# Silicon N-Channel Power MOSFET

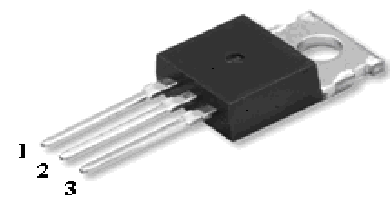
## CS100N03 B8-1

## General Description:

CS100N03 B8-1, the silicon N-channel Enhanced VDMOSFETs, is obtained by the high density Trench technology which reduce the conduction loss, improve switching performance and enhance the avalanche energy. This device is suitable for use as a load switch and PWM applications. The package form is TO-220AB, which accords with the RoHS standard.

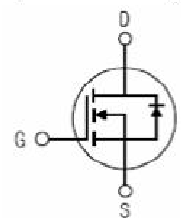
| | | |
|---|---|---|
| $V_{DSS}$ | 30 | V |
| $I_D$（Silicon limited current） | 100 | A |
| $P_D$ | 90 | W |
| $R_{DS(ON)Typ}$ | 4 | mΩ |

TO-220AB




1.Gate 2. Drain 3. Source

Inner Equivalent Principium Chart




## Features:

- Fast Switching
- Low ON Resistance(Rdson≤6 mΩ)
- Low Gate Charge
- Low Reverse transfer capacitances
- 100% Single Pulse avalanche energy Test

## Applications:

Power switch circuit of adaptor and charger.

**Absolute**（$T_C$= 25℃ unless otherwise specified）

| Symbol | Parameter | Rating | Units |
|---|---|---|---|
| $V_{DSS}$ | Drain-to-Source Voltage | 30 | V |
| $I_D$ | Continuous Drain Current | 100 | A |
| | Continuous Drain Current $T_C$ = 100 °C | 75 | A |
| $I_{DM}$ [a1] | Pulsed Drain Current | 400 | A |
| $V_{GS}$ | Gate-to-Source Voltage | ±20 | V |
| $E_{AS}$ [a2] | Avalanche Energy | 100 | mJ |
| $P_D$ | Power Dissipation | 90 | W |
| | Derating Factor above 25°C | 0.71 | W/℃ |
| $T_J$，$T_{stg}$ | Operating Junction and Storage Temperature Range | 150，–55 to 150 | ℃ |
| $T_L$ | MaximumTemperature for Soldering | 300 | ℃ |

**Electrical Characteristics**（$T_J$= 25℃ unless otherwise specified）:

**OFF Characteristics**

| Symbol | Parameter | Test Conditions | Rating Min. | Rating Typ. | Rating Max. | Units |
|---|---|---|---|---|---|---|
| $V_{DSS}$ | Drain to Source Breakdown Voltage | $V_{GS}$=0V, $I_D$=250μA | 30 | -- | -- | V |
| $I_{DSS}$ | Drain to Source Leakage Current | $V_{DS}$ = 30V, $V_{GS}$= 0V, $T_a$ = 25℃ | -- | -- | 1 | μA |
| | | $V_{DS}$ =24V, $V_{GS}$= 0V, $T_a$ = 125℃ | | | 100 | |
| $I_{GSS(F)}$ | Gate to Source Forward Leakage | $V_{GS}$=20V | -- | -- | 100 | nA |
| $I_{GSS(R)}$ | Gate to Source Reverse Leakage | $V_{GS}$ =-20V | -- | -- | -100 | nA |

**ON Characteristics**

| Symbol | Parameter | Test Conditions | Rating Min. | Rating Typ. | Rating Max. | Units |
|---|---|---|---|---|---|---|
| $R_{DS(ON)}$ | Drain-to-Source On-Resistance | $V_{GS}$=10V,$I_D$=50A | -- | 4 | 6 | mΩ |
| $R_{DS(ON)}$ | Drain-to-Source On-Resistance | $V_{GS}$=4.5V,$I_D$=40A | -- | 5 | 7.6 | mΩ |
| $V_{GS(TH)}$ | Gate Threshold Voltage | $V_{DS}$ = $V_{GS}$, $I_D$ = 250μA | 1.0 | 1.5 | 2.0 | V |
| Pulse width tp≤300μs, δ ≤2% | | | | | | |

**Dynamic Characteristics**

| Symbol | Parameter | Test Conditions | Rating Min. | Rating Typ. | Rating Max. | Units |
|---|---|---|---|---|---|---|
| $R_g$ | Gate resistance | VGS=0V, VDS=0V, f=1MHz | | 1.95 | | Ω |
| $C_{iss}$ | Input Capacitance | $V_{GS}$ = 0V $V_{DS}$ =25V f = 1.0MHz | -- | 2546 | | pF |
| $C_{oss}$ | Output Capacitance | | -- | 364 | | |
| $C_{rss}$ | Reverse Transfer Capacitance | | -- | 287 | | |

**Resistive Switching Characteristics**

| Symbol | Parameter | Test Conditions | Rating Min. | Rating Typ. | Rating Max. | Units |
|---|---|---|---|---|---|---|
| $t_{d(ON)}$ | Turn-on Delay Time | $V_{GS}$=10V，$R_G$=12Ω $V_{DD}$=15V，$I_D$=30A | -- | 17 | -- | ns |
| tr | Rise Time | | -- | 43 | -- | |
| $t_{d(OFF)}$ | Turn-Off Delay Time | | -- | 109 | -- | |
| $t_f$ | Fall Time | | -- | 104 | -- | |
| $Q_g$(10V) | Total Gate Charge | Vdd=15V，Id=30A，$V_{GS}$=10V | -- | 52.8 | | nC |
| $Q_{gs}$ | Gate to Source Charge | | -- | 8.78 | | |
| $Q_{gd}$ | Gate to Drain (“Miller”)Charge | | -- | 12.6 | | |

| Source-Drain Diode Characteristics | | | | | | |
|---|---|---|---|---|---|---|
| Symbol | Parameter | Test Conditions | Rating | | | Units |
| | | | Min. | Typ. | Max. | |
| $I_S$ | Continuous Source Current (Body Diode) | | -- | -- | 100 | A |
| $I_{SM}$ | Maximum Pulsed Current (Body Diode) | | -- | -- | 400 | A |
| $V_{SD}$ | Diode Forward Voltage | $I_S$=100A,$V_{GS}$=0V | -- | -- | 1.5 | V |
| trr | Reverse Recovery Time | $I_S$=30A,$T_j$ = 25°C $dI_F/dt$=100A/us, $V_{GS}$=0V | -- | 23.5 | -- | ns |
| Qrr | Reverse Recovery Charge | | -- | 12.4 | -- | nC |
| Pulse width tp≤300μs, δ ≤2% | | | | | | |

| Symbol | Parameter | Max. | Units |
|---|---|---|---|
| $R_{\theta JC}$ | Junction-to-Csae | 1.39 | ℃/W |
| $R_{\theta JA}$ | Junction-to-Ambient | 62.5 | ℃/W |

[a1]： Repetitive rating; pulse width limited by maximum junction temperature

[a2]： L=0.1mH, $I_D$=47A, Start $T_J$=25℃

## Characteristics Curve:

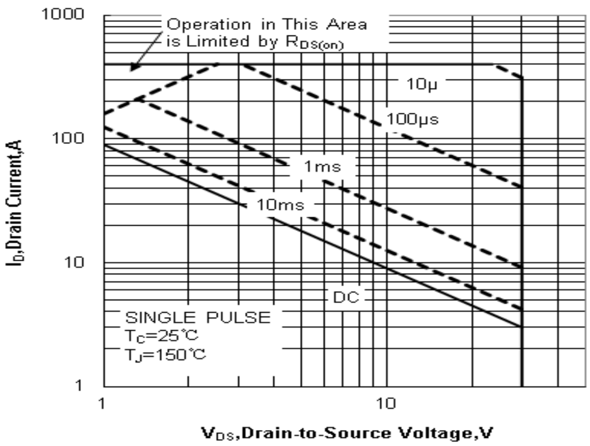



Figure 1 Maximun Forward Bias Safe Operating Area

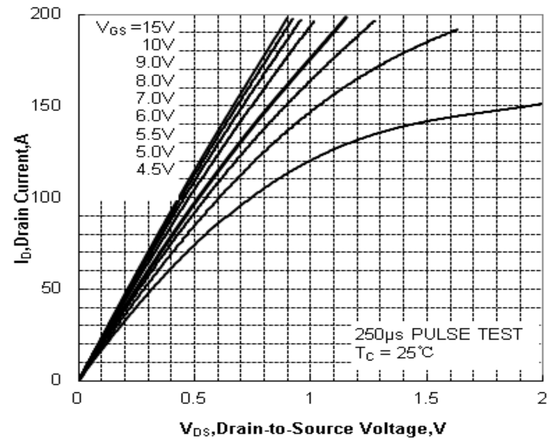



Figure 2 Typical Output Characteristics

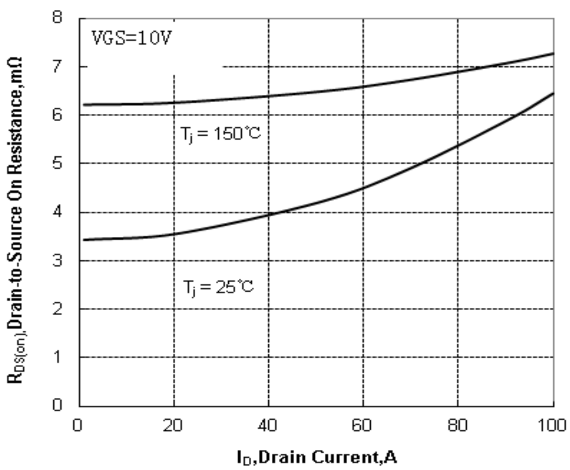



Figure 3 Typical Drain to Source ON Resistance vs Drain Current

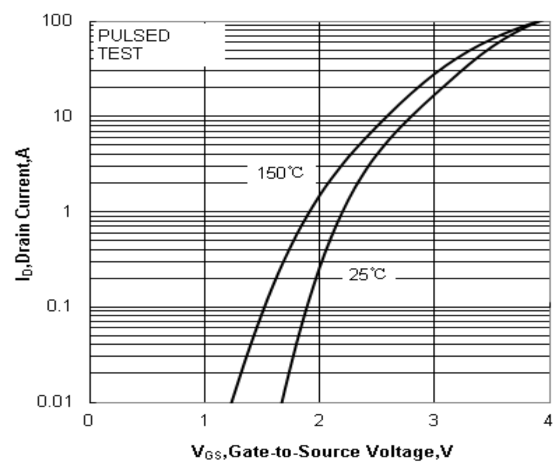



Figure 4 Typical Transfer Characteristics

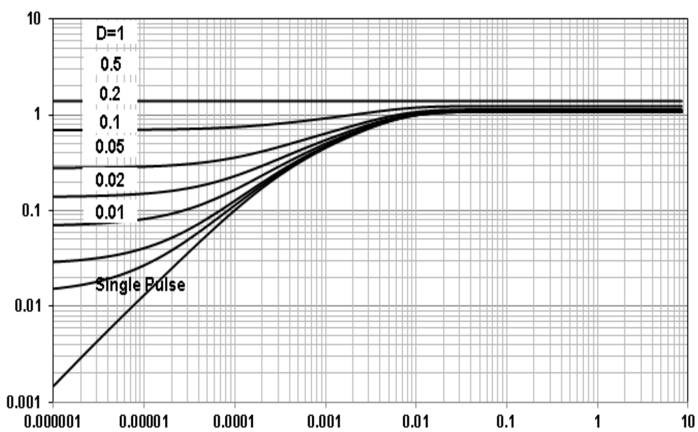



Figure 5 Maximum Effective Thermal Impendance ,
Junction to Case

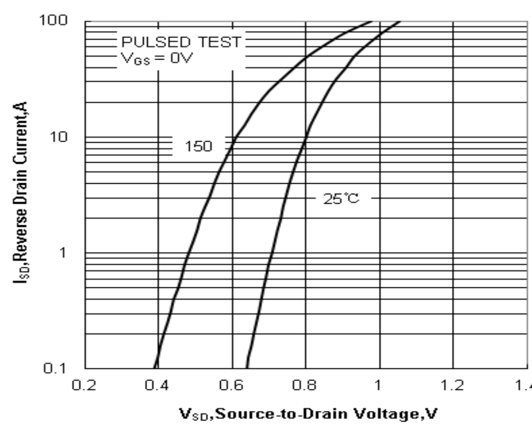



Figure 6 Body Diode Forward Voltage vs.
Source Current and Temperature

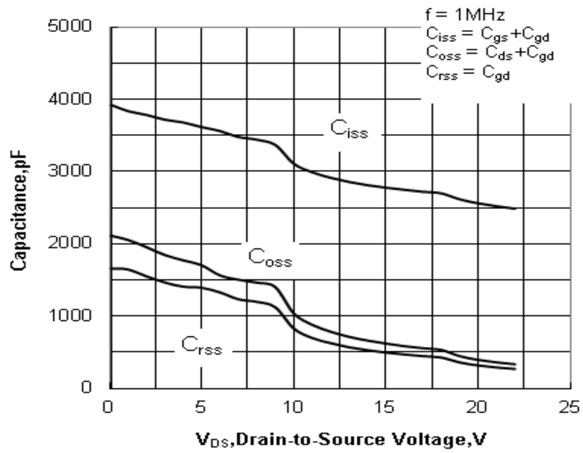



Figure 7 Typical Capacitance vs Drain to Source Voltage

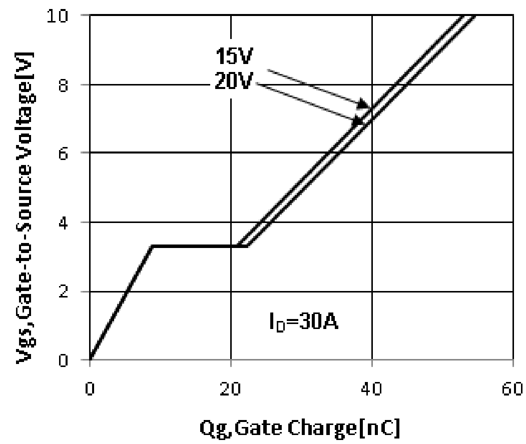



Figure 8 Typical Gate Charge vs Gate to Source Voltage

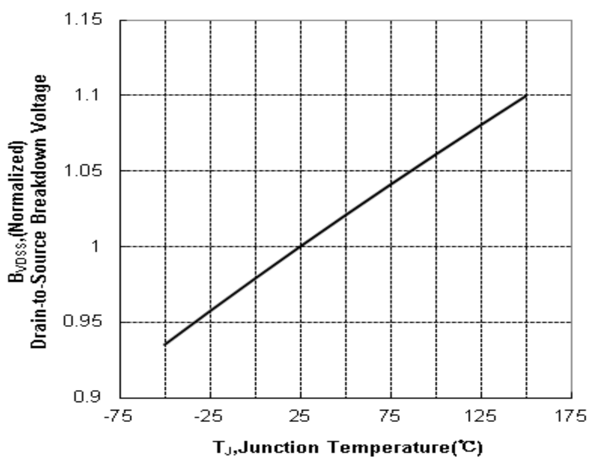



Figure 9 Typical Breakdown Voltage vs Junction Temperature

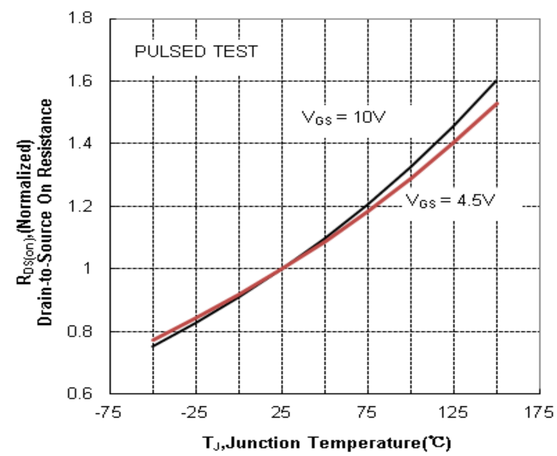



Figure 10 Typical Drian to Source on Resistance vs Junction Temperature

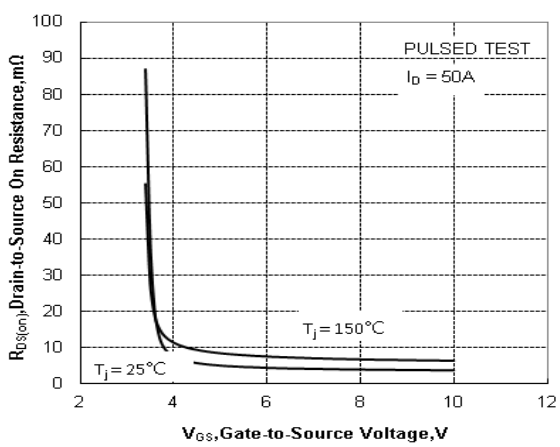



Figure 11 Drain-to-Source On Resistance vs Gate Voltage and Drain Current

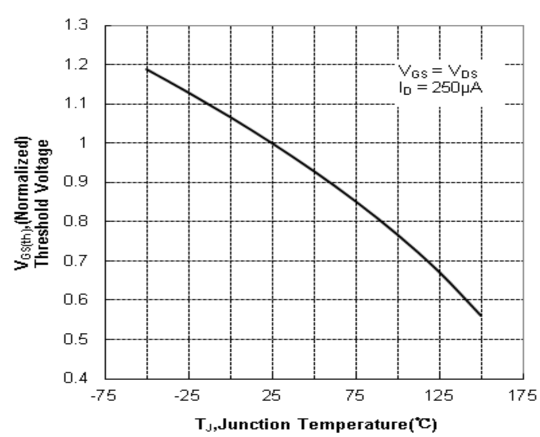



Figure 12 Typical Threshold Voltage vs Junction Temperature

## Test Circuit and Waveform

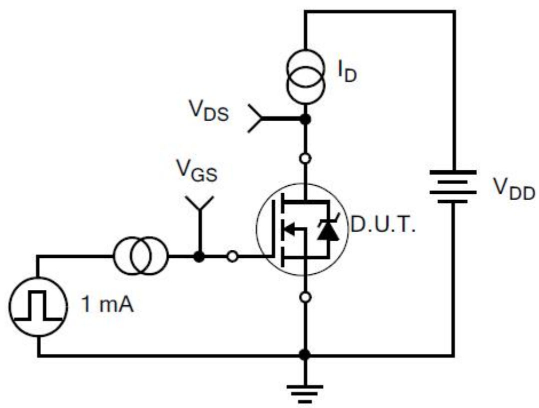



Figure 13. Gate Charge Test Circuit

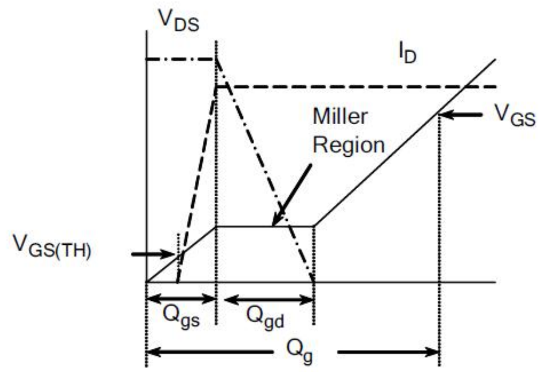



Figure 14. Gate Charge Waveforms

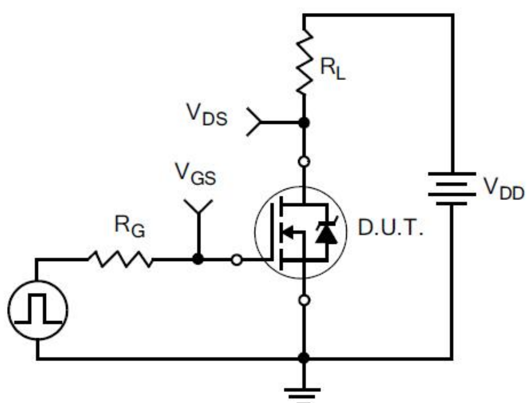



Figure 15. Resistive Switching Test Circuit

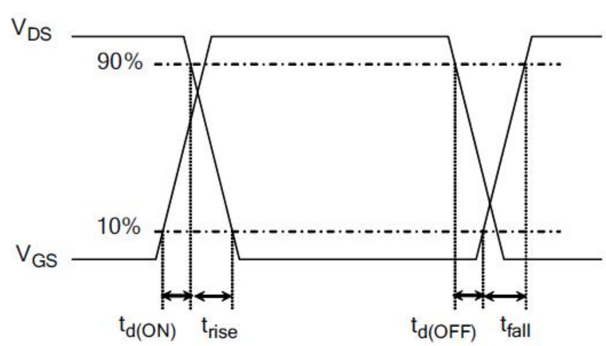



Figure 16. Resistive Switching Waveforms

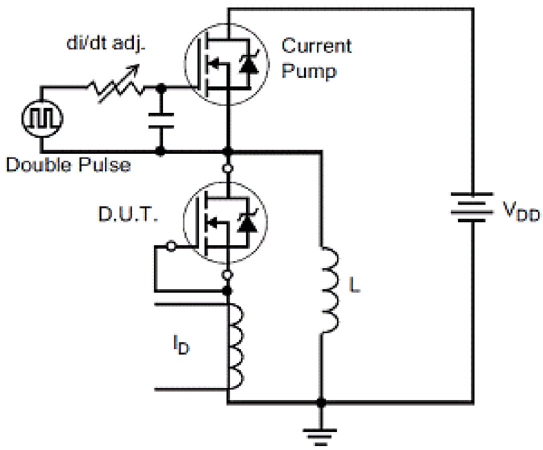



Figure 17. Diode Reverse Recovery Test Circuit

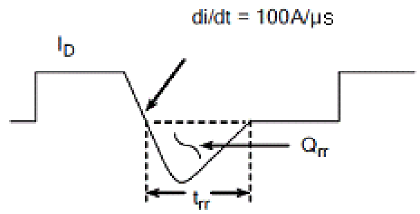



Figure 18. Diode Reverse Recovery Waveform

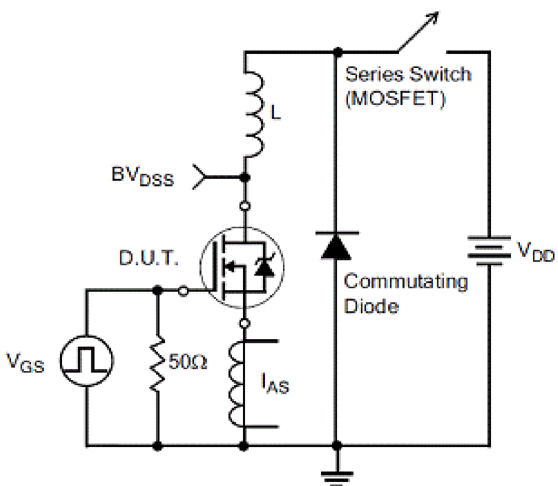
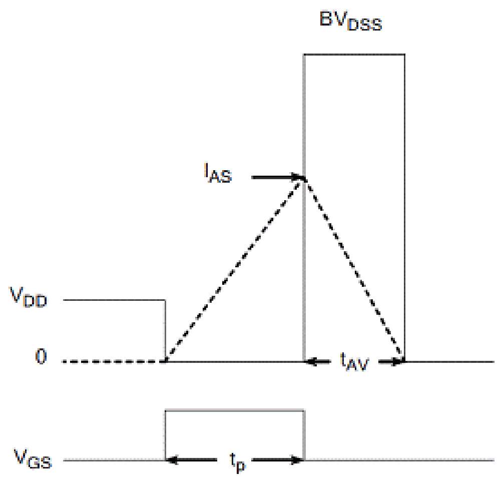


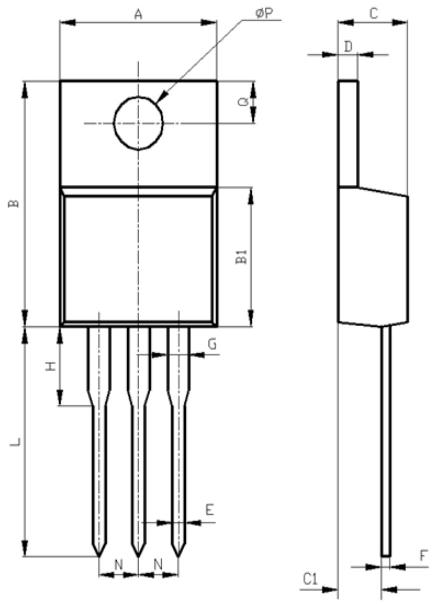

Figure19.Unclamped Inductive Switching Test Circuit




$$E_{AS} = \frac{I_{AS}^{2} L}{2}$$

Figure20.Unclamped Inductive Switching Waveform

## Package Information：




| Items | Values(mm) | |
|---|---|---|
| | MIN | MAX |
| A | 9.60 | 10.6 |
| B | 15.0 | 16.0 |
| B1 | 8.90 | 9.50 |
| C | 4.30 | 4.80 |
| C1 | 2.30 | 3.10 |
| D | 1.20 | 1.40 |
| E | 0.70 | 0.90 |
| F | 0.30 | 0.60 |
| G | 1.17 | 1.37 |
| H | 2.70 | 3.80 |
| L* | 12.6 | 14.8 |
| N | 2.34 | 2.74 |
| Q | 2.40 | 3.00 |
| ΦP | 3.50 | 3.90 |

*adjustable

TO-220AB Package

## The name and content of poisonous and harmful material in products

| | Hazardous Substance | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Pb | Hg | Cd | Cr(VI) | PBB | PBDE | DIBP | DEHP | DBP | BBP |
| Limit | ≤0.1% | ≤0.1% | ≤ 0.01% | ≤0.1% | ≤0.1% | ≤0.1% | ≤0.1% | ≤0.1% | ≤0.1% | ≤0.1% |
| Lead Frame | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| Molding | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| Chip | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| Wire Bonding | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| Solder | × | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| Note | ○：Means the hazardous material is under the criterion of 2011/65/EU.<br>×：Means the hazardous material exceeds the criterion of 2011/65/EU.<br>The plumbum element of solder exist in products presently, but within the allowed range of Eurogroup's RoHS. | | | | | | | | | |

## Warnings

1. Exceeding the maximum ratings of the device in performance may cause damage to the device, even the permanent failure, which may affect the dependability of the machine. It is suggested to be used under 80 percent of the maximum ratings of the device.
2. When installing the heat sink, please pay attention to the torsional moment and the smoothness of the heat sink.
3. VDMOSFETs is the device which is sensitive to the static electricity, it is necessary to protect the device from being damaged by the static electricity when using it.
4. This publication is made by Huajing Microelectronics and subject to regular change without notice.

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