

## Description

The SQ6601PT is a hybrid IC consists from power MOSFET and a controller IC, designed for Indirect feed-back Quasi-Resonant (including low frequency PRC) fly-back converter type SMPS (Switching Mode Power Supply) applications. this IC realizes high efficiency, low noise, downsizing and standardizing of a power supply system reducing external components count and simplifying the circuit designs. the device is provided in a five pin over-molded TO-220 style package, affording dielectric isolation without compromising thermal characteristics.

(Note). PRC is abbreviation of "Pulse Ratio Control" (On-width control with fixed OFF-time).

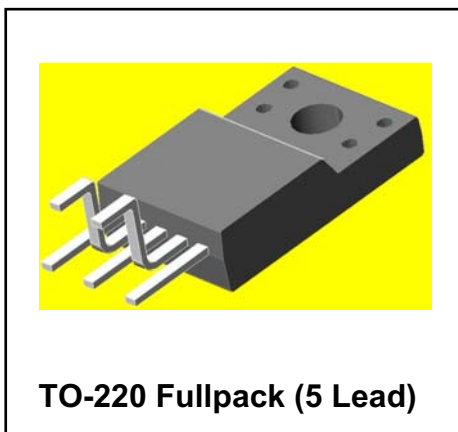
## Features

- Quasi-Resonant Operation
- Low-loss, Pulse-Ration-Control standby mode
- Under-voltage lockout with Hysteresis
- Adjustable switching speed for EMI control
- Low start-up circuit current (100uA max)
- Active low-pass filter for stabilizing the operation in case of light load
- Avalanche Energy Guaranteed MOSFET with high VDSS
- Built-in constant voltage drive circuit
- Built-in step drive circuit
- Built-in low frequency PRC mode ( $\approx 20\text{kHz}$ )
- Pulse-by-pulse Overcurrent Protection (OCP)
- Overvoltage Protection with latch mode (OVP)
- Thermal Shutdown with latch mode (TSD)
- Over-molded Five-Pin Package

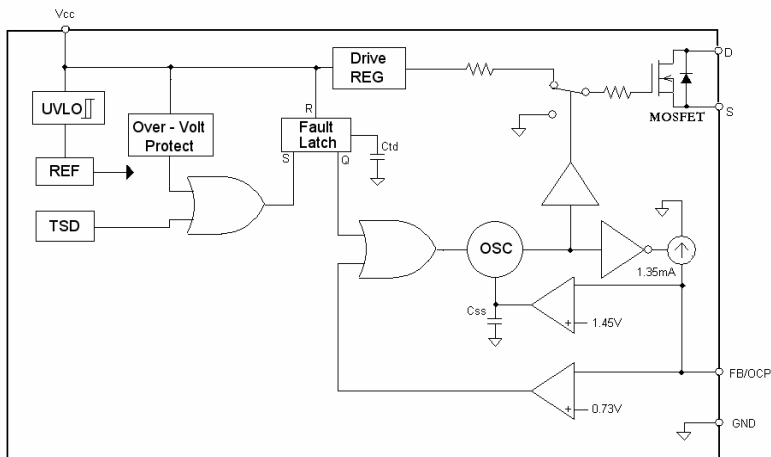
## Ordering Information

Type NO.	Marking	Package Code
SQ6601PT	SQ6601PT	TO-220F-5FL

## Package Outline



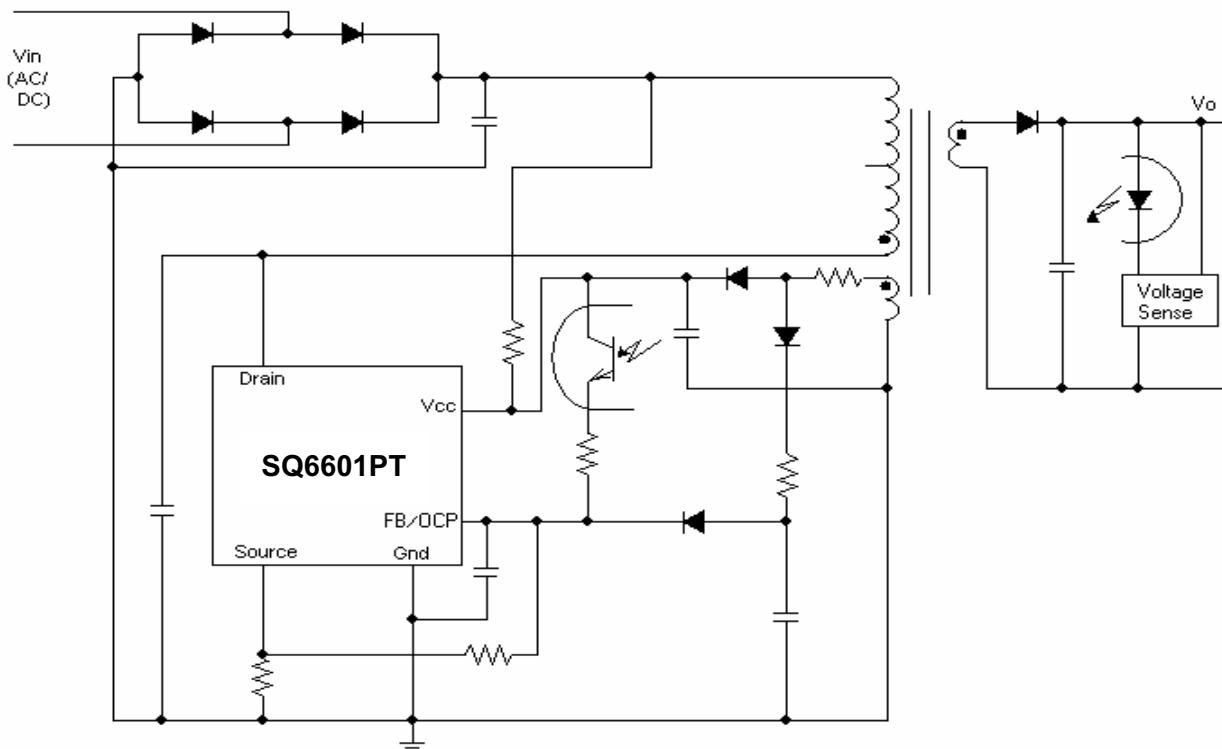
## Internal Block Diagram



## Pin Function

Pin Number	Pin Name	Pin Function
1	Drain	Power Switch MOSFET Drain Part
2	Source	Power Switch MOSFET Source Part
3	GND	Ground of the Control Section
4	Vcc	Supply Voltage of Output Drive & Control Section
5	FB/OCP	Voltage Mode Control Feedback Signal & Over Current Detection

## Typical Connection Diagram



## Absolute maximum ratings

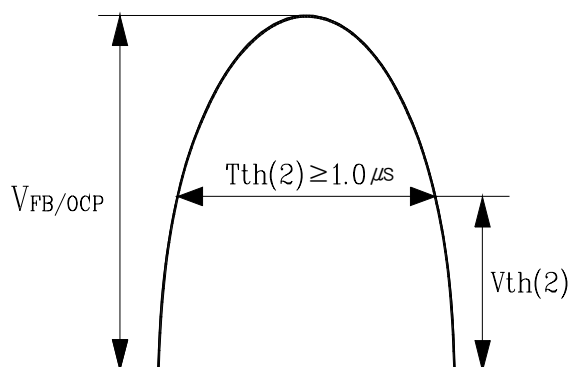
(Ta=25°C, Unless otherwise specified)

Characteristic	Symbol	Ratings	Unit	Note
Drain Source Voltage	$V_{DS}$	650	V	-
Drain Current	$I_D$	7	A	$T_C = 25^\circ\text{C}$
Peak Drain Current	$I_{DP}$	28	A	Single Pulse
Single Pulsed Avalanche Energy	$E_{AS}$	640	mJ	$L=23\text{mH}, V_{DD}=100\text{V}, I_{DP}=7.0\text{A}$
Control Supply Voltage	$V_{CC}$	20	V	-
FB/OCP Voltage Range	FB/OCP	-0.3 ~ +6	V	-
Power Dissipation	$P_D$	40	W	With infinite heatsink
Thermal Resistance, Junction to Case	$R_{thJC}$	3.12	$^\circ\text{C}/\text{W}$	-
Junction Temperature	$T_J$	150	$^\circ\text{C}$	-
Operating Temperature Range	$T_{opr}$	-25 ~ +125	$^\circ\text{C}$	-
Storage Temperature Range	$T_{stg}$	-55 ~ +150	$^\circ\text{C}$	-

## Recommended Operating Conditions

Time for input of quasi resonant signals.

For the Quasi resonant signal inputted to the  $V_{FB/OCP}$  terminal at the time of quasi resonant operation, the signal should be wider than  $T_{th}(2)$



## Electrical Characteristics

( $V_{CC} = 11V$ ,  $T_a = 25^{\circ}C$  ; Unless otherwise specified)

Characteristic	Symbol	Test Conditions	Min.	Typ.	Max.	Units
Start Threshold Voltage	$V_{TH(ST)}$	$V_{CC}$ Increasing	8.5	9.5	10.5	V
Stop Threshold Voltage	$V_{TH(SP)}$	$V_{CC}$ decreasing after turn on start threshold voltage	7.2	8	8.8	V
Start up Supply Current	$I_{ST}$	$V_{CC} = V_{TH(ST)} - 0.1V$	-	-	100	$\mu A$
Operating Supply Current	$I_{CC}$	$V_{FB} = 1V$	-	3	7	mA
Dynamic Operating Supply Current	$I_{DCC}$	-	-	4	10	mA
Maximum Off Time	$t_{MAX}$	Drain waveform high	30	-	60	$\mu s$
Minimum Off Time	$t_{MIN}$	Drain waveform high	-	-	1.5	$\mu s$
Minimum Input Pulse Width	$t_{MIN(W)}$	Drain waveform high	-	-	1.0	$\mu s$
Over Voltage Threshold	$V_{OVP}$	$V_{CC}$ Increasing until shut down output	15.3	17	18.7	V
Latch Release Voltage	$V_{RE}$	$V_{CC}$ decreasing until latch releasing	2.5	-	6.0	V
Latch Holding Current	$I_{CC(RE)}$	-	-	-	400	$\mu A$
Feedback Threshold Voltage	$V_{FB}$	-	0.68	0.73	0.78	V
Css Synchronized Voltage	$V_{SYNC}$	-	1.3	1.45	1.6	V
Feedback Sink Current	$I_{SINK}$	$V_{FB} = 1V$	1.2	1.35	1.5	mA
Thermal Shutdown Activation Temperature	$T_{J(TSD)}$	-	140	-	-	$^{\circ}C$
Drain-to-Source Breakdown Voltage	$V_{DS}$	$I_D = 300\mu A$	650	-	-	V
Drain Leakage Current	$I_{DS}$	$V_{DS} = 650V$	-	-	300	$\mu A$
On-State Resistance	$R_{DS(ON)}$	$I_D = 3.5A$	-	-	1.2	$\Omega$
Rise Time	$t_r$	10% to 90%	-	-	250	ns

Electrical Characteristic Curves

Fig. 1  $I_{CC}$  vs.  $T_a$

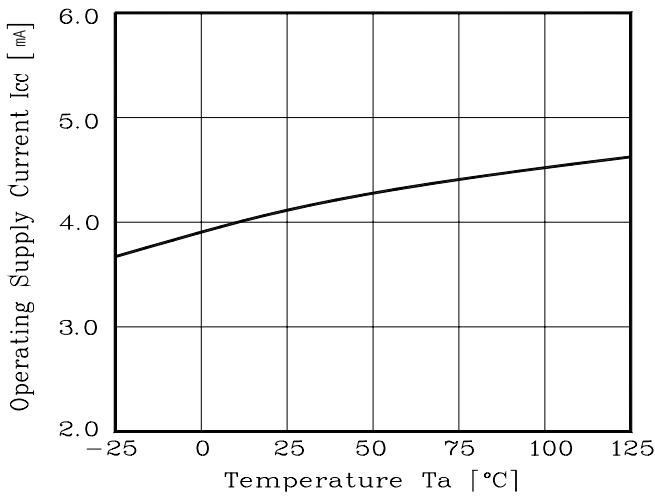


Fig. 2  $V_{TH(SP)}$  vs.  $T_a$

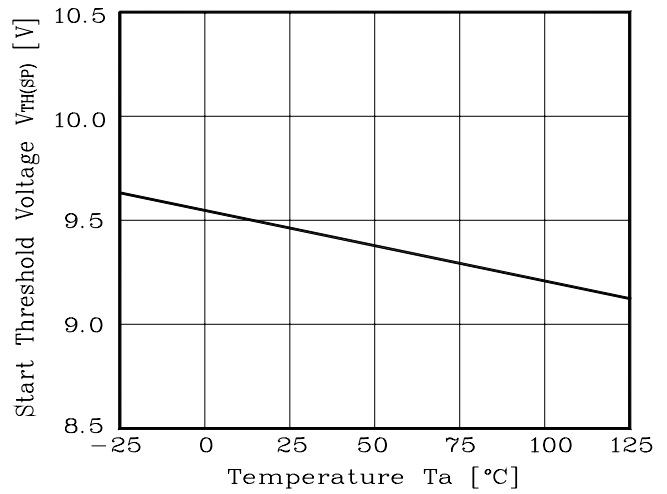


Fig. 3  $I_{ST}$  vs.  $T_a$

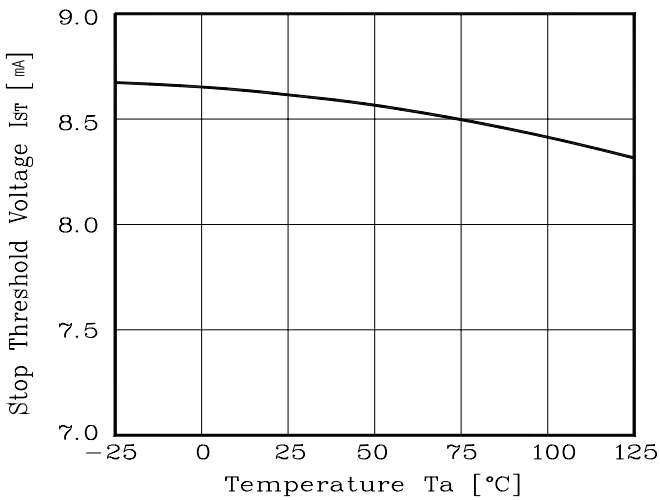


Fig. 4  $V_{FB}$  vs.  $T_a$

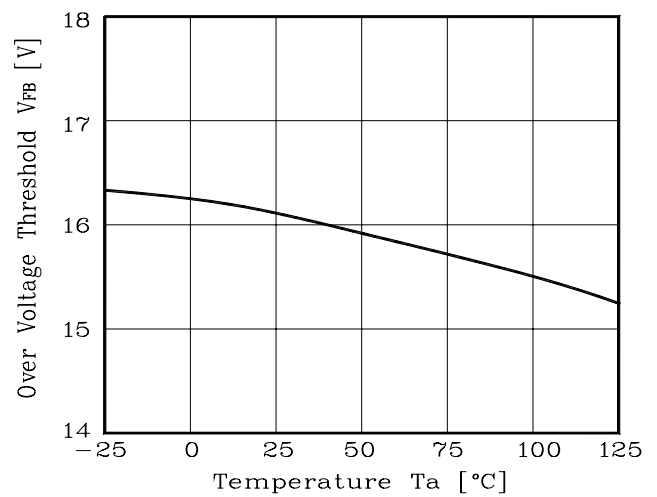


Fig. 5  $V_{TH(ST)}$  vs.  $T_a$

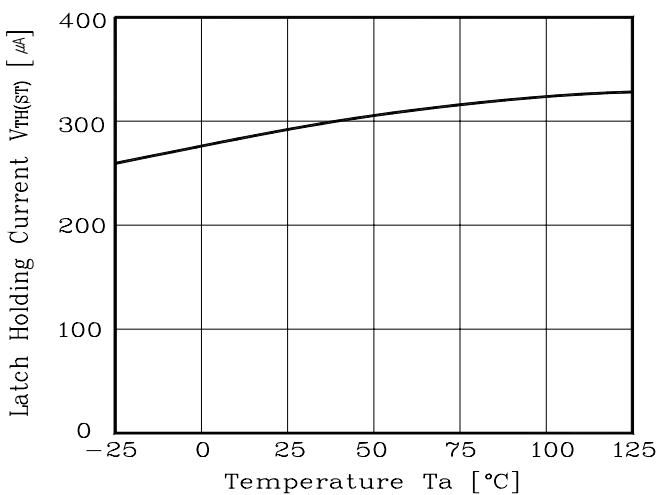
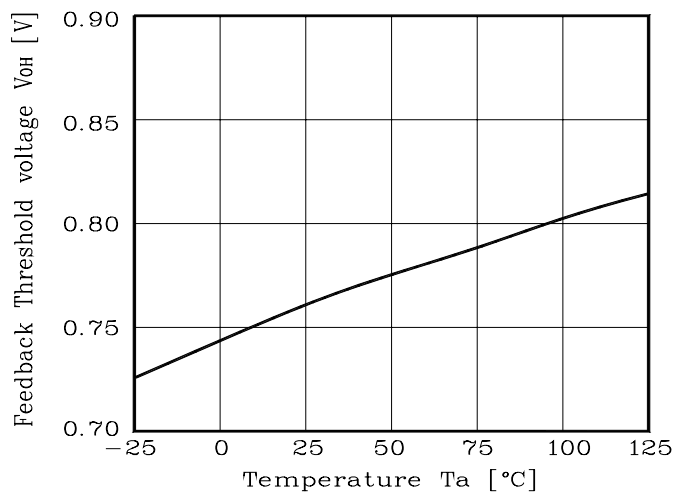


Fig. 6  $V_{OH}$  vs.  $T_a$



## Electrical Characteristic Curves

Fig. 7  $V_{OL}$  vs  $T_a$

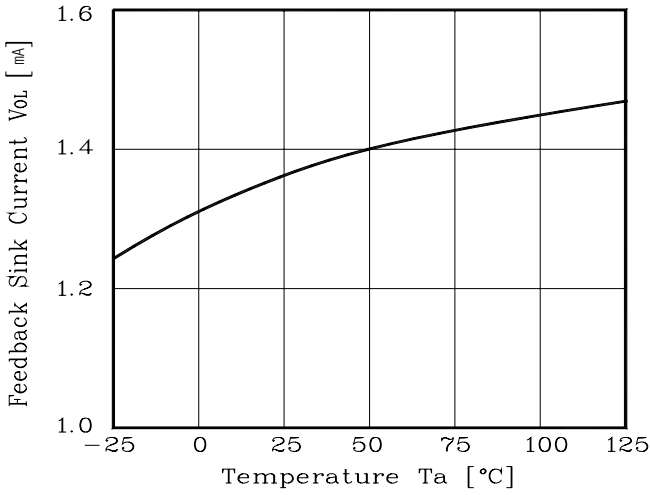


Fig. 8  $I_{CC}$  vs  $V_{th}$

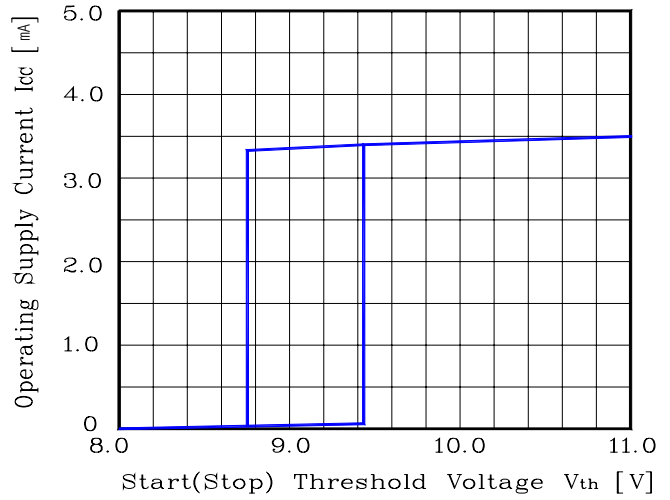


Fig. 8 Safe Operating Area

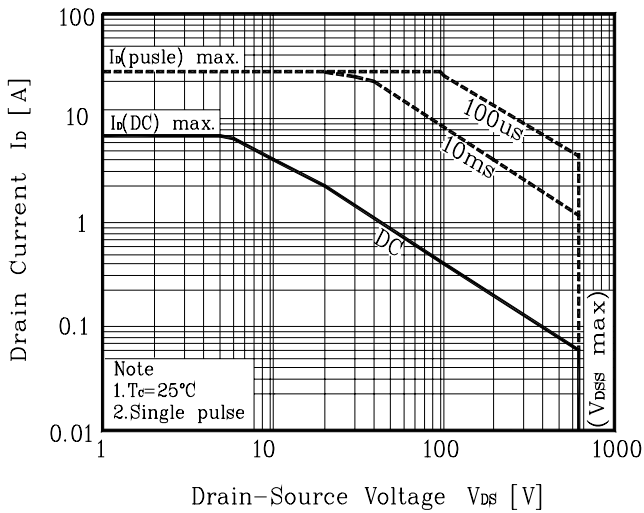


Fig. 9  $P_D$  vs  $T_c$

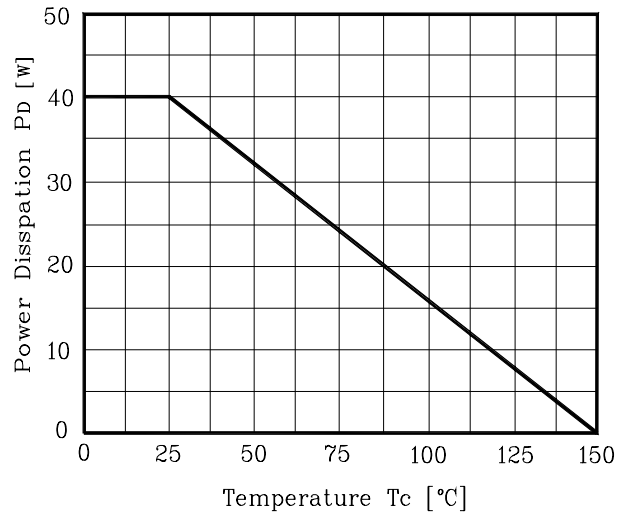
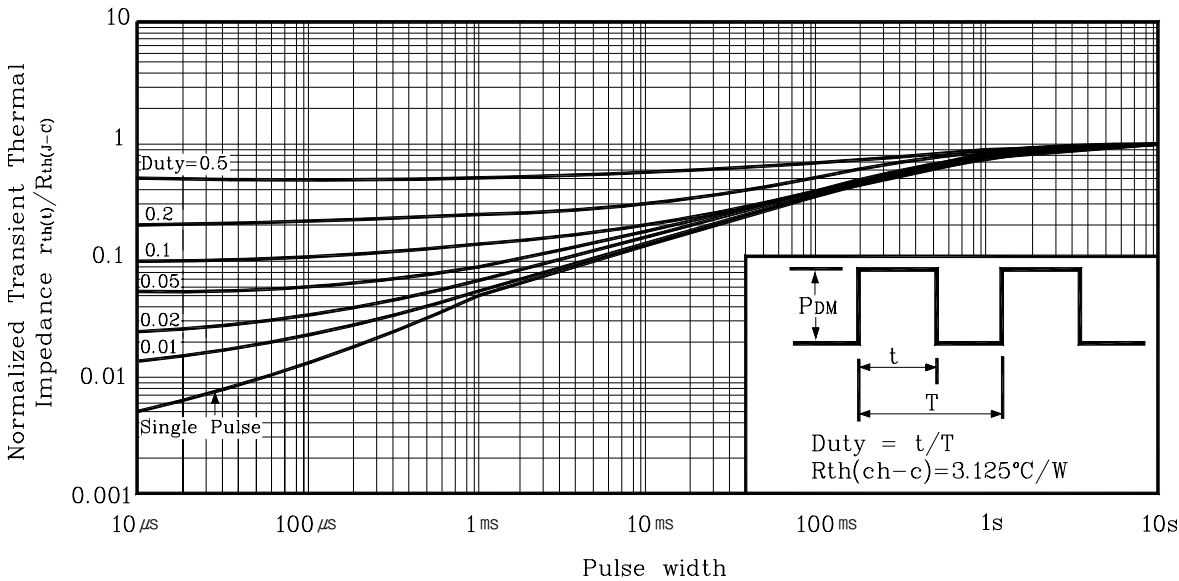
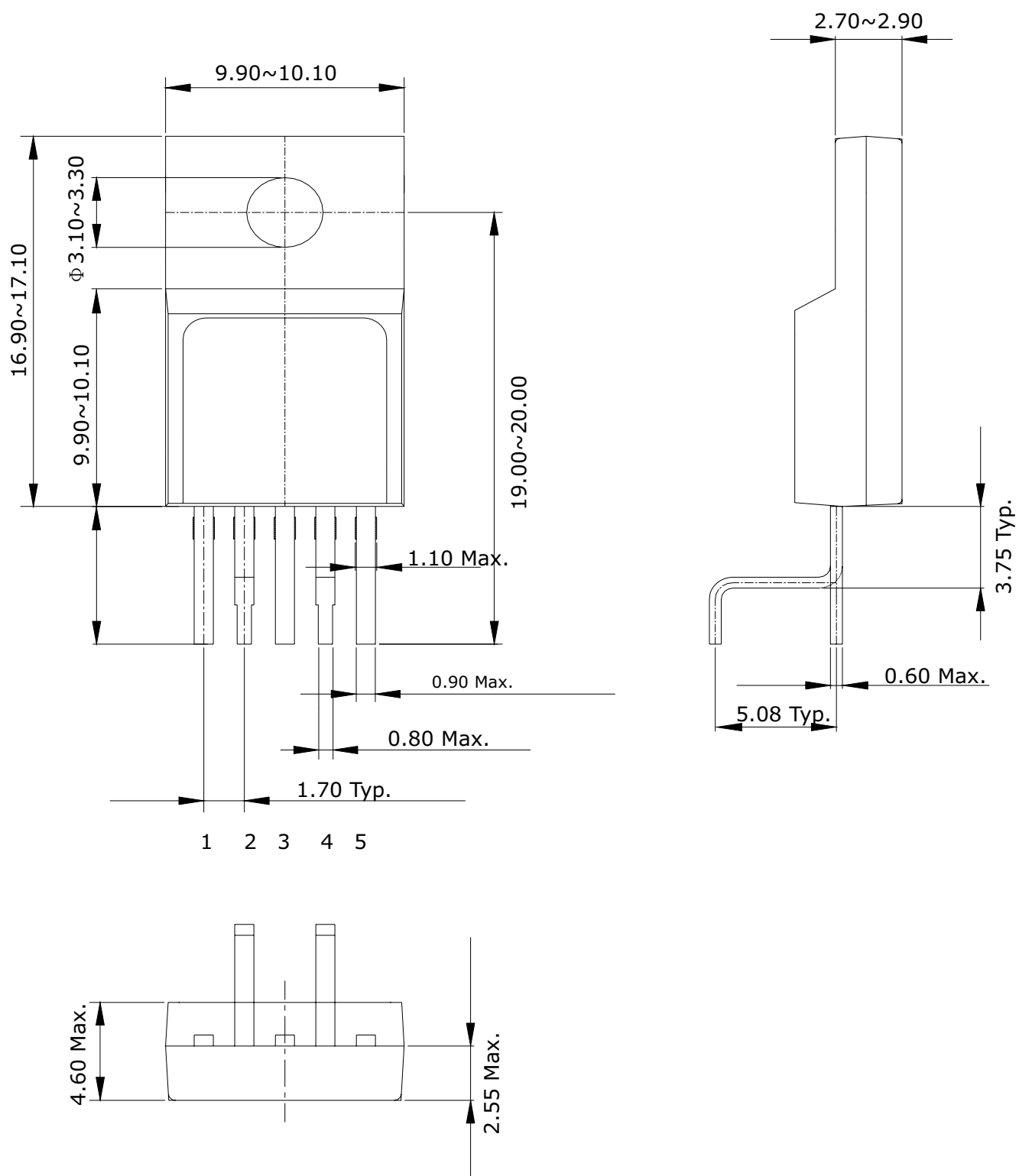


Fig. 10 Thermal Response



Outline Dimensions

unit : mm



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