

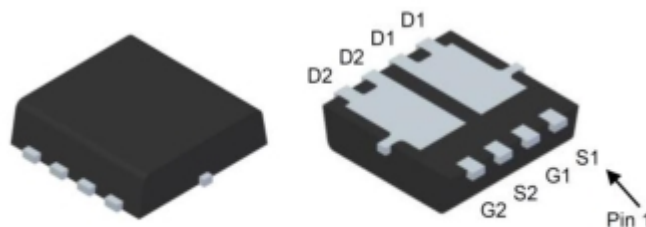
Product Summary

| $V_{(BR)DSS}$ | $R_{DS(on)TYP}$ | I_D |
|---------------|-----------------|-------|
| 30V | 11mΩ@10V | 16A |
| | 15mΩ@4.5V | |
| -30V | 28mΩ@-10V | -8A |
| | 38mΩ@-4.5V | |

Feature

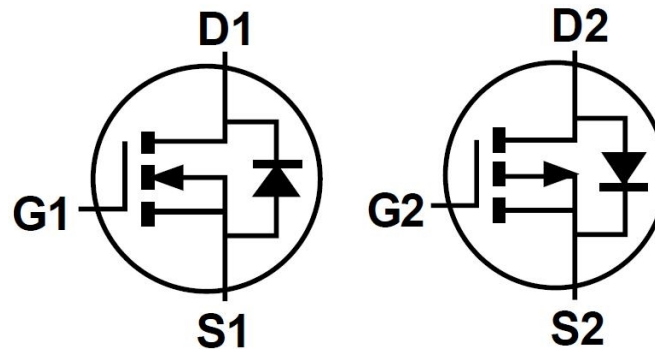
- N-Channel
 $V_{DS} = 30V, I_D = 16A$
 $R_{DS(ON)} < 15m\Omega @ V_{GS}=10V$
 $R_{DS(ON)} < 28m\Omega @ V_{GS}=4.5V$
- P-Channel
 $V_{DS} = -30V, I_D = -8A$
 $R_{DS(ON)} < 42m\Omega @ V_{GS}=-10V$
 $R_{DS(ON)} < 55m\Omega @ V_{GS}=-4.5V$
- High power and current handing capability
- Lead free product is acquired
- Surface mount package

Package

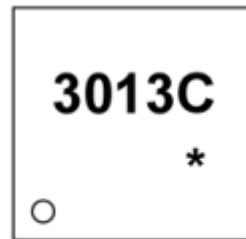


PDFNWB3.3×3.3-8L-B

Circuit diagram



Marking



3013C: Product code
*: Month code

Absolute maximum ratings

($T_a=25^{\circ}\text{C}$ unless otherwise noted)

| Parameter | Symbol | Value | | Unit |
|--|-----------------|-----------|-----------|-----------------------------|
| | | N-Channel | P-Channel | |
| Drain-Source Voltage | V_{DS} | 30 | -30 | V |
| Gate-Source Voltage | V_{GS} | ± 20 | ± 20 | V |
| Continuous Drain Current | I_D | 16 | -8 | A |
| Maximum Power Dissipation | P_D | 2 | | W |
| Thermal Resistance from Junction to Ambient($t \leq 10\text{s}$) | $R_{\theta JA}$ | 62.5 | | $^{\circ}\text{C}/\text{W}$ |
| Operating Junction and Storage Temperature Range | T_J, T_{STG} | -55~ +150 | | $^{\circ}\text{C}$ |

N-Channel Electrical characteristics

($T_A=25^{\circ}\text{C}$, unless otherwise noted)

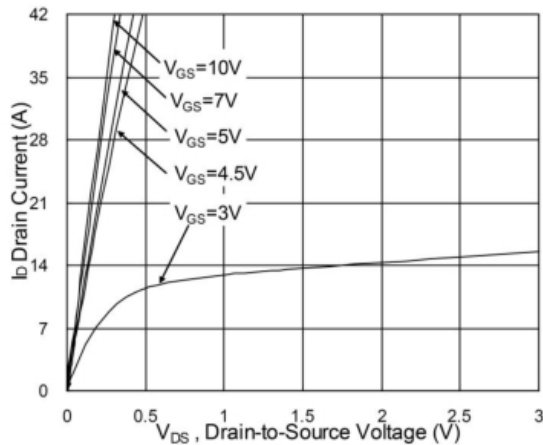
| Parameter | Symbol | Test Condition | Min. | Typ. | Max. | Unit |
|---------------------------------------|---------------------|---|------|------|------|------|
| Static Characteristics | | | | | | |
| Drain-source breakdown voltage | BV (BR)DSS | V _{GS} = 0V, I _D =250μA | 30 | | | V |
| Zero gate voltage drain current | I _{DSS} | V _{DS} =30V, V _{GS} = 0V | | | 1 | uA |
| Gate-body leakage current | I _{GSS} | V _{GS} = ±20V, V _{DS} = 0V | | | ±100 | uA |
| Gate threshold voltage ⁽¹⁾ | V _{GS(th)} | V _{DS} =V _{GS} , I _D =250μA | 1 | 1.5 | 2.2 | V |
| Drain-source on-resistance | R _{DS(on)} | V _{GS} =10V, I _D =8A | | 11 | 15 | mΩ |
| | | V _{GS} =4.5V, I _D =6A | | 15 | 28 | |
| Dynamic Characteristics | | | | | | |
| Input capacitance | C _{iss} | V _{DS} =15V, V _{GS} =0V, f=1MHz | | 940 | 1316 | pF |
| Output capacitance | C _{oss} | | | 131 | 183 | |
| Reverse transfer capacitance | C _{rss} | | | 109 | 153 | |
| Total gate charge | Q _g | V _{DS} =15V, V _{GS} =4.5V, I _D =8A | | 9.63 | 13.5 | nC |
| Gate-source charge | Q _{gs} | | | 3.88 | 5.4 | |
| Gate-drain charge | Q _{gd} | | | 3.44 | 4.8 | |
| Switching Characteristics | | | | | | |
| Turn-on Delay Time | T _{d(on)} | V _{DD} =15V, V _{GS} =10V, R _G =1.5Ω, I _D =8A | | 4.2 | 8.4 | nS |
| Turn-on Rise Time | T _r | | | 8.2 | 15 | |
| Turn-Off Delay Time | T _{d(off)} | | | 31 | 62 | |
| Turn-Off Fall Time | t _f | | | 4 | 8 | |
| Source-Drain Diode Characteristics | | | | | | |
| Diode Forward Voltage | V _{SD} | I _S =1A, V _{GS} = 0V , T _J =25°C | | | 1.2 | V |

P-Channel Electrical characteristics

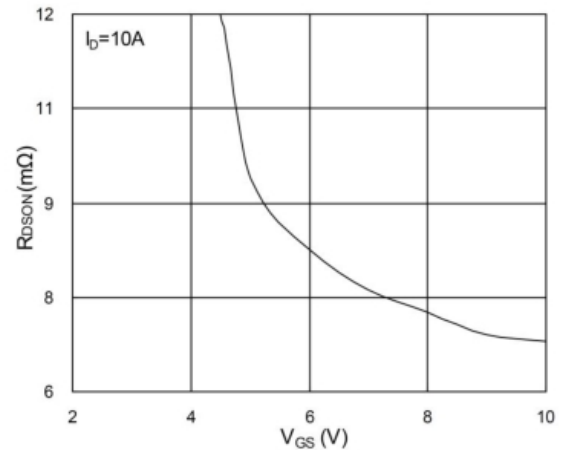
(T_A=25°C, unless otherwise noted)

| Parameter | Symbol | Test Condition | Min. | Typ. | Max. | Unit |
|------------------------------------|----------------|--|------|------|-----------|------------|
| Off Characteristics | | | | | | |
| Drain-source breakdown voltage | $BV_{(BR)DSS}$ | $V_{GS} = 0V, I_D = -250\mu A$ | -30 | | | V |
| Zero gate voltage drain current | I_{DSS} | $V_{DS} = -24V, V_{GS} = 0V$ | | | 1 | μA |
| Gate-body leakage current | I_{GSS} | $V_{GS} = \pm 20V, V_{DS} = 0V$ | | | ± 100 | μA |
| On characteristics | | | | | | |
| Gate threshold voltage | $V_{GS(th)}$ | $V_{DS} = V_{GS}, I_D = -250\mu A$ | -1.2 | -1.6 | -2.5 | V |
| Drain-source on-resistance | $R_{DS(on)}$ | $V_{GS} = -10V, I_D = -6.5A$ | | 28 | 42 | m Ω |
| | | $V_{GS} = -4.5V, I_D = -5A$ | | 38 | 55 | |
| Forward transconductance | g_{FS} | $V_{DS} = -5V, I_D = -6.5A$ | 14 | | | S |
| Switching characteristics | | | | | | |
| Total gate charge | Q_g | $V_{DS} = -15V, V_{GS} = -10V, I_D = -6.5A$ | | 9.2 | | nC |
| Gate-source charge | Q_{gs} | | | 1.6 | | |
| Gate-drain charge | Q_{gd} | | | 2.2 | | |
| Turn-on Delay Time | $T_{d(on)}$ | $V_{DD} = -15V, I_D = -4A, V_{GS} = -10V, R_G = 3\Omega$ | | 7.5 | | nS |
| Turn-on Rise Time | T_r | | | 5.5 | | |
| Turn-Off Delay Time | $T_{d(off)}$ | | | 19 | | |
| Turn-Off Fall Time | t_f | | | 7 | | |
| Source-Drain Diode Characteristics | | | | | | |
| Body Diode Voltage | V_{SD} | $I_S = -1A, V_{GS} = 0V$ | | | -1.2 | V |

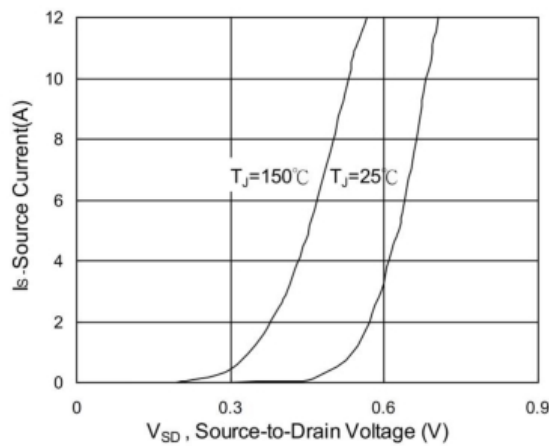
N-Channel Typical Characteristics



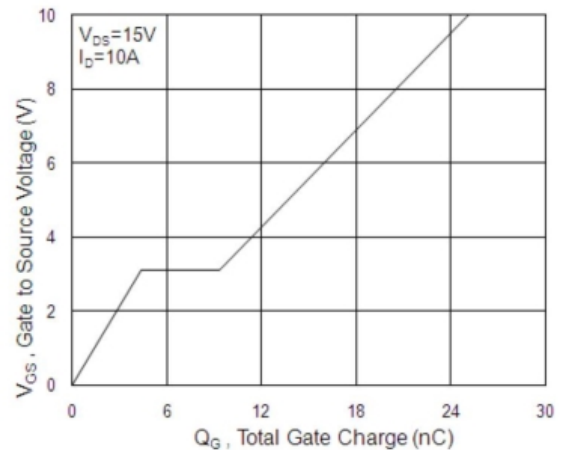
Typical Output Characteristics



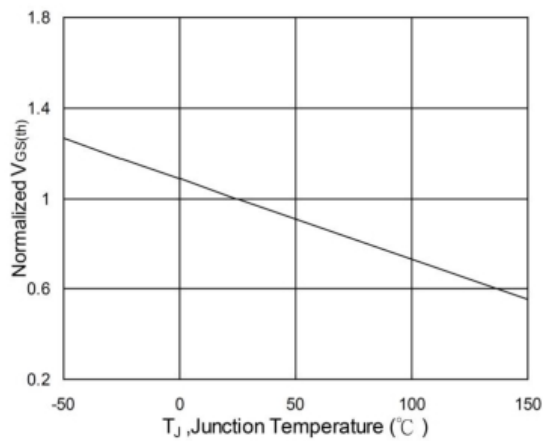
On-Resistance vs. Gate-Source



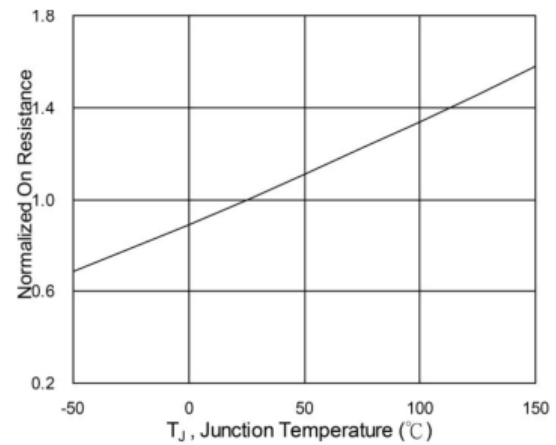
Forward Characteristics of reverse



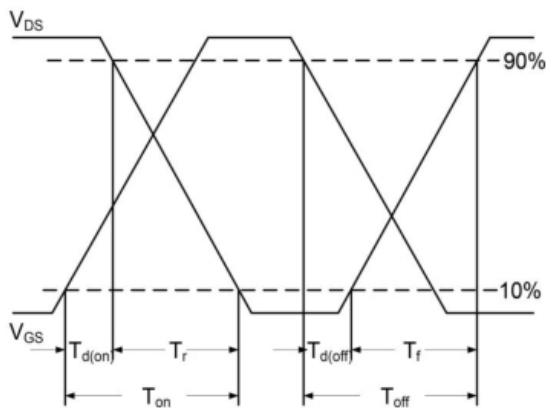
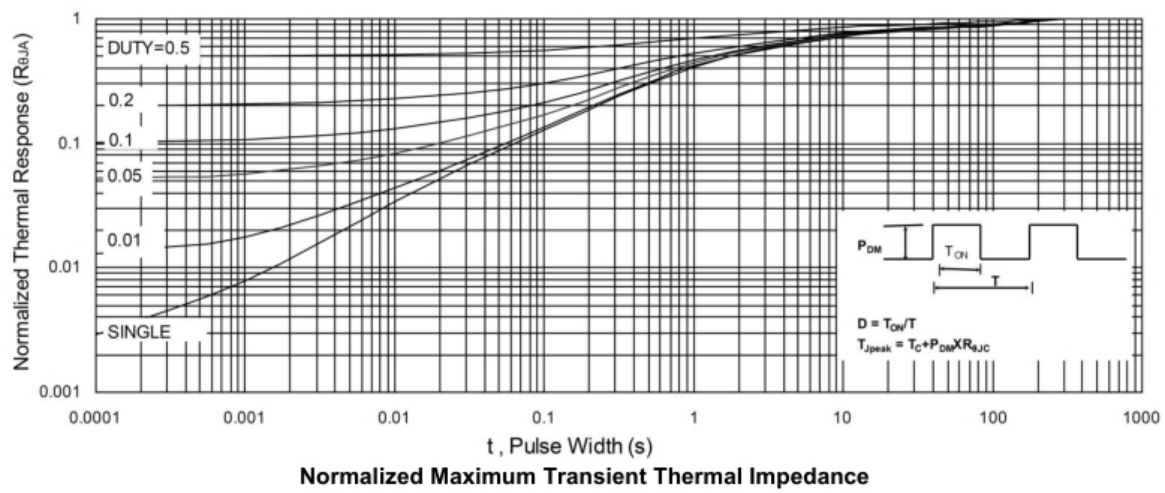
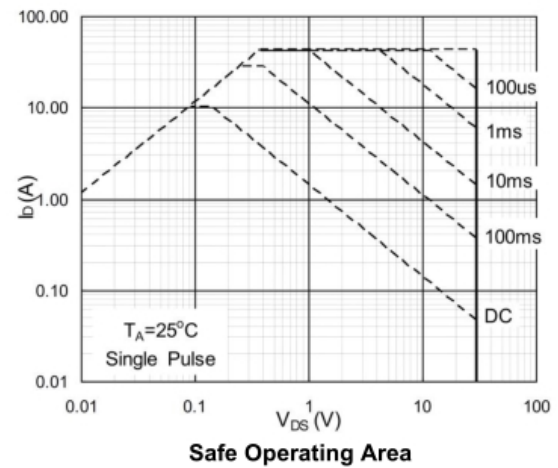
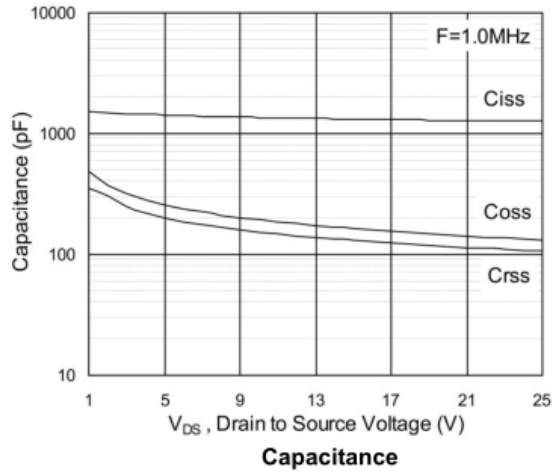
Gate-Charge Characteristics



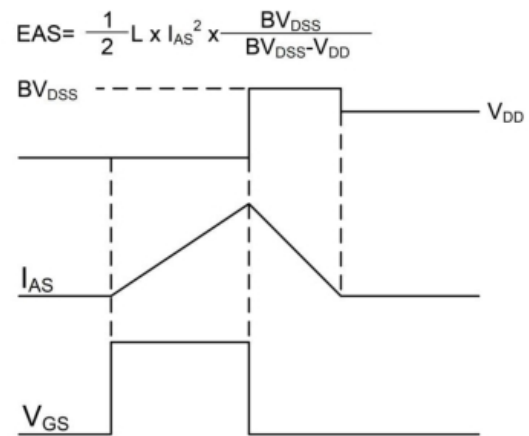
Normalized $V_{GS(th)}$ vs. T_J



Normalized $R_{DS(on)}$ vs. T_J

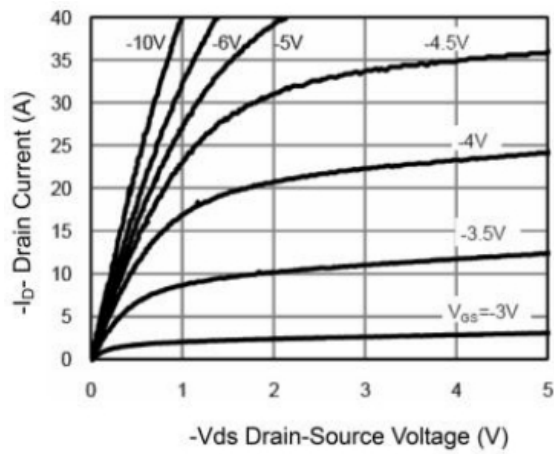


Switching Time Waveform

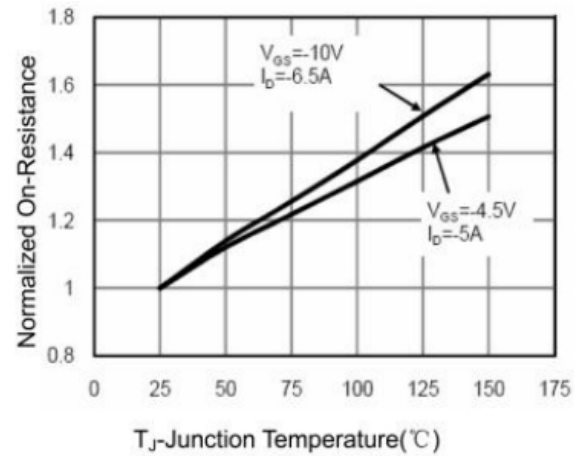


Unclamped Inductive Switching Waveform

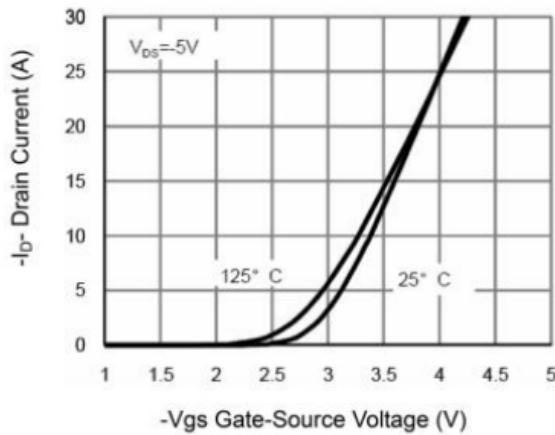
P-Channel Typical Characteristics



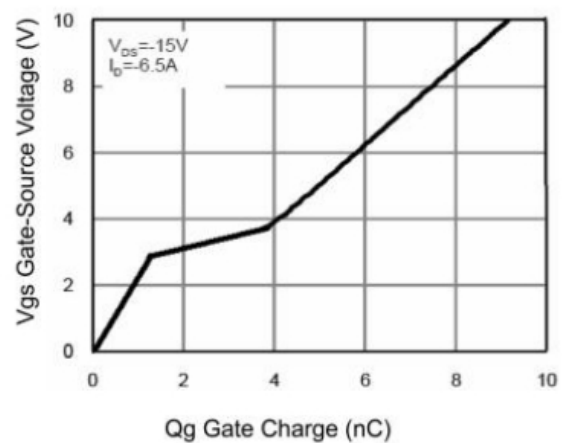
Typical Output Characteristics



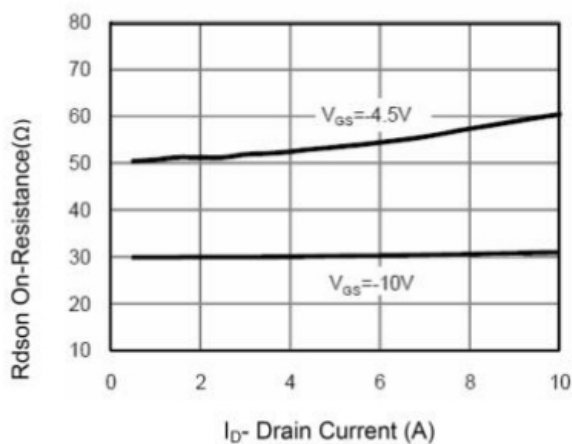
Rdson-Junction Temperature



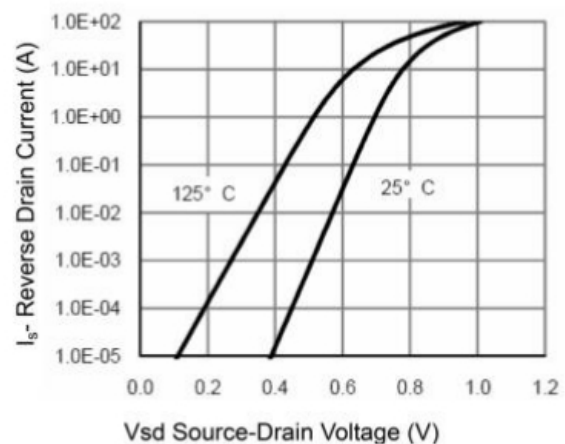
Transfer Characteristics



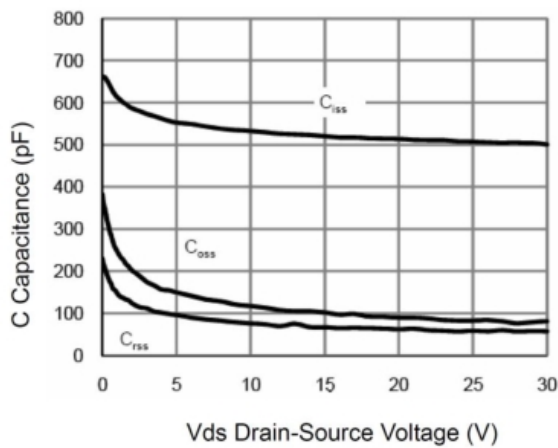
Gate-Charge



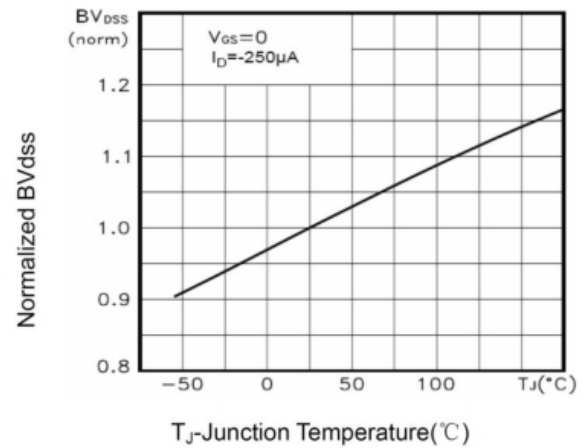
Rdson- Drain Current



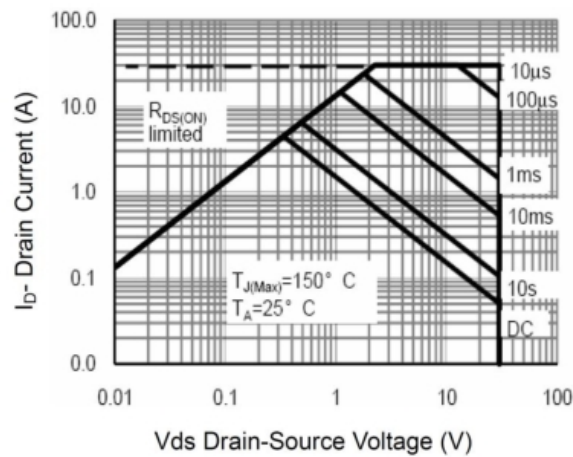
Source- Drain Diode Forward



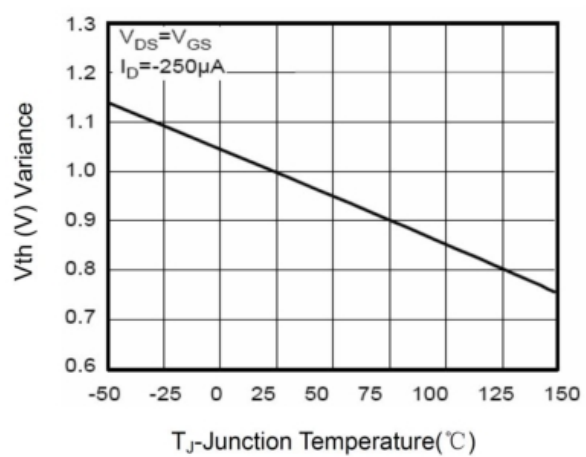
Capacitance vs Vds



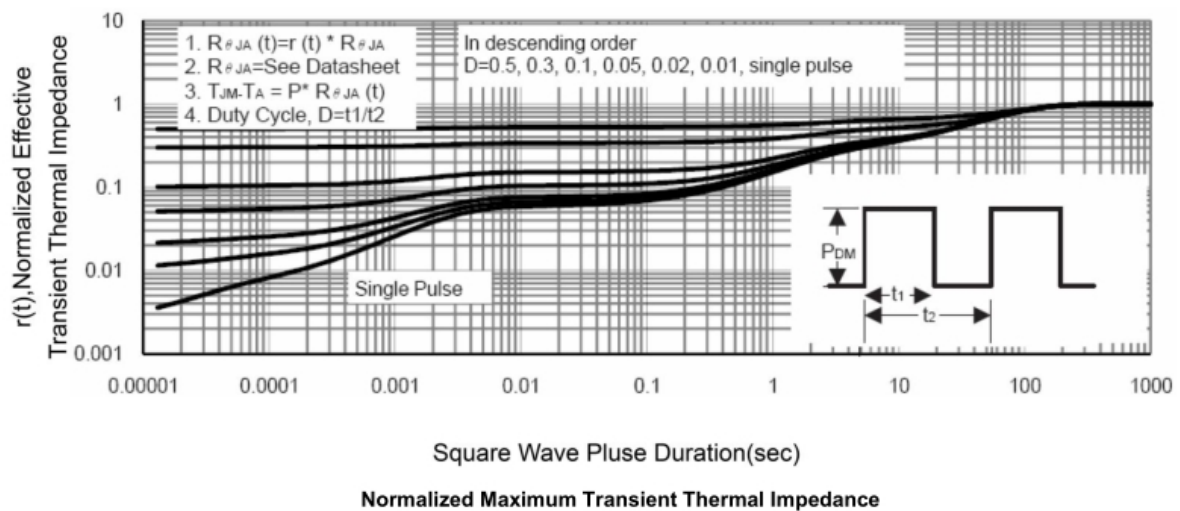
BVDSS vs Junction Temperature



Safe Operation Area

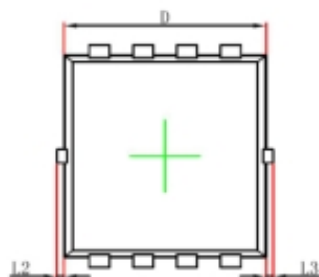


VGS(th) vs Junction Temperature

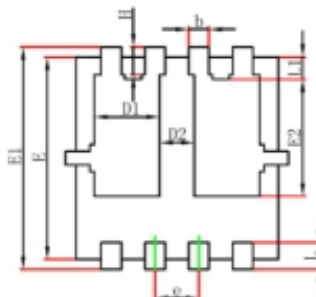


Normalized Maximum Transient Thermal Impedance

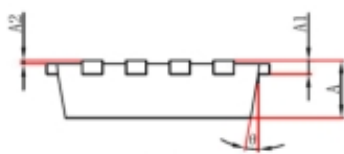
PDFNWB3.3×3.3-8L-B Package Information



Top View
[顶视图]



Bottom View
[背视图]



Side View
[侧视图]

| Symbol | Dimensions In Millimeters | | Dimensions In Inches | |
|--------|---------------------------|-------|----------------------|-------|
| | Min. | Max. | Min. | Max. |
| A | 0.650 | 0.850 | 0.026 | 0.033 |
| A1 | 0.152 REF. | | 0.006 REF. | |
| A2 | 0~0.05 | | 0~0.002 | |
| D | 2.900 | 3.100 | 0.114 | 0.122 |
| D1 | 0.935 | 1.135 | 0.037 | 0.045 |
| D2 | 0.280 | 0.480 | 0.011 | 0.019 |
| E | 2.900 | 3.100 | 0.114 | 0.122 |
| E1 | 3.150 | 3.450 | 0.124 | 0.136 |
| E2 | 1.535 | 1.935 | 0.060 | 0.076 |
| b | 0.200 | 0.400 | 0.008 | 0.016 |
| e | 0.550 | 0.750 | 0.022 | 0.030 |
| L | 0.300 | 0.500 | 0.012 | 0.020 |
| L1 | 0.180 | 0.480 | 0.007 | 0.019 |
| L2 | 0~0.100 | | 0~0.004 | |
| L3 | 0~0.100 | | 0~0.004 | |
| H | 0.315 | 0.515 | 0.012 | 0.020 |
| θ | 9° | 13° | 9° | 13° |