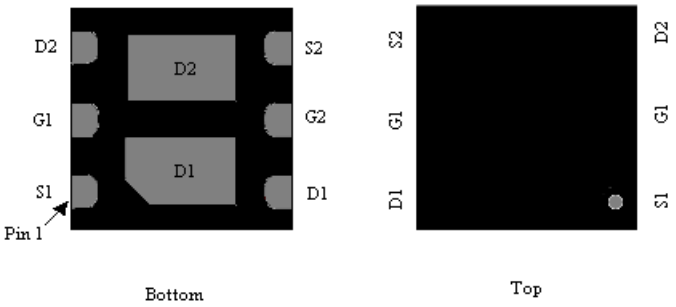
# N- AND P-Channel Enhancement Mode MOSFET

## Features:

- Simple drive requirement
- Low gate charge
- Low on-resistance
- Fast switching speed
- Pb-free lead plating and halogen-free package

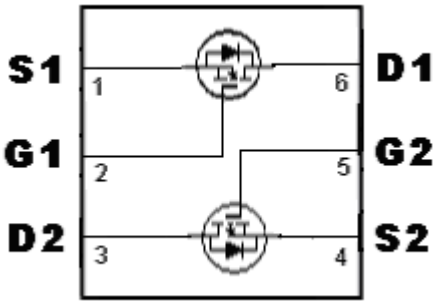
**DFN2*2-6L**




## Description:

The KWC3586BDFA6 consists of a N-channel and a P-channel enhancement-mode MOSFET in a single DFN2*2-6L package, providing the designer with the best combination of fast switching, ruggedized device design, low on-resistance and cost-effectiveness. The l-industrial surface mount applications.

KWC3586BDFA6




G：Gate S：Source D：Drain

## Ordering Information

| Device | Package | Shipping |
|---|---|---|
| KWC3586BDFA6 | DFN2x2-6L<br>(Pb-free lead plating and halogen-free package) | 3000 pcs / Tape & Reel |

## Absolute Maximum Ratings (Ta=25°C)

| Parameter | Symbol | Limits | | Unit |
|---|---|---|---|---|
| | | N-channel | P-channel | |
| Drain-Source Breakdown Voltage | $BV_{DSS}$ | 20 | -20 | V |
| Gate-Source Voltage | $V_{GS}$ | ±12 | ±12 | |
| Continuous Drain Current @$T_A$=25 °C (Note 1) | $I_D$ | 5 | -3.3 | A |
| Continuous Drain Current @$T_A$=70 °C (Note 1) | $I_D$ | 4 | -2.6 | |
| Pulsed Drain Current (Note 2) | $I_{DM}$ | 20 | -20 | |
| Total Power Dissipation (Note 1) | Pd | 1.38 | | W |
| Linear Derating Factor | | 0.01 | | W / °C |
| Operating Junction and Storage Temperature | Tj, Tstg | -55~+150 | | °C |

Note : 1.Surface mounted on 1 in² copper pad of FR-4 board, t≤5 sec
2.Pulse width limited by maximum junction temperature

## N-Channel Electrical Characteristics (Tj=25°C, unless otherwise specified)

| Symbol | Min. | Typ. | Max. | Unit | Test Conditions |
|---|---|---|---|---|---|
| **Static** | | | | | |
| $BV_{DSS}$ | 20 | - | - | V | $V_{GS}$=0, $I_D$=250μA |
| $\Delta BV_{DSS}/\Delta Tj$ | - | 0.02 | - | V/°C | Reference to 25°C, $I_D$=1mA |
| $V_{GS(th)}$ | 0.5 | 0.7 | 1.2 | V | $V_{DS}$=$V_{GS}$, $I_D$=250μA |
| $I_{GSS}$ | - | - | ±100 | nA | $V_{GS}$=±12V, $V_{DS}$=0 |
| $I_{DSS}$ | - | - | 1 | μA | $V_{DS}$=20V, $V_{GS}$=0 |
| | - | - | 10 | | $V_{DS}$=16V, $V_{GS}$=0, Tj=70°C |
| *$R_{DS(ON)}$ | - | 27 | 40 | mΩ | $I_D$=3.5A, $V_{GS}$=4.5V |
| | - | 37 | 50 | | $I_D$=1.2A, $V_{GS}$=2.5V |
| | - | 82 | 105 | | $I_D$=0.5A, $V_{GS}$=1.5V |
| *$G_{FS}$ | - | 7 | - | S | $V_{DS}$=5V, $I_D$=3A |
| **Dynamic** | | | | | |
| Ciss | - | 423 | - | pF | $V_{DS}$=20V, $V_{GS}$=0, f=1MHz |
| Coss | - | 50 | - | | |
| Crss | - | 48 | - | | |
| *$t_{d(ON)}$ | - | 6 | - | ns | $V_{DS}$=15V, $I_D$=1A, $V_{GS}$=5V, $R_G$=3.3Ω , $R_D$=15Ω |
| *$t_r$ | - | 8 | - | | |
| *$t_{d(OFF)}$ | - | 11 | - | | |
| *$t_f$ | - | 10 | - | | |
| *Qg | - | 6 | - | nC | $V_{DS}$=16V, $I_D$=3A, $V_{GS}$=4.5V |
| *Qgs | - | 0.8 | - | | |
| *Qgd | - | 2.5 | - | | |
| **Source-Drain Diode** | | | | | |
| *$V_{SD}$ | - | 0.77 | 1.2 | V | $V_{GS}$=0V, $I_S$=1.2A |
| *trr | - | 16 | - | ns | $I_S$=3A, $V_{GS}$=0V, dI/dt=100A/μs |
| *Qrr | - | 8 | - | nC | |

*Pulse Test : Pulse Width ≤300μs, Duty Cycle≤2%

## P-Channel Electrical Characteristics (Tj=25°C, unless otherwise specified)

| Symbol | Min. | Typ. | Max. | Unit | Test Conditions |
|---|---|---|---|---|---|
| **Static** | | | | | |
| $BV_{DSS}$ | -20 | - | - | V | $V_{GS}$=0, $I_D$=-250μA |
| $\Delta BV_{DSS}/\Delta Tj$ | - | -0.01 | - | V/°C | Reference to 25°C, $I_D$=-1mA |
| $V_{GS(th)}$ | - | -0.8 | -1.2 | V | $V_{DS}$=$V_{GS}$, $I_D$=-250μA |
| $I_{GSS}$ | - | - | ±100 | nA | $V_{GS}$=±12V, $V_{DS}$=0 |
| $I_{DSS}$ | - | - | -1 | μA | $V_{DS}$=-20V, $V_{GS}$=0 |
| | - | - | -25 | | $V_{DS}$=-16V, $V_{GS}$=0, Tj=70°C |
| *$R_{DS(ON)}$ | - | 78 | 105 | mΩ | $I_D$=-2.5A, $V_{GS}$=-4.5V |
| | - | 115 | 150 | | $I_D$=-2A, $V_{GS}$=-2.5V |
| | - | 280 | 350 | | $I_D$=-0.5A, $V_{GS}$=-1.5V |
| *$G_{FS}$ | - | 5 | - | S | $V_{DS}$=-5V, $I_D$=-2A |
| **Dynamic** | | | | | |
| Ciss | - | 429 | - | pF | $V_{DS}$=-20V, $V_{GS}$=0, f=1MHz |
| Coss | - | 45 | - | | |
| Crss | - | 41 | - | | |
| *$t_{d(ON)}$ | - | 6 | - | ns | $V_{DS}$=-10V, $I_D$=-1A, $V_{GS}$=-10V, $R_G$=3.3Ω , $R_D$=10Ω |
| *$t_r$ | - | 17 | - | | |
| *$t_{d(OFF)}$ | - | 16 | - | | |
| *$t_f$ | - | 5 | - | | |
| *Qg | - | 6 | - | nC | $V_{DS}$=-16V, $I_D$=-2A, $V_{GS}$=-4.5V |
| *Qgs | - | 0.8 | - | | |
| *Qgd | - | 2.4 | - | | |
| **Source-Drain Diode** | | | | | |
| *$V_{SD}$ | - | -0.82 | -1.2 | V | $V_{GS}$=0V, $I_S$=-1.2A |
| *trr | - | 20 | - | ns | $I_S$=-2A, $V_{GS}$=0V, dI/dt=100A/μs |
| *Qrr | - | 15 | - | nC | |

*Pulse Test : Pulse Width ≤300μs, Duty Cycle≤2%

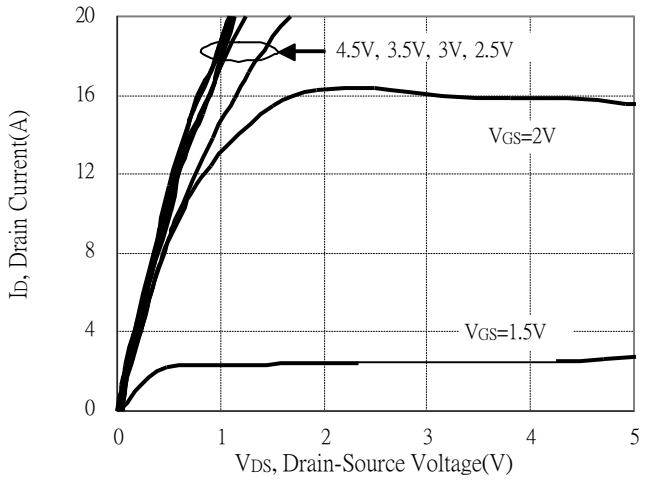
## Thermal Data

| Parameter | Symbol | Value | Unit |
|---|---|---|---|
| Thermal Resistance, Junction-to-case, max | $R_{\theta JC}$ | 80 | °C/W |
| Thermal Resistance, Junction-to-ambient, max | $R_{\theta JA}$ | 90 (Note ) | |

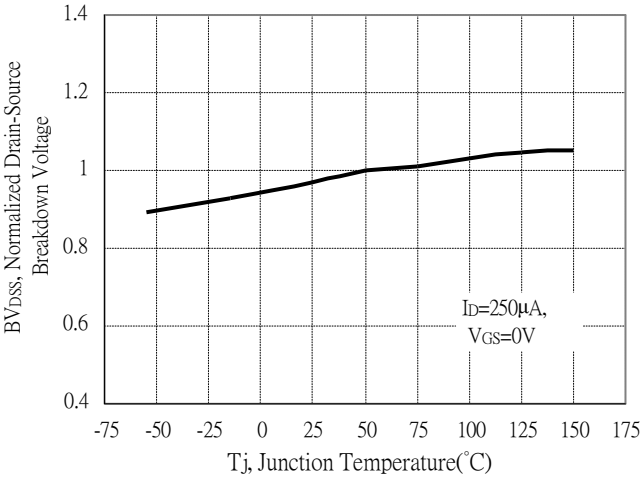
Note :.Surface mounted on 1 in² copper pad of FR-4 board, t≤5 sec; 195°C/W when mounted on minimum copper pad

## N-channel Typical Characteristics

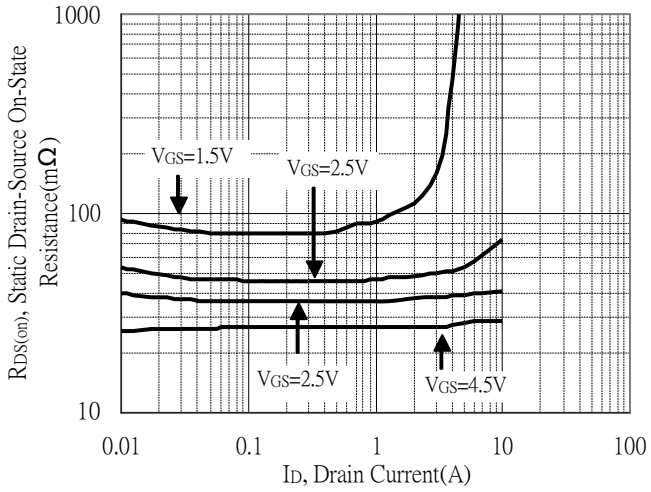
Typical Output Characteristics



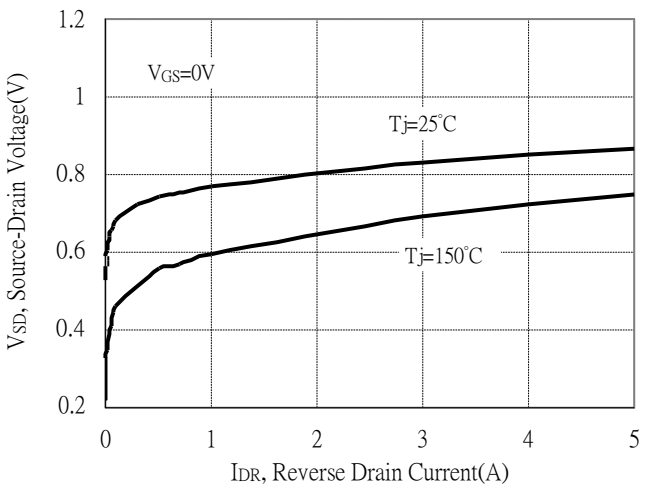

Brekdown Voltage vs Ambient Temperature



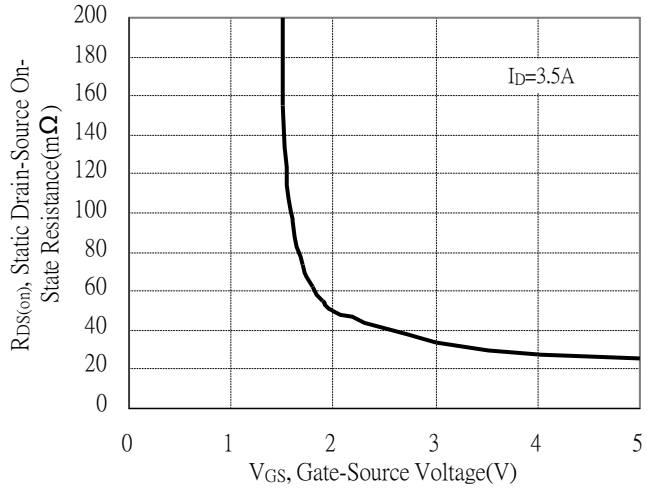

Static Drain-Source On-State resistance vs Drain Current



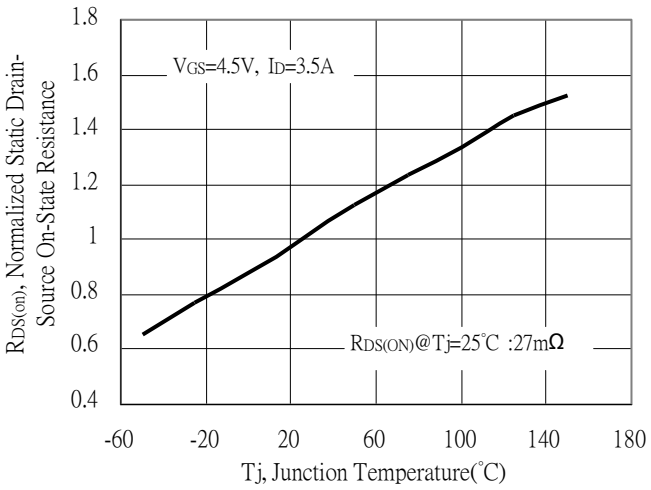

Reverse Drain Current vs Source-Drain Voltage




Static Drain-Source On-State Resistance vs Gate-Source Voltage

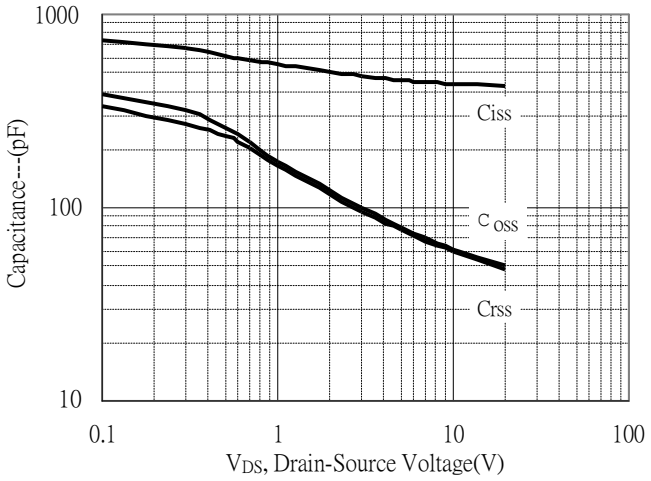



Drain-Source On-State Resistance vs Junction Tempearture

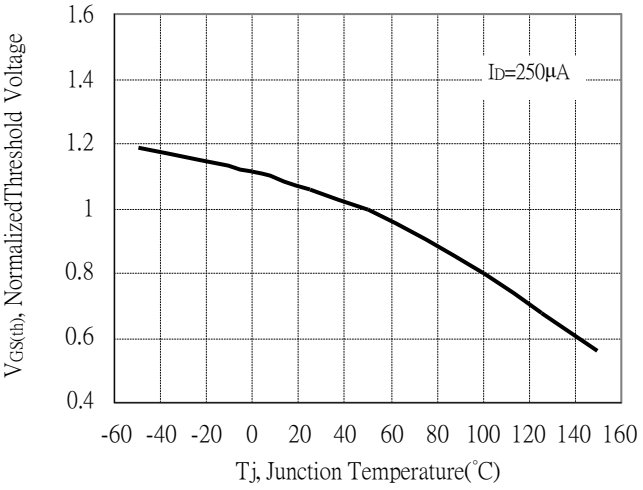


## N-channel Typical Characteristics(Cont.)

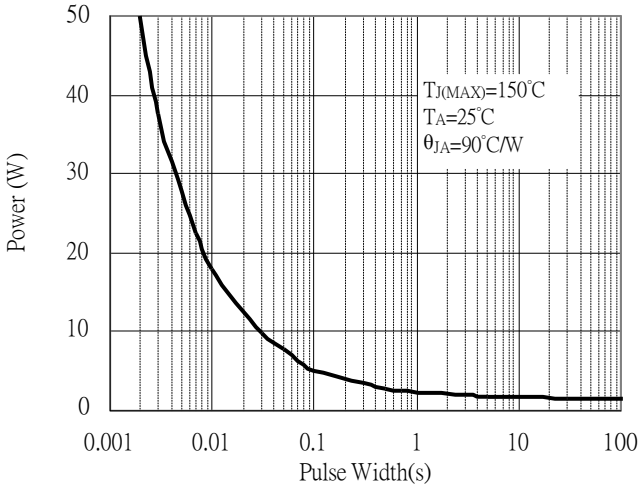
Capacitance vs Drain-to-Source Voltage



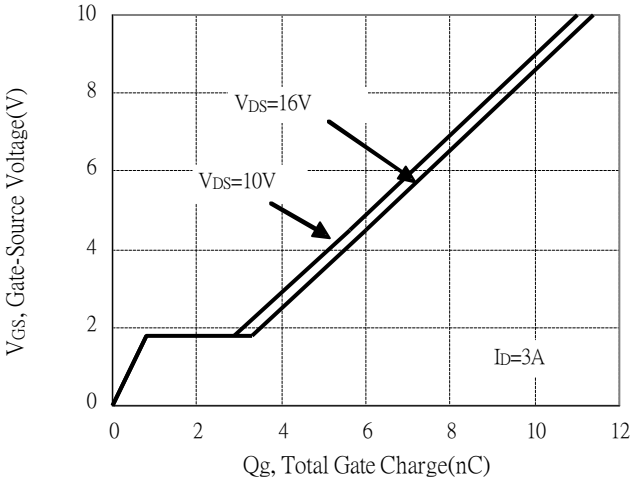

Threshold Voltage vs Junction Tempearture



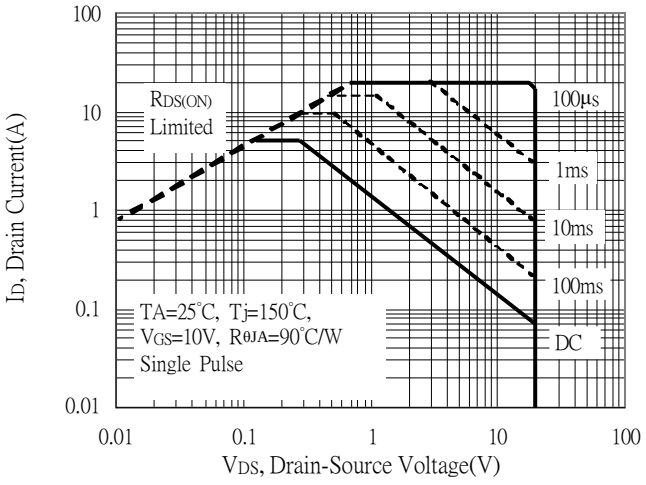

Single Pulse Power Rating, Junction to Ambient



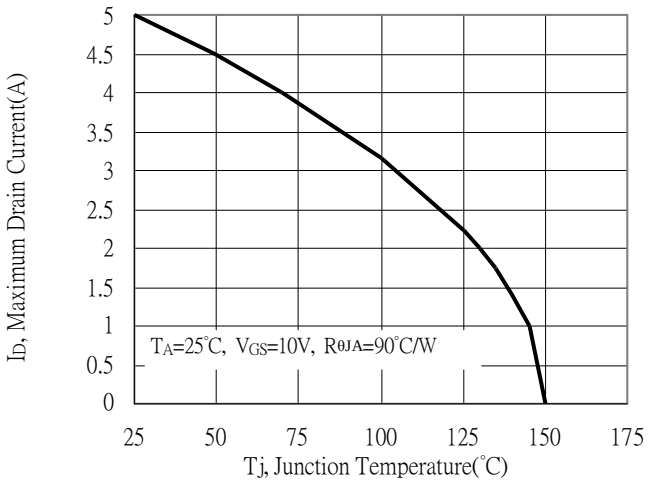

Gate Charge Characteristics



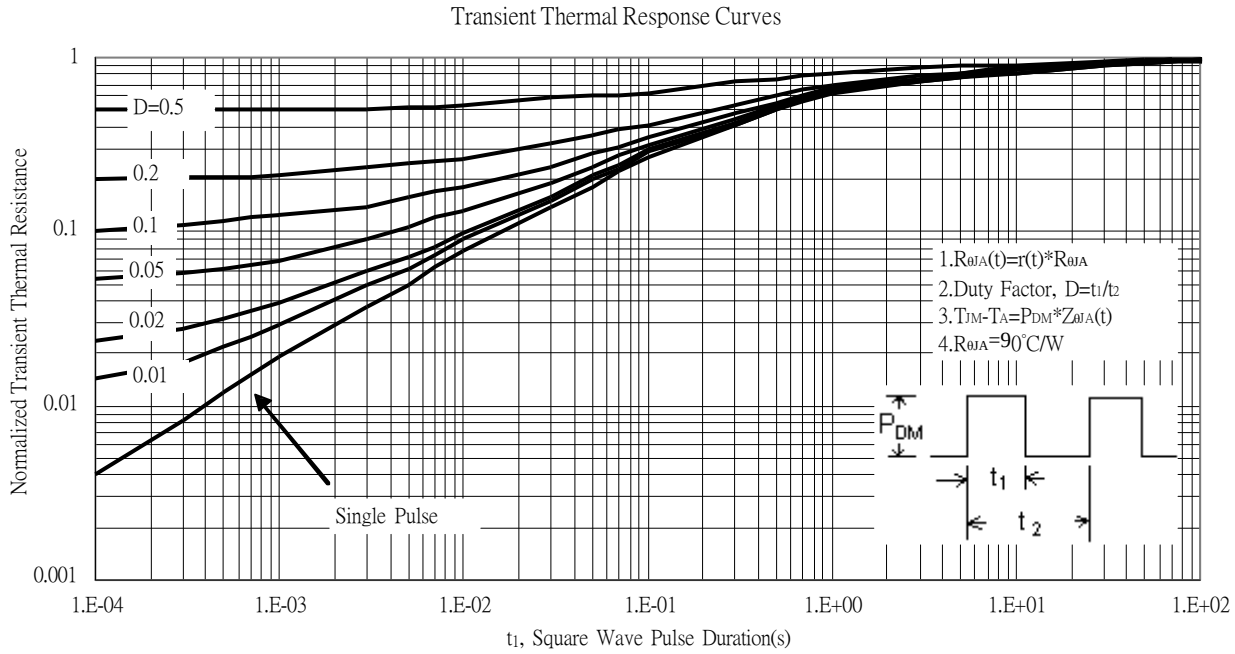

Maximum Safe Operating Area




Maximum Drain Current vs JunctionTemperature

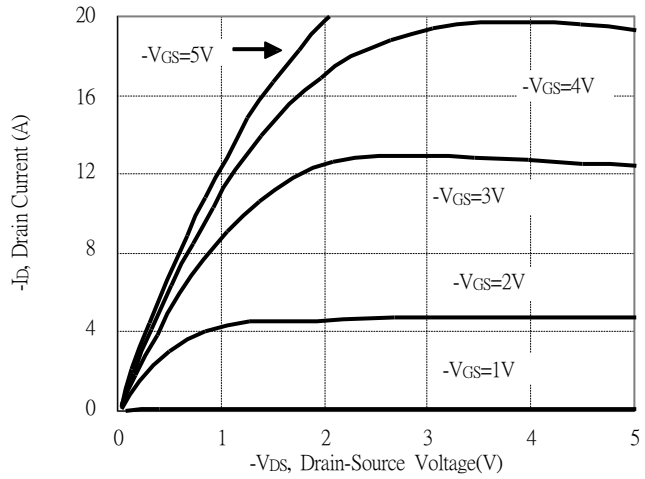


## N-channel Typical Characteristics(Cont.)

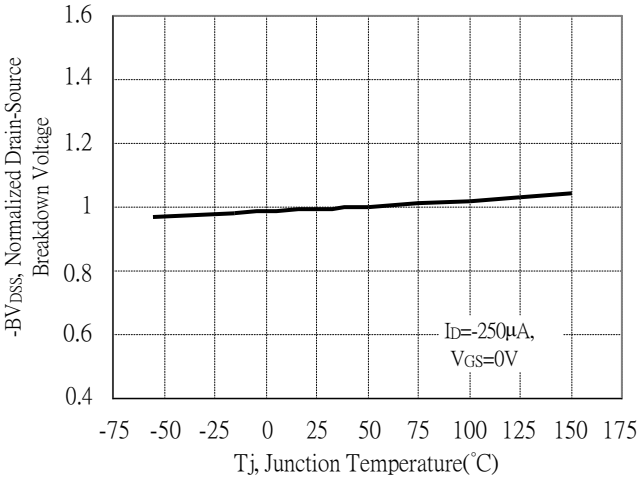


## P-channel Typical Characteristics

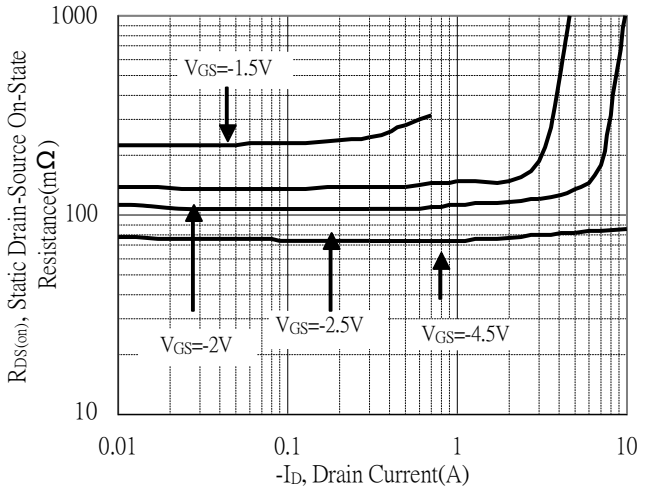
Typical Output Characteristics



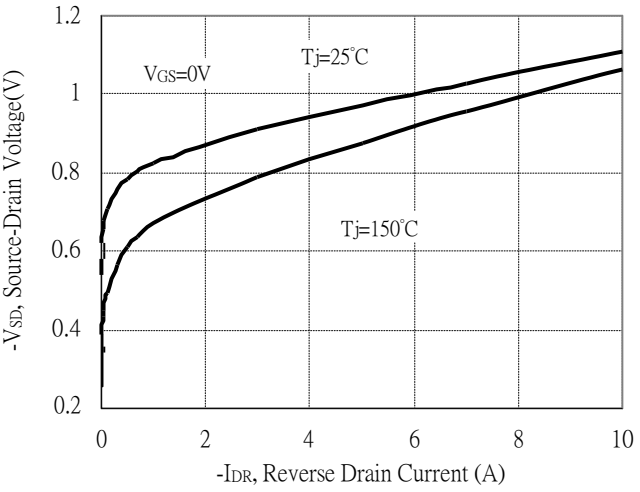

Brekdown Voltage vs Ambient Temperature



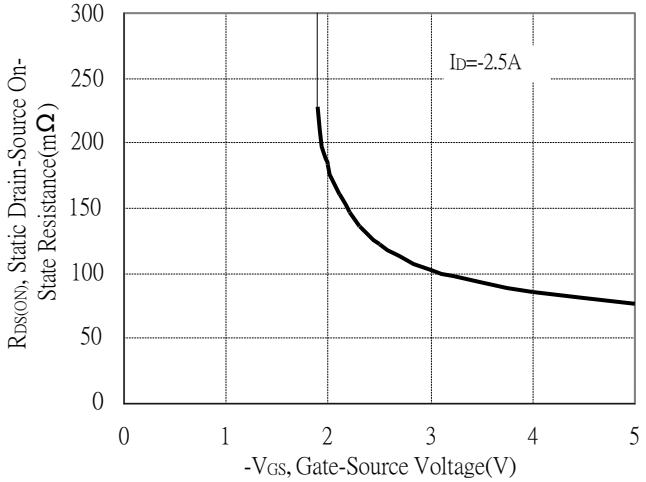

Static Drain-Source On-State resistance vs Drain Current



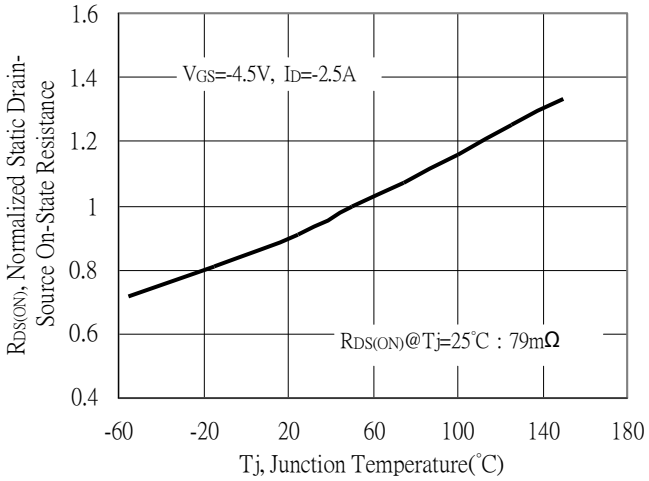

Reverse Drain Current vs Source-Drain Voltage




Static Drain-Source On-State Resistance vs Gate-Source Voltage

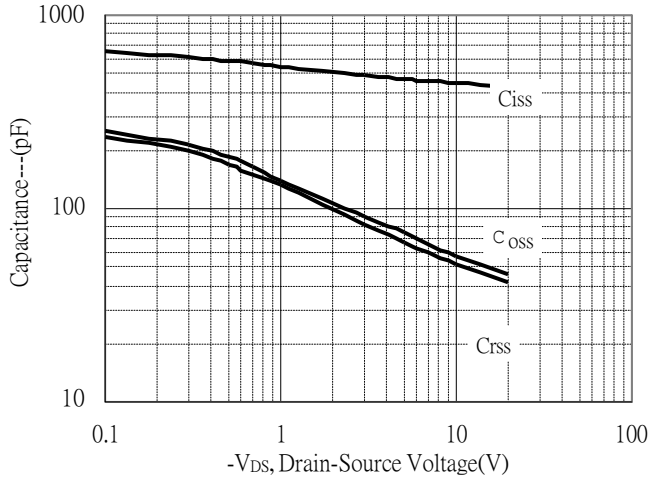



Drain-Source On-State Resistance vs Junction Tempearture

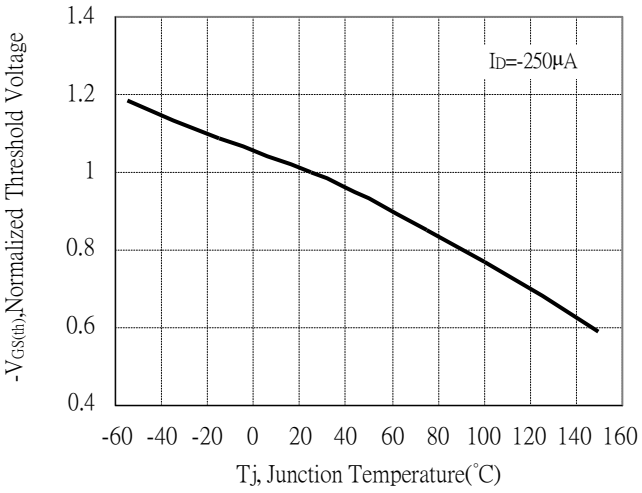


## P-channel Typical Characteristics(Cont.)

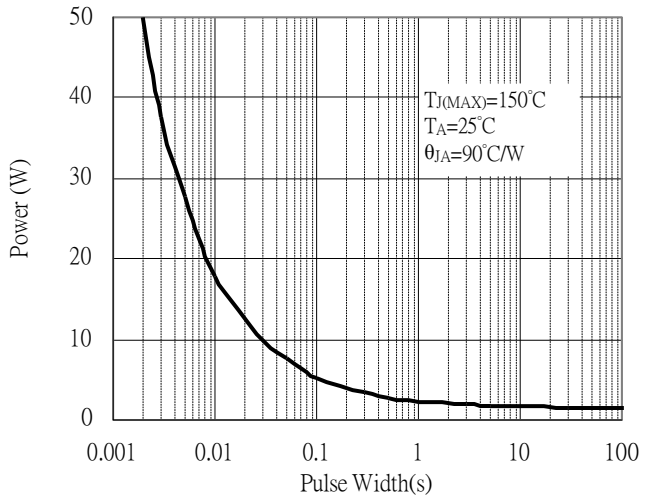
Capacitance vs Drain-to-Source Voltage



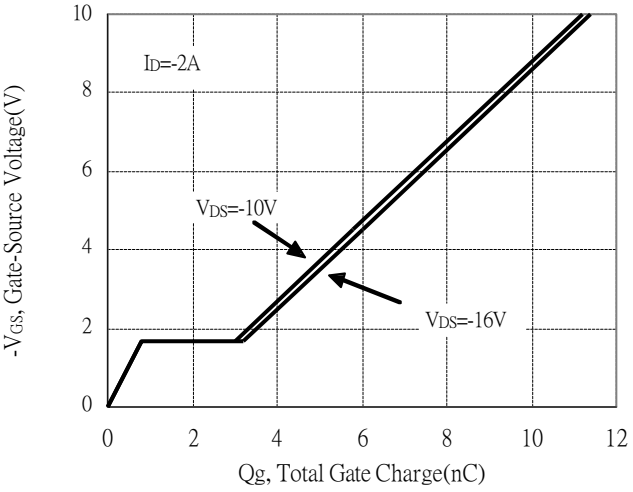

Threshold Voltage vs Junction Tempearture



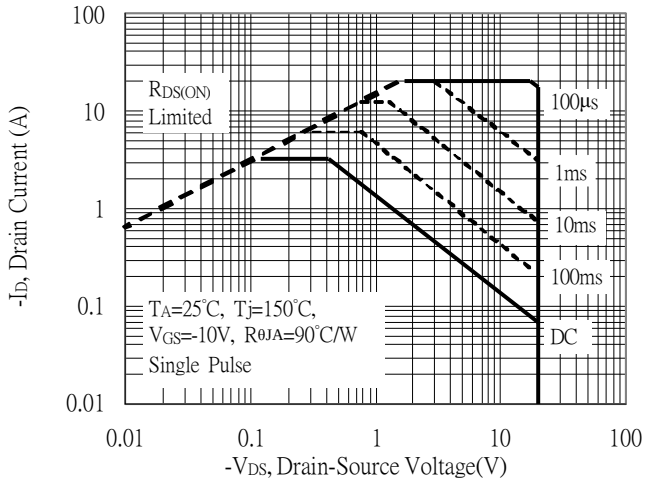

Single Pulse Power Rating, Junction to Ambient



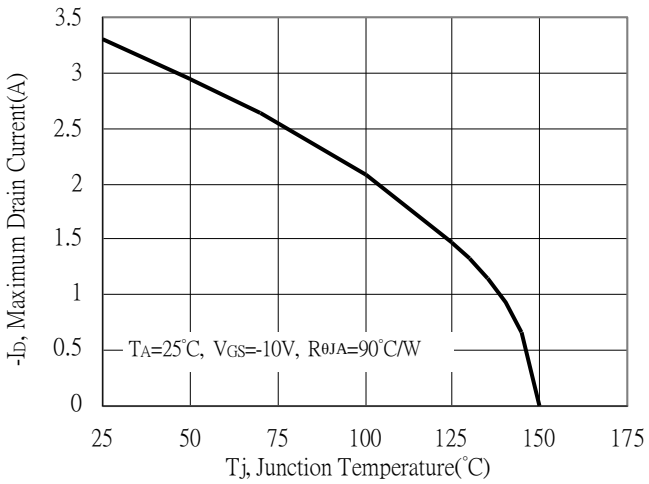

Gate Charge Characteristics



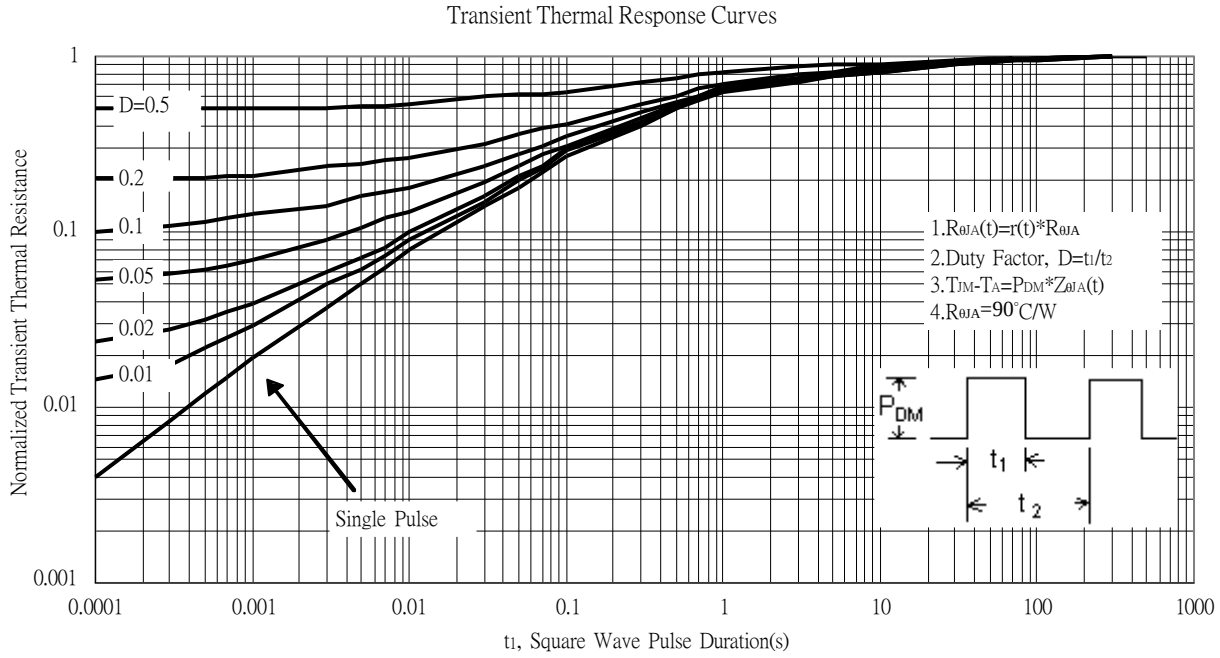

Maximum Safe Operating Area



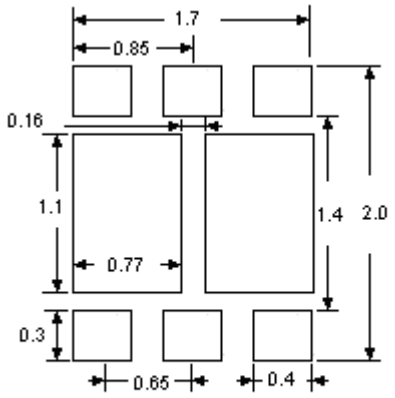

Maximum Drain Current vs JunctionTemperature



## P-channel Typical Characteristics(Cont.)




## Recommended Soldering Footprint

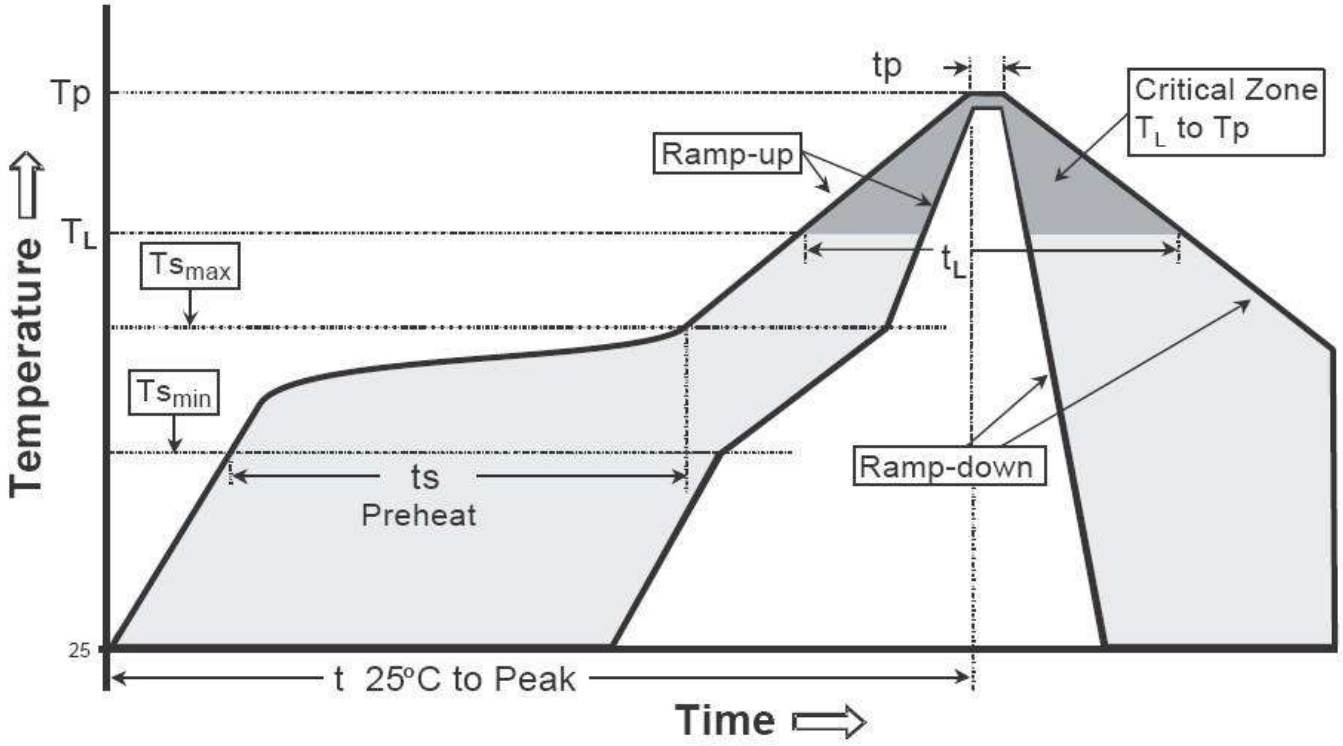



Unit : mm

## Recommended wave soldering condition

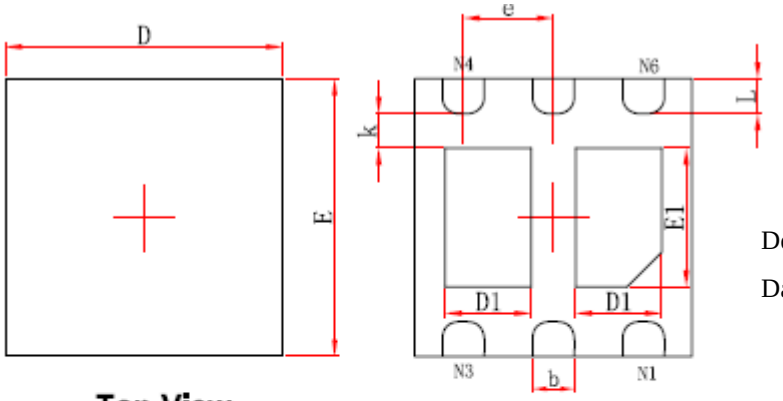
| Product | Peak Temperature | Soldering Time |
|---|---|---|
| Pb-free devices | 260 +0/-5 °C | 5 +1/-1 seconds |

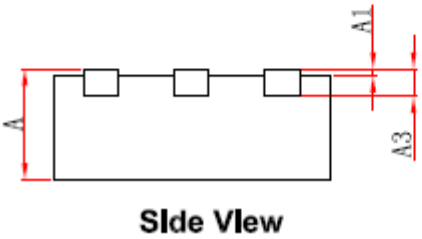
## Recommended temperature profile for IR reflow



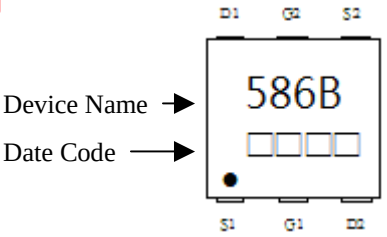

| Profile feature | Sn-Pb eutectic Assembly | Pb-free Assembly |
|---|---|---|
| Average ramp-up rate (Tsmax to Tp) | 3°C/second max. | 3°C/second max. |
| Preheat<br>−Temperature Min($T_S$ min)<br>−Temperature Max($T_S$ max)<br>−Time($t_{s\ min}$ to $t_{s\ max}$) | <br>100°C<br>150°C<br>60-120 seconds | <br>150°C<br>200°C<br>60-180 seconds |
| Time maintained above:<br>−Temperature ($T_L$)<br>– Time ($t_L$) | <br>183°C<br>60-150 seconds | <br>217°C<br>60-150 seconds |
| Peak Temperature($T_P$) | 240 +0/-5 °C | 260 +0/-5 °C |
| Time within 5°C of actual peak temperature(tp) | 10-30 seconds | 20-40 seconds |
| Ramp down rate | 6°C/second max. | 6°C/second max. |
| Time 25 °C to peak temperature | 6 minutes max. | 8 minutes max. |

Note : All temperatures refer to topside of the package, measured on the package body surface.




Marking:




6-Lead DFN2x2-6L Plastic
Surface Mounted Package
Code: DFA6

Style:
Pin 1. Source1 (S1)
Pin 2. Gate 1 (G1)
Pin 3. Drain2 (D2)
Pin 4. Source2 (S2)
Pin 5. Gate2 (G2)
Pin 6. Drain1 (D1)

| DIM | Millimeters | | Inches | | DIM | Millimeters | | Inches | |
|---|---|---|---|---|---|---|---|---|---|
| | Min. | Max. | Min. | Max. | | Min. | Max. | Min. | Max. |
| A | 0.700 | 0.900 | 0.028 | 0.035 | E1 | 0.900 | 1.100 | 0.035 | 0.043 |
| A1 | 0.000 | 0.050 | 0.000 | 0.002 | k | 0.200 | - | 0.008 | - |
| A3 | 0.203 REF | | 0.008 REF | | b | 0.250 | 0.350 | 0.010 | 0.014 |
| D | 1.950 | 2.050 | 0.077 | 0.081 | e | 0.650 TYP | | 0.026 TYP | |
| E | 1.950 | 2.050 | 0.077 | 0.081 | L | 0.200 | 0.300 | 0.008 | 0.012 |
| D1 | 0.570 | 0.770 | 0.022 | 0.030 | | | | | |