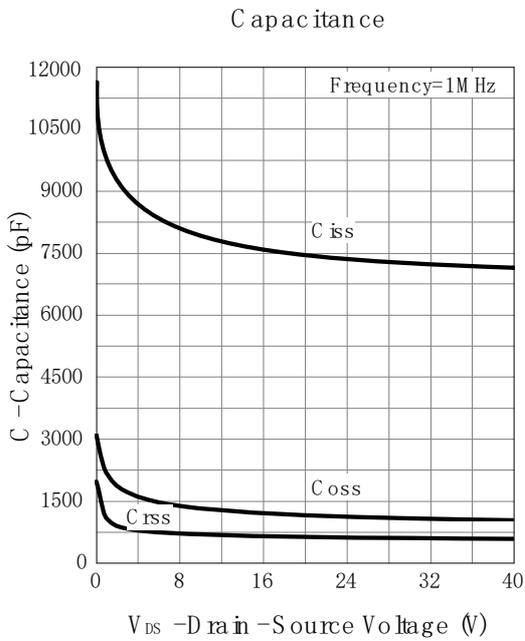
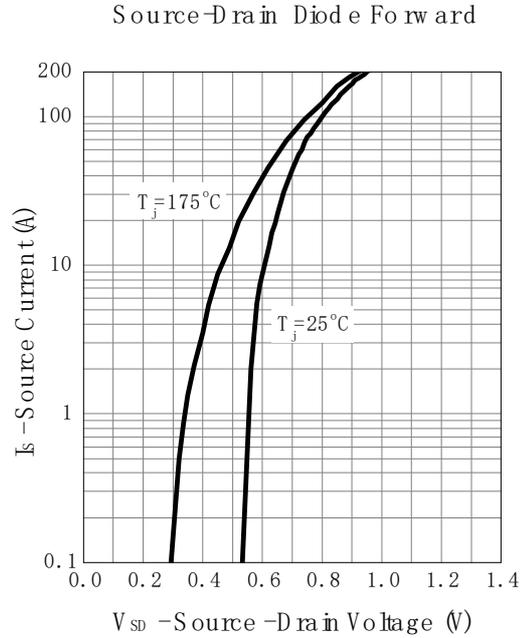
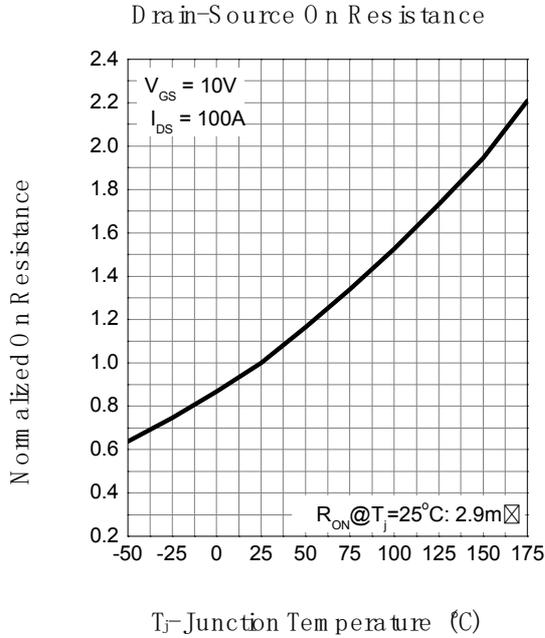


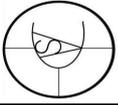
Gate Threshold Voltage





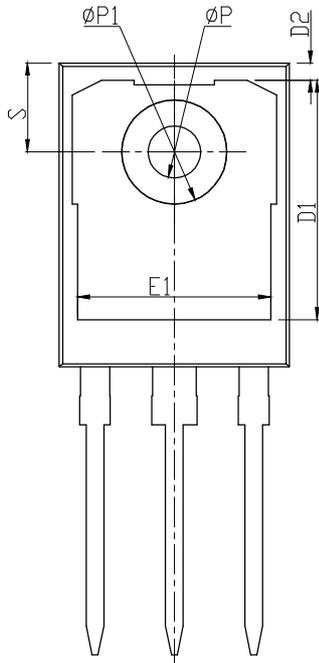
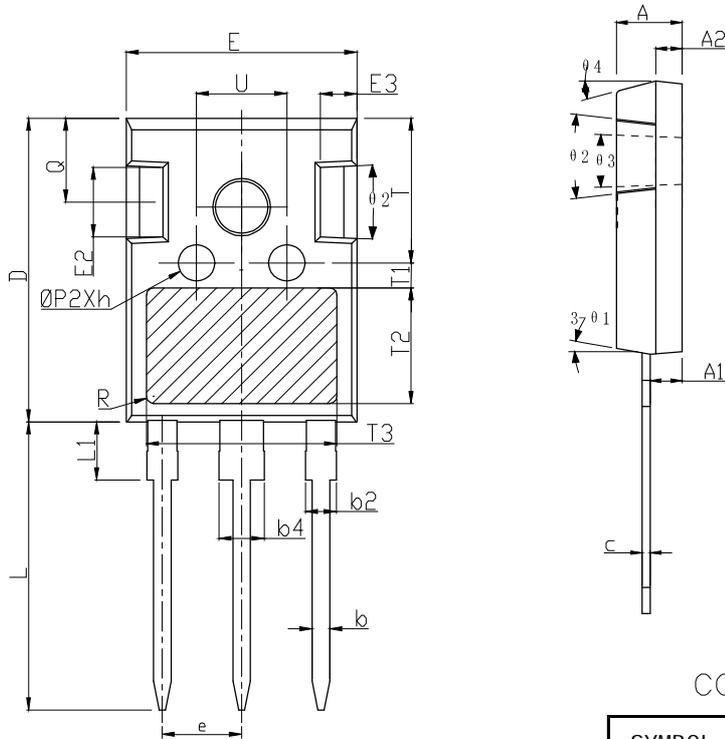
## Typical Operating Characteristics (Cont.)





# Package Information

## TO-247-3L



COMMON DIMENSIONS

SYMBOL	mm		
	MIN	NOM	MAX
A	4.90	5.00	5.10
A1	2.31	2.41	2.51
A2	1.90	2.00	2.10
b	1.16	1.21	1.26
b2	1.96	2.01	2.06
b4	2.96	3.01	3.06
c	0.59	0.61	0.66
D	20.90	21.00	21.10
D1	16.25	16.55	16.85
D2	1.05	1.20	1.35
E	15.70	15.80	15.90
E1	13.10	13.30	13.50
E2	4.90	5.00	5.10
E3	2.40	2.50	2.60
e	5.44BSC		
h	0.05	0.10	0.15
L	19.80	19.92	20.10
L1	-	-	4.30
ΦP	3.50	3.60	3.70
ΦP1	-	-	7.30
ΦP2	2.40	2.50	2.60
Q	5.60	5.80	6.00
S	6.15BSC		
R	0.50REF		
T	9.80	-	10.20
T1	1.65REF		
T2	8.00REF		
T3	12.80REF		
U	6.00	-	6.40
θ1	6°	7°	8°
θ2	4°	5°	6°
θ3	1°	-	1.5°
θ4	14°	15°	16°