

## QUAD 100 V, DMOS SWITCH

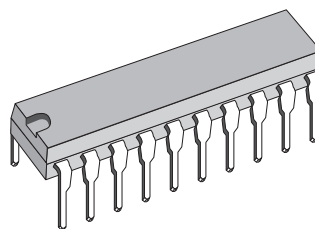
- OUTPUT VOLTAGE TO 100 V
- $0.7 \Omega R_{DS(ON)}$
- SUPPLY VOLTAGE UP TO 60 V
- LOW INPUT CURRENT
- TTL/CMOS COMPATIBLE INPUTS
- HIGH SWITCHING FREQUENCY (200 KHz)

### DESCRIPTION

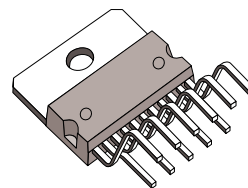
Realized with the Multipower-BCD mixed bipolar/CMOS/DMOS process, the L6114/15 monolithic quad DMOS switch is designed for high current, high voltage switching applications. Each of the four switches is controlled by a logic input and all four are controlled by a common enable input. All inputs are TTL/CMOS compatible for direct connection to logic circuits. Each source is available for the insertion of the sense resistors in current control applications.

Two versions are available : the L6114 mounted in a Powerdip 14+3+3 package and the L6115 in a 15-lead Multiwatt package.

### MULTIPOWER BCD TECHNOLOGY



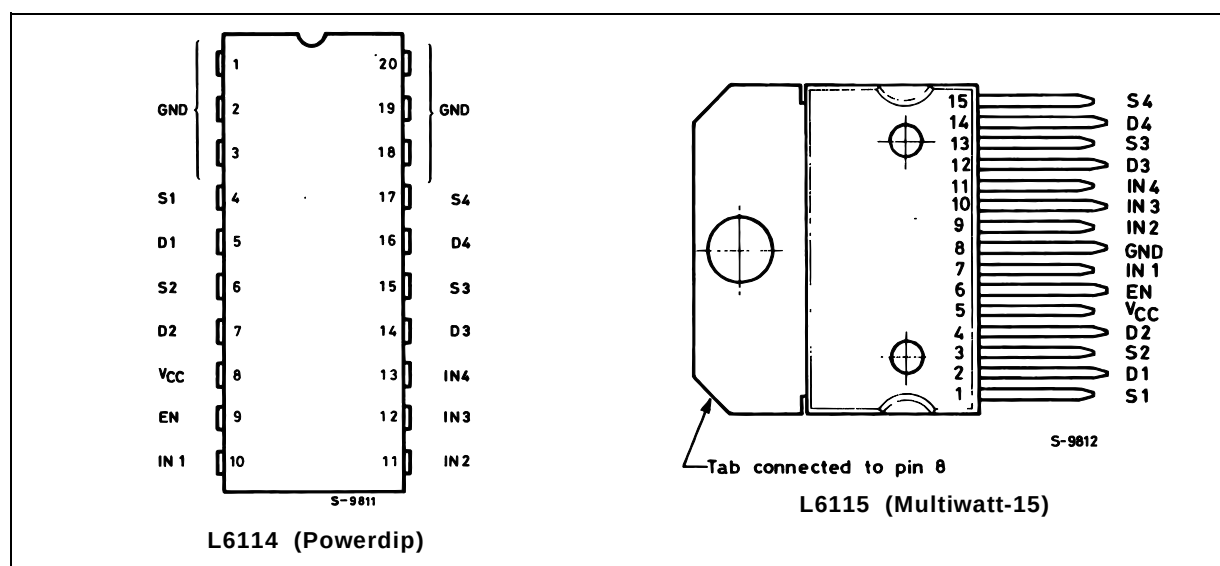
Powerdip 14 + 3 + 3



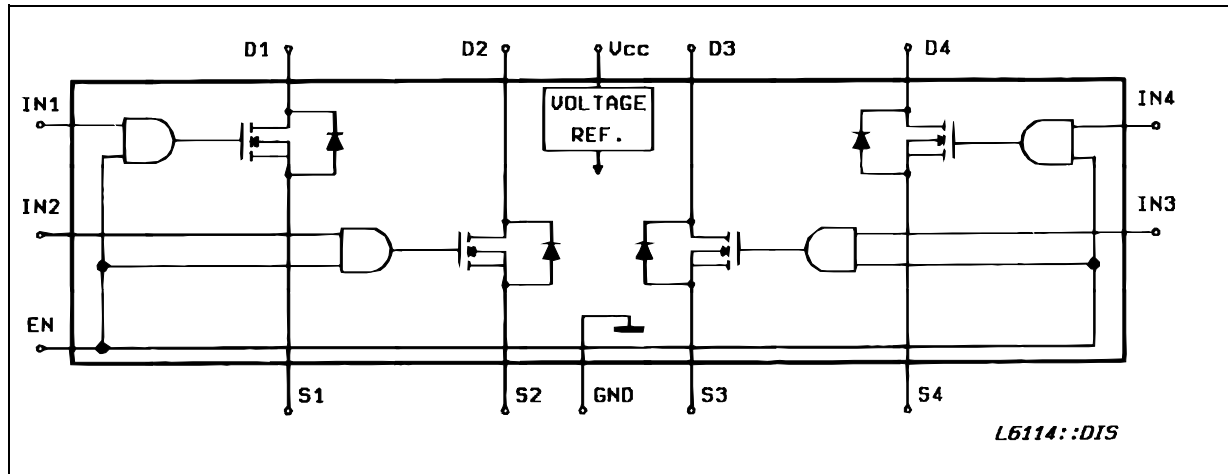
Multiwatt-15

**ORDERING NUMBERS :** L6114 (Powerdip)  
L6115 (Multiwatt-15)

### PIN CONNECTIONS (top view)



## BLOCK DIAGRAM



## ABSOLUTE MAXIMUM RATINGS

| Symbol         | Parameter                                                                                                                                                                                                 | Value                                                                             | Unit               |
|----------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|--------------------|
| $V_{DS}$       | Drain-source Voltage                                                                                                                                                                                      | 100                                                                               | V                  |
| $V_{CC}$       | Supply Voltage                                                                                                                                                                                            | 60                                                                                | V                  |
| $I_D$          | Continuous Drain Current<br>@<0> $T_{pins} = 90\text{ }^{\circ}\text{C}$<br>@<0> $T_{case} = 90\text{ }^{\circ}\text{C}$                                                                                  | Powerdip<br>Multiwatt -15<br>1.5<br>3                                             | A<br>A             |
| $I_{DM} (*)$   | Pulsed Drain Current                                                                                                                                                                                      | Powerdip<br>Multiwatt -15<br>5<br>8                                               | A<br>A             |
| $I_{SD}$       | Continuous Source-drain<br>Diode Current<br>@<0> $T_{pins} = 90\text{ }^{\circ}\text{C}$<br>@<0> $T_{case} = 90\text{ }^{\circ}\text{C}$                                                                  | Powerdip<br>Multiwatt -15<br>1.5<br>3                                             | A<br>A             |
| $I_{SDM}$      | Pulsed Source Drain Diode Current                                                                                                                                                                         | Powerdip<br>Multiwatt -15<br>5<br>8                                               | A<br>A             |
| $V_{IN}$       | Input Voltage                                                                                                                                                                                             | 7                                                                                 | V                  |
| $V_{EN}$       | Enable Voltage                                                                                                                                                                                            | 7                                                                                 | V                  |
| $V_S$          | Source Voltage                                                                                                                                                                                            | - 1 to + 4                                                                        | V                  |
| $P_{tot}$      | Total Power Dissipation<br>@ $T_{pins} = 90\text{ }^{\circ}\text{C}$<br>@ $T_{case} = 90\text{ }^{\circ}\text{C}$<br>@ $T_{amb} = 70\text{ }^{\circ}\text{C}$<br>@ $T_{amb} = 70\text{ }^{\circ}\text{C}$ | Powerdip<br>Multiwatt -15<br>Powerdip<br>Multiwatt -15<br>4.3<br>20<br>1.3<br>2.3 | W<br>W<br>W<br>W   |
| $T_{stg}, T_J$ | Storage and Junction Temperature Range                                                                                                                                                                    | - 40 to + 150                                                                     | $^{\circ}\text{C}$ |

(\*) Pulse width  $\leq 300\text{ }\mu\text{s}$ , duty cycle  $\leq 10\%$ .

**Note** :  $I_D$ ,  $I_{DM}$ ,  $I_{SD}$ ,  $I_{SDM}$  are given per channel.

## THERMAL DATA

| Symbol           | Parameter                                   | Powerdip | Multiwatt-15 | Unit                 |
|------------------|---------------------------------------------|----------|--------------|----------------------|
| $R_{th\ j-pins}$ | Thermal Resistance Junction-pins<br>Max.    | 14       | -            | $^{\circ}\text{C/W}$ |
| $R_{th\ j-case}$ | Thermal Resistance Junction-case<br>Max.    | -        | 3            | $^{\circ}\text{C/W}$ |
| $R_{th\ j-amb}$  | Thermal Resistance Junction-ambient<br>Max. | 65       | 35           | $^{\circ}\text{C/W}$ |

**ELECTRICAL CHARACTERISTICS** ( $T_j = 25^{\circ}\text{C}$ ,  $V_{CC} = 40\text{V}$ , unless otherwise specified)

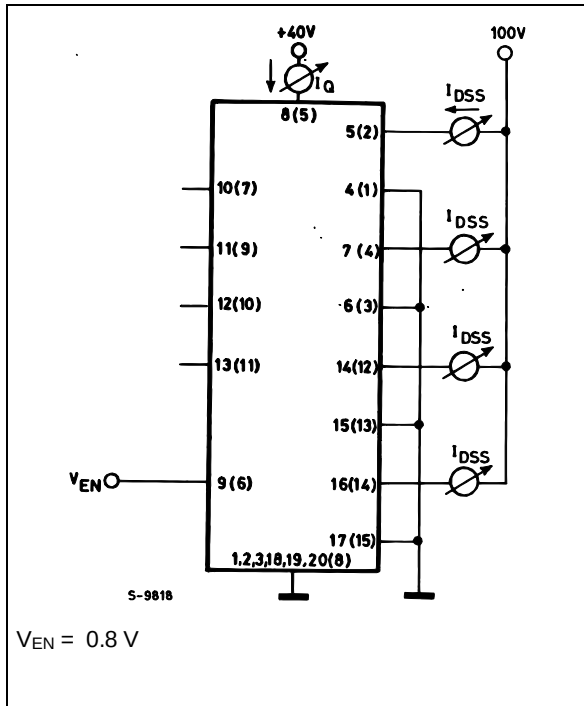
| Symbol                  | Parameter                          | Test Conditions                                                                               | Min.  | Typ. | Max.  | Unit          |
|-------------------------|------------------------------------|-----------------------------------------------------------------------------------------------|-------|------|-------|---------------|
| $V_{CC}$                | Supply Voltage                     |                                                                                               | 14    |      | 48    | V             |
| $I_{CC}$                | Supply Current                     | All $V_{IN} = H$<br>$V_{EN} = \text{Square Wave}$<br>(200kHz, 50 % DC)                        |       | 9    |       | mA            |
| $I_Q$                   | Quiescent Current                  | $V_{EN} = L$                                                                                  |       | 2    | 3     | mA            |
| $BV_{DSS}$              | Drain Source Breakdown Voltage     | $I_D = 1\text{mA}$ , $V_{EN} = L$                                                             | 100   |      |       | V             |
| $I_{DSS}$               | Output Leakage Current             | $V_{EN} = L$<br>$V_{DS} = 100\text{V}$<br>$V_{DS} = 80\text{V}$ , $T_j = 125^{\circ}\text{C}$ |       | 1    | 1     | mA            |
| $R_{DS(on)}^{(*)}$      | Static Drain-source on Resistance  | $V_{CC} \geq 14\text{V}$ , $I_D = 1.5\text{A}$<br>$V_{EN}$ , $V_{IN} = H$                     |       | 0.7  |       | $\Omega$      |
| $V_{IN L}$ , $V_{EN L}$ | Input Low Voltage                  |                                                                                               | - 0.3 |      | 0.8   | V             |
| $V_{IN H}$ , $V_{EN H}$ | Input High Voltage                 |                                                                                               | 2     |      | 7     | V             |
| $I_{IN L}$ , $I_{EN L}$ | Input Low Current                  | $V_{IN}$ , $V_{EN} = L$                                                                       |       |      | - 100 | $\mu\text{A}$ |
| $I_{IN H}$ , $I_{EN H}$ | Input High Current                 | $V_{IN}$ , $V_{EN} = H$                                                                       |       |      | 10    | $\mu\text{A}$ |
| $t_{d(on)}$             | Turn on Delay Time                 | $I_D = 1.5\text{A}$<br>See Test Circuit and Waveforms                                         |       | 300  |       | ns            |
| $t_r$                   | Rise Time                          |                                                                                               |       | 100  |       | ns            |
| $t_{d(off)}$            | Turn off Delay Time                |                                                                                               |       | 400  |       | ns            |
| $t_f$                   | Fall Time                          |                                                                                               |       | 100  |       | ns            |
| $V_{SD}^{(*)}$          | Source Drain Diode Forward Voltage | $I_{SD} = 1.5\text{A}$ , $V_{EN} = L$                                                         |       |      | 1.5   | V             |
| $V_{SD(on)}^{(*)}$      | Source Drain Forward Voltage       | $I_{SD} = 1.5\text{A} - V_{IN}$ , $V_{EN} = H$                                                |       |      | 1.2   | V             |

(\*) Pulse test : pulse width = 300  $\mu\text{s}$ , duty cycle = 2 %.

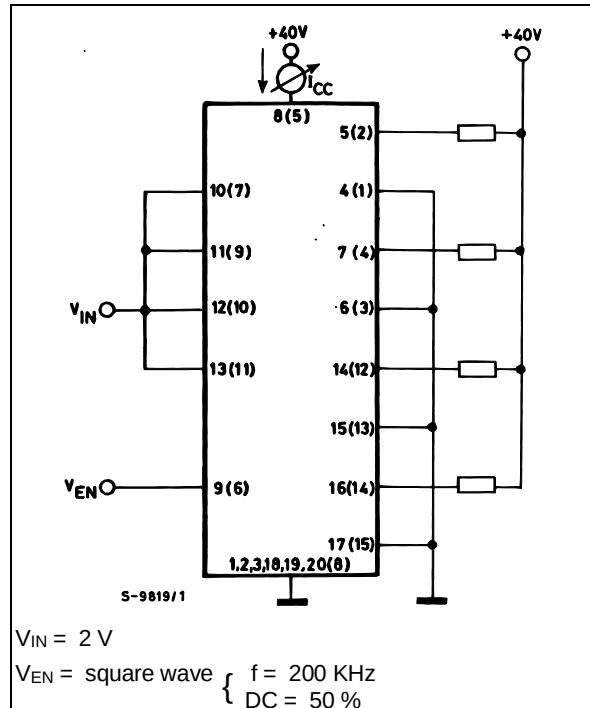


**TEST CIRCUIT** (Pins x = Powerdip ; Pins (x) = Multiwatt)

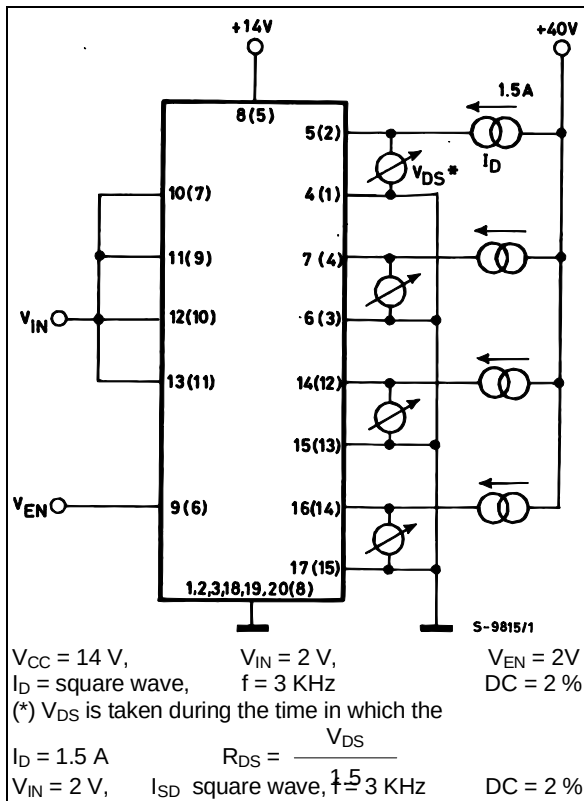
**Figure 3 :** Quiescent Current and Output Leakage Current..



**Figure 4 :** Supply Current.



**Figure 5 :**  $R_{DS(on)}$ .



**Figure 6 :** Source-drain Diode Forward Voltage.

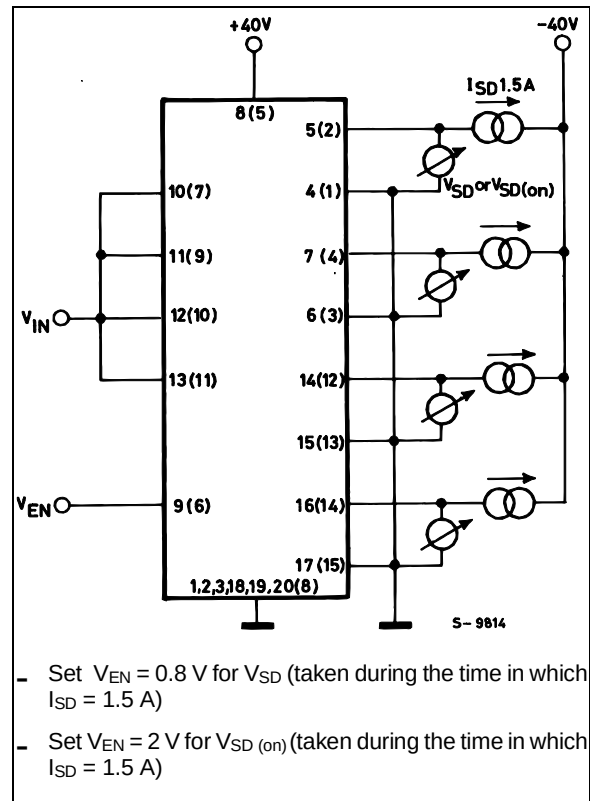


Figure 7 : Input Logic Levels

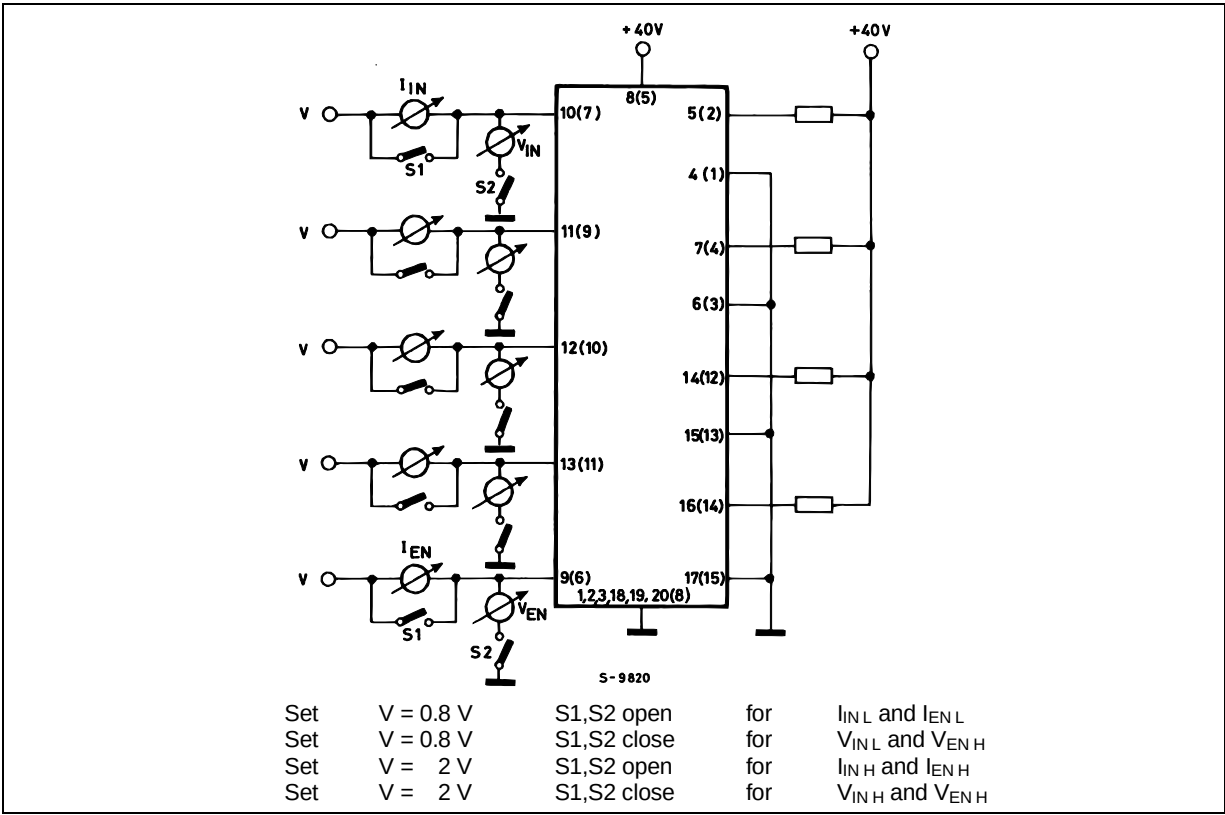


Figure 8 : Static Drain-source on Resistance.

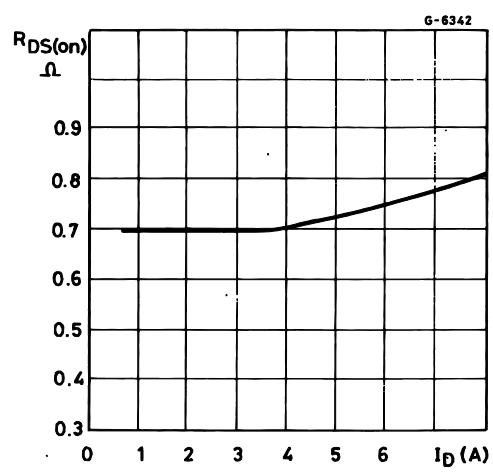
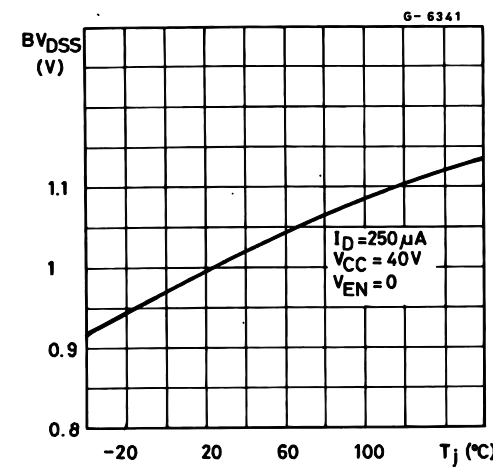
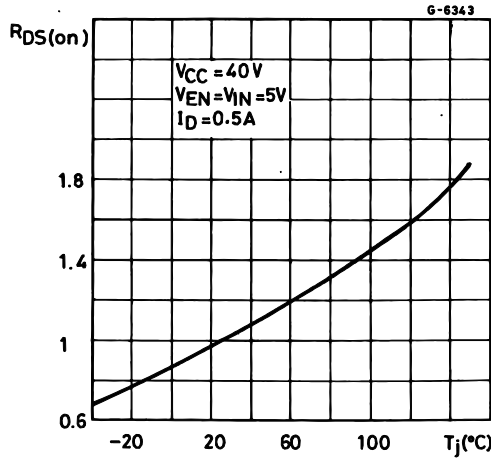


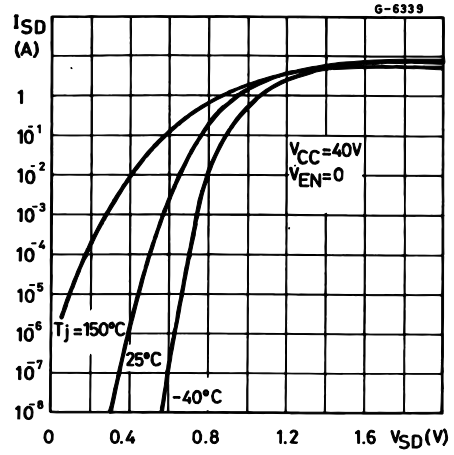
Figure 9 : Normalized Break-down Voltage vs. Temperature.



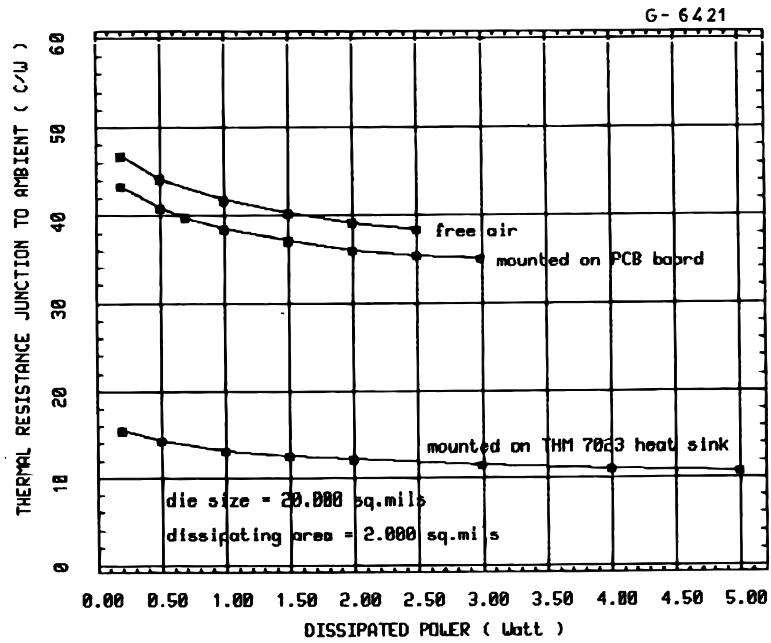
**Figure 10 :** Normalized on Resistance vs. Temperature.



**Figure 11 :** Typical Source-drain Diode Forward Voltage.



**Figure 12 :**  $R_{th j-amb}$  vs. Dissipated Power(Multiwatt).



(\*)  $R_{th} \approx 9^{\circ}C/W$ .

Figure 13 : Transient Thermal Resistance for Single Pulses (Multiwatt).

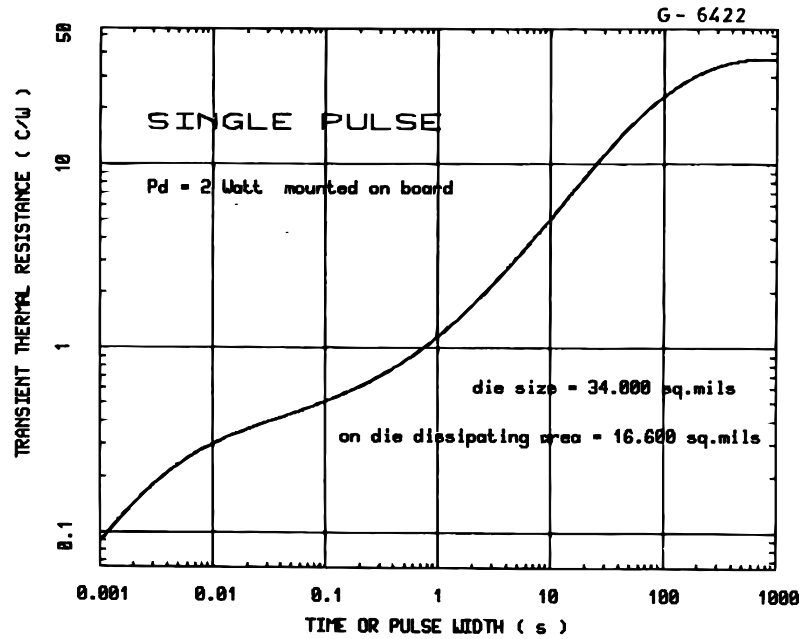
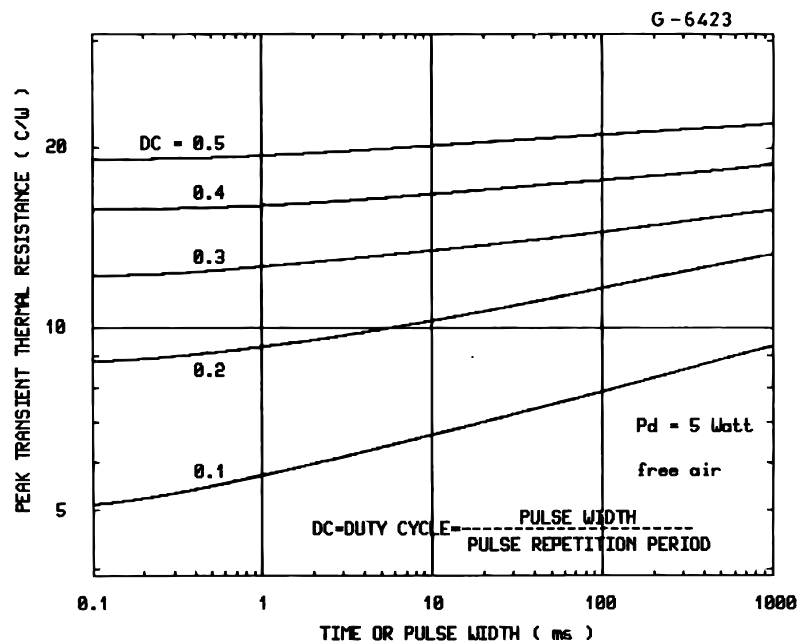


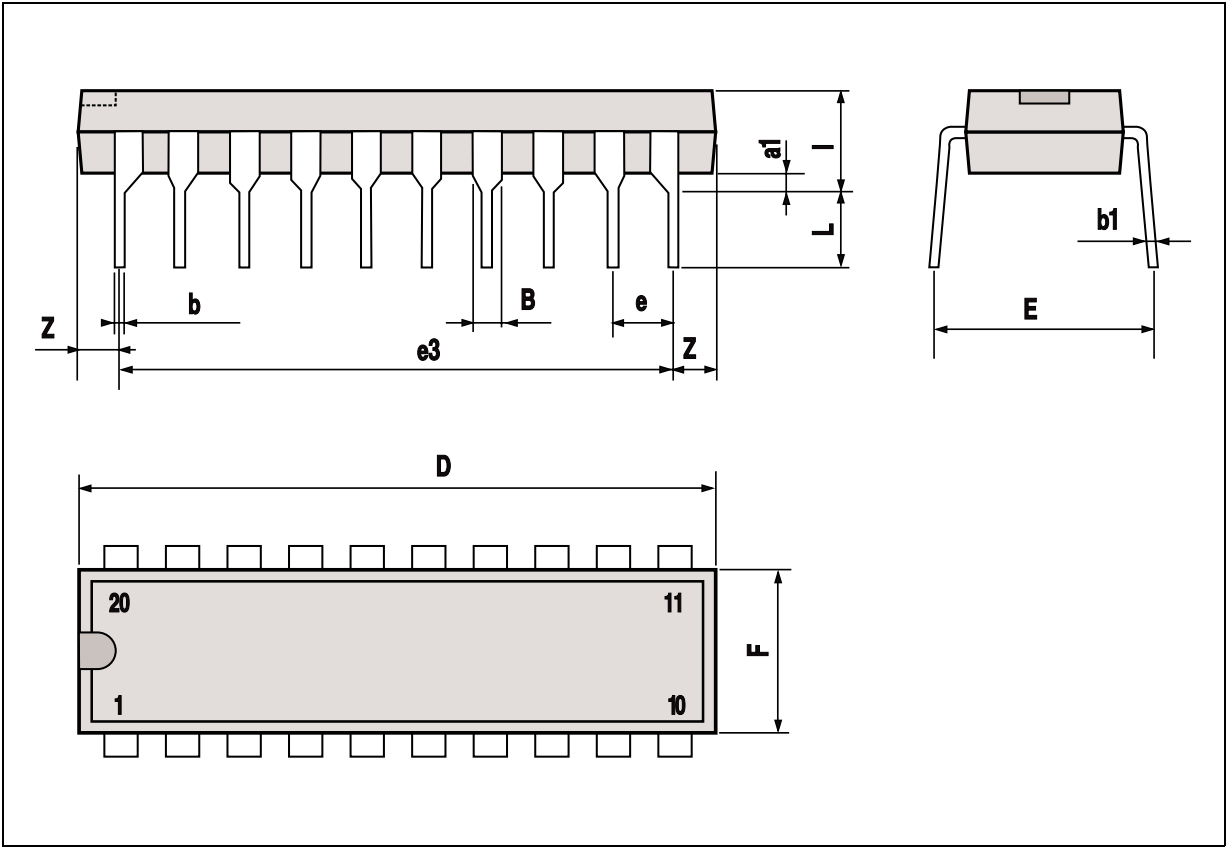
Figure 14 : Peak Transient Thermal Resistance vs. Pulse width and duty cycle (Multiwatt).





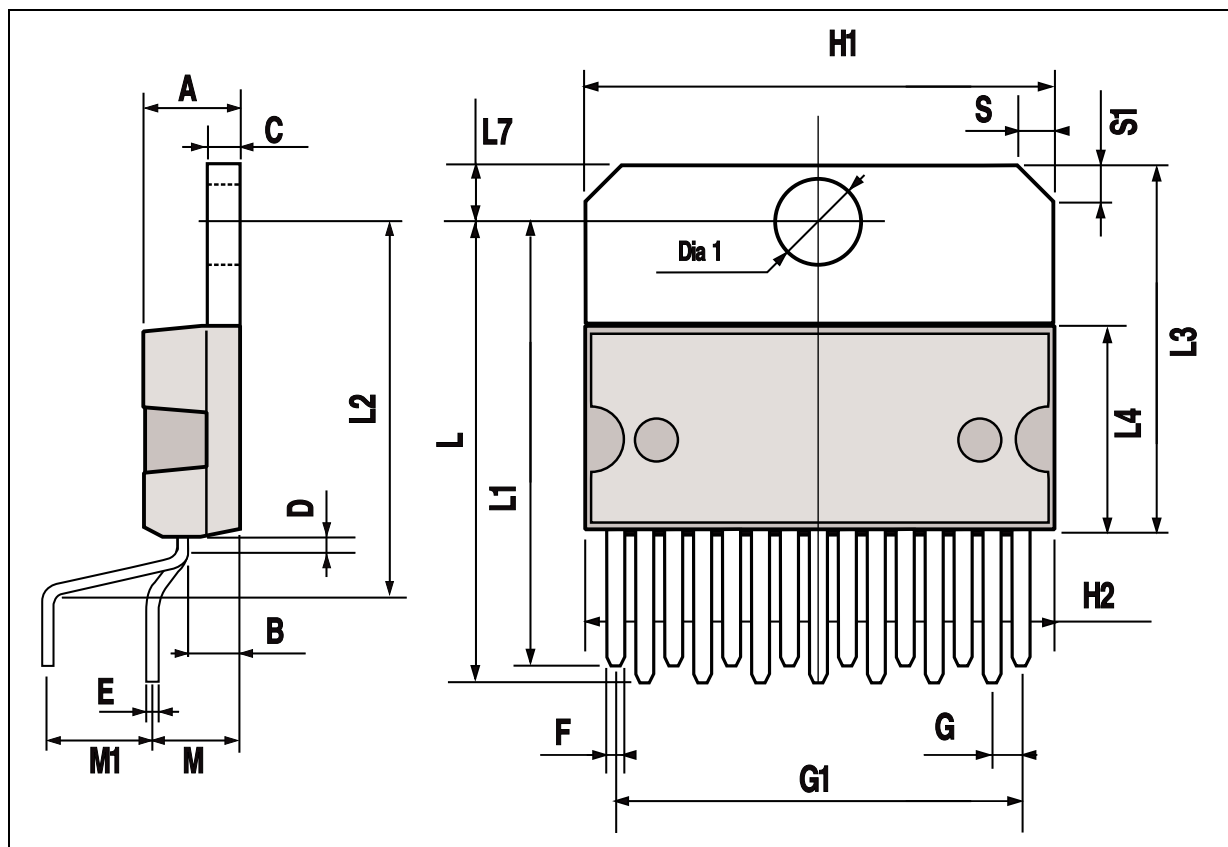
POWERDIP20 PACKAGE MECHANICAL DATA

| DIM. | mm   |       |       | inch  |       |       |
|------|------|-------|-------|-------|-------|-------|
|      | MIN. | TYP.  | MAX.  | MIN.  | TYP.  | MAX.  |
| a1   | 0.51 |       |       | 0.020 |       |       |
| B    | 0.85 |       | 1.40  | 0.033 |       | 0.055 |
| b    |      | 0.50  |       |       | 0.020 |       |
| b1   | 0.38 |       | 0.50  | 0.015 |       | 0.020 |
| D    |      |       | 24.80 |       |       | 0.976 |
| E    |      | 8.80  |       |       | 0.346 |       |
| e    |      | 2.54  |       |       | 0.100 |       |
| e3   |      | 22.86 |       |       | 0.900 |       |
| F    |      |       | 7.10  |       |       | 0.280 |
| I    |      |       | 5.10  |       |       | 0.201 |
| L    |      | 3.30  |       |       | 0.130 |       |
| Z    |      |       | 1.27  |       |       | 0.050 |



## MULTIWATT15 PACKAGE MECHANICAL DATA

| DIM. | mm    |       |       | inch  |       |       |
|------|-------|-------|-------|-------|-------|-------|
|      | MIN.  | TYP.  | MAX.  | MIN.  | TYP.  | MAX.  |
| A    |       |       | 5     |       |       | 0.197 |
| B    |       |       | 2.65  |       |       | 0.104 |
| C    |       |       | 1.6   |       |       | 0.063 |
| D    |       | 1     |       |       | 0.039 |       |
| E    | 0.49  |       | 0.55  | 0.019 |       | 0.022 |
| F    | 0.66  |       | 0.75  | 0.026 |       | 0.030 |
| G    | 1.14  | 1.27  | 1.4   | 0.045 | 0.050 | 0.055 |
| G1   | 17.57 | 17.78 | 17.91 | 0.692 | 0.700 | 0.705 |
| H1   | 19.6  |       |       | 0.772 |       |       |
| H2   |       |       | 20.2  |       |       | 0.795 |
| L    | 22.1  |       | 22.6  | 0.870 |       | 0.890 |
| L1   | 22    |       | 22.5  | 0.866 |       | 0.886 |
| L2   | 17.65 |       | 18.1  | 0.695 |       | 0.713 |
| L3   | 17.25 | 17.5  | 17.75 | 0.679 | 0.689 | 0.699 |
| L4   | 10.3  | 10.7  | 10.9  | 0.406 | 0.421 | 0.429 |
| L7   | 2.65  |       | 2.9   | 0.104 |       | 0.114 |
| M    | 4.2   | 4.3   | 4.6   | 0.165 | 0.169 | 0.181 |
| M1   | 4.5   | 5.08  | 5.3   | 0.177 | 0.200 | 0.209 |
| S    | 1.9   |       | 2.6   | 0.075 |       | 0.102 |
| S1   | 1.9   |       | 2.6   | 0.075 |       | 0.102 |
| Dia1 | 3.65  |       | 3.85  | 0.144 |       | 0.152 |



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