## Asymmetric Dual N- Channel Enhancement Mode MOSFET

# MTNN081404SH8

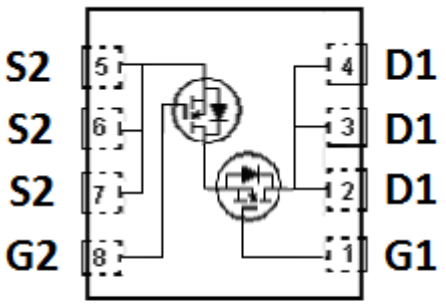
| | Tr 1 | Tr 2 |
|---|---|---|
| $BV_{DSS}$ | 40V | 40V |
| $I_D$@$V_{GS}$=10V, $T_A$=25°C | 9.8A | 12A |
| $I_D$@$V_{GS}$=10V, $T_C$=25°C | 44A | 65A |
| $R_{DSON(typ)}$@$V_{GS}$=10V | 9.8mΩ | 6.3mΩ |
| $R_{DSON(typ)}$@$V_{GS}$=4.5V | 14.3mΩ | 8.0mΩ |

## Features

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

## Equivalent Circuit

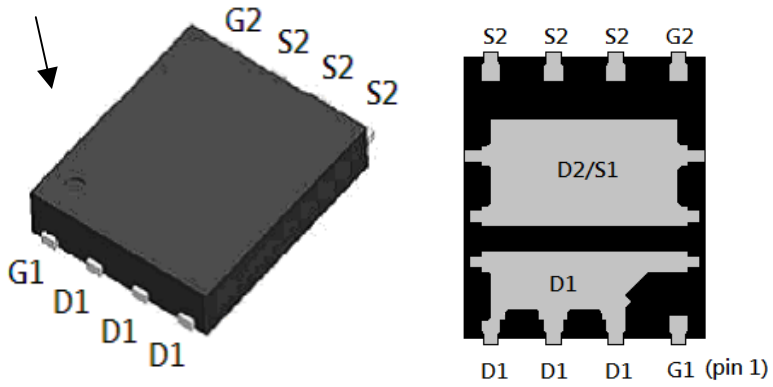
MTNN081404SH8




S1 and D2 are connected to the bottom side.

## Outline

DFN5x6




Top View

Bottom View

## Ordering Information

| Device | Package | Shipping |
|---|---|---|
| MTNN081404SH8-0-T6-G | DFN 5 x6<br>(Pb-free lead plating & halogen-free package) | 3000 pcs / Tape & Reel |

Environment friendly grade : S for RoHS compliant products, G for RoHS compliant and green compound products

Packing spec, T3 : 2500 pcs / tape & reel, 13" reel

Product rank, zero for no rank products

Product name

## Absolute Maximum Ratings (Tc=25°C, unless otherwise noted)

| Parameter | | Symbol | Limits | | Unit |
|---|---|---|---|---|---|
| | | | Tr 1 | Tr 2 | |
| Drain-Source Breakdown Voltage | | $BV_{DSS}$ | 40 | 40 | V |
| Gate-Source Voltage | | $V_{GS}$ | ±20 | ±20 | |
| Continuous Drain Current | $T_A$=25 °C, $V_{GS}$=10V | $I_D$ | 9.8 | 12 | A |
| | $T_A$=70 °C, $V_{GS}$=10V | | 7.8 | 9.6 | |
| | $T_C$=25 °C, $V_{GS}$=10V | | 44 | 65 | |
| | $T_C$=100 °C, $V_{GS}$=10V | | 27.8 | 41 | |
| Pulsed Drain Current (Note 1 & 2) | | $I_{DM}$ | 88 | 130 | |
| Single Pulse Avalanche Current @ L=0.1mH | | $I_{AS}$ | 20 | 40 | |
| Single Pulse Avalanche Energy (Note 4) | | $E_{AS}$ | 20 | 80 | mJ |
| Power Dissipation | $T_A$=25 °C (Note 3) | $P_{DSM}$ | 2.01 | 2.08 | W |
| | $T_A$=70 °C (Note 3) | | 1.2 | 1.3 | |
| | $T_C$=25 °C | $P_D$ | 48 | 69 | |
| | $T_C$=100 °C | | 19 | 27 | |
| Operating Junction and Storage Temperature Range | | Tj; Tstg | -55~+150 | | °C |

## Thermal Data

| Parameter | Symbol | Value | | Unit |
|---|---|---|---|---|
| Thermal Resistance, Junction-to-case, max | $R_{\theta JC}$ | 2.6 | 1.8 | °C/W |
| Thermal Resistance, Junction-to-ambient, max | $R_{\theta JA}$ | 62 | 60 | |
| Thermal Resistance, Junction-to-ambient, max (Note 3) | | 27 | 25 | |

Note : 1. Pulse width limited by maximum junction temperature
2. Duty cycle≤1%
3. Surface mounted on 1 in² copper pad of FR-4 board, t≤10s; 125°C/W when mounted on minimum copper pad.
4. For Tr 1, 100% tested by conditions of L=0.5mH, $V_{DD}$=15V, $V_{GS}$=10V, $I_{AS}$=5A; for Tr 2, 100% tested by conditions of L=0.5mH, $V_{DD}$=15V, $V_{GS}$=10V, $I_{AS}$=12A

## Tr 1, Electrical Characteristics (Tc=25°C, unless otherwise specified)

| Symbol | Min. | Typ. | Max. | Unit | Test Conditions |
|---|---|---|---|---|---|
| **Static** | | | | | |
| $BV_{DSS}$ | 40 | - | - | V | $V_{GS}$=0V, $I_D$=250μA |
| $V_{GS(th)}$ | 1.0 | - | 2.5 | | $V_{DS}$=$V_{GS}$, $I_D$=250μA |
| $I_{GSS}$ | - | - | ±100 | nA | $V_{GS}$=±20V, $V_{DS}$=0V |
| $I_{DSS}$ | - | - | 1 | μA | $V_{DS}$=32V, $V_{GS}$=0V |
| | - | - | 25 | | $V_{DS}$=30V, $V_{GS}$=0V, Tj=125°C |
| *$R_{DS(ON)}$ | - | 9.8 | 14 | mΩ | $V_{GS}$=10V, $I_D$=12A |
| | - | 14.3 | 19.5 | | $V_{GS}$=4.5V, $I_D$=10A |
| *$G_{FS}$ | - | 7.8 | - | S | $V_{DS}$=10V, $I_D$=5A |

| | | | | | |
|---|---|---|---|---|---|
| **Dynamic** | | | | | |
| Ciss | - | 708 | - | pF | $V_{DS}$=20V, $V_{GS}$=0V, f=1MHz |
| Coss | - | 107 | - | | |
| Crss | - | 55 | - | | |
| *$t_{d(ON)}$ | - | 8.4 | - | ns | $V_{DS}$=20V, $I_D$=12A, $V_{GS}$=10V, $R_G$=1Ω |
| *tr | - | 13 | - | | |
| *$t_{d(OFF)}$ | - | 25.6 | - | | |
| *tf | - | 7.4 | - | | |
| *Qg($V_{GS}$=10V) | - | 14.6 | - | nC | $V_{DS}$=20V, $I_D$=12A, $V_{GS}$=10V |
| *Qg($V_{GS}$=4.5V) | - | 7.3 | | | |
| *Qgs | - | 2 | - | | |
| *Qgd | - | 4 | - | | |
| **Body Diode** | | | | | |
| *$V_{SD}$ | - | 0.73 | 1 | V | $V_{GS}$=0V, $I_S$=1A |
| *trr | - | 10.8 | - | ns | $I_F$=6A, $dI_F/dt$=100A/μs |
| *Qrr | - | 4.6 | - | nC | |

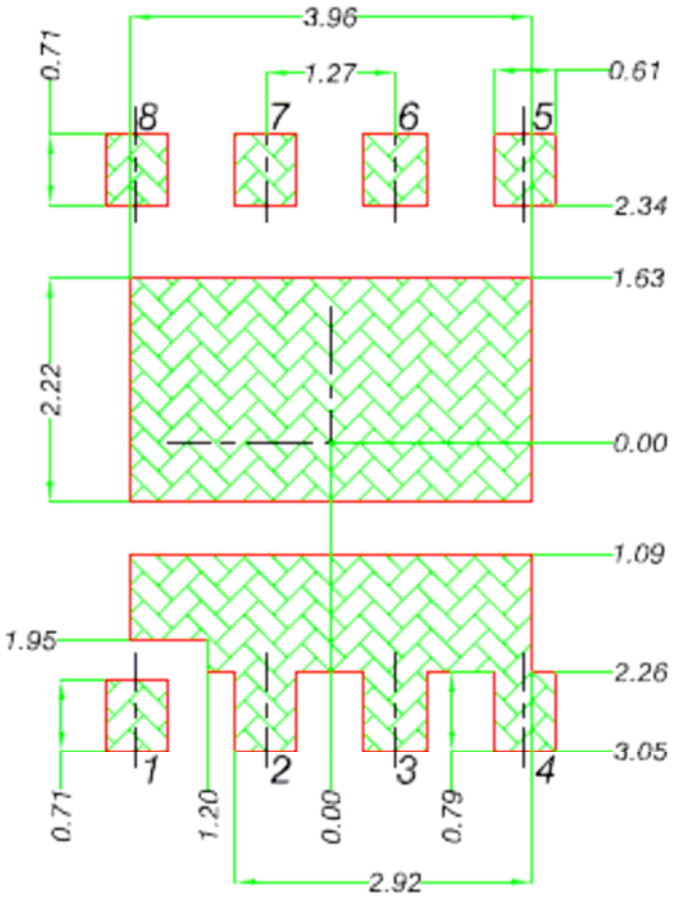
*Pulse Test : Pulse Width ≤300μs, Duty Cycle≤2%

## Tr 2, Electrical Characteristics (Tc=25°C, unless otherwise specified)

| Symbol | Min. | Typ. | Max. | Unit | Test Conditions |
|---|---|---|---|---|---|
| **Static** | | | | | |
| $BV_{DSS}$ | 40 | - | - | V | $V_{GS}$=0V, $I_D$=-250μA |
| $V_{GS(th)}$ | 1.0 | - | 2.5 | | $V_{DS}$=VGS, $I_D$=-250μA |
| $I_{GSS}$ | - | - | ±100 | nA | $V_{GS}$=±20V, $V_{DS}$=0V |
| $I_{DSS}$ | - | - | 1 | μA | $V_{DS}$=32V, $V_{GS}$=0V |
| | - | - | 25 | | $V_{DS}$=30V, $V_{GS}$=0V, Tj=125°C |
| *$R_{DS(ON)}$ | - | 6.3 | 8 | mΩ | $V_{GS}$=10V, $I_D$=12A |
| | - | 8.0 | 12 | | $V_{GS}$=4.5V, $I_D$=10A |
| *$G_{FS}$ | - | 11.4 | - | S | $V_{DS}$=10V, $I_D$=7A |
| **Dynamic** | | | | | |
| Ciss | - | 1466 | - | pF | $V_{DS}$=20V, $V_{GS}$=0V, f=1MHz |
| Coss | - | 178 | - | | |
| Crss | - | 117 | - | | |
| *$t_{d(ON)}$ | - | 13.6 | - | ns | $V_{DS}$=20V, $I_D$=12A, $V_{GS}$=10V, $R_G$=1Ω |
| *tr | - | 15.4 | - | | |
| *$t_{d(OFF)}$ | - | 43.2 | - | | |
| *tf | - | 8.2 | - | | |
| *Qg($V_{GS}$=10V) | - | 31.2 | - | nC | $V_{DS}$=20V, $I_D$=12A, $V_{GS}$=10V |
| *Qg($V_{GS}$=4.5V) | - | 15.9 | - | | |
| *Qgs | - | 5.3 | - | | |
| *Qgd | - | 7.2 | - | | |
| **Body Diode** | | | | | |
| *$V_{SD}$ | - | 0.72 | 1 | V | $V_{GS}$=0V, $I_S$=1A |
| *trr | - | 15 | - | ns | $I_F$=12A, $dI_F/dt$=100A/μs |
| *Qrr | - | 8.2 | - | nC | |

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

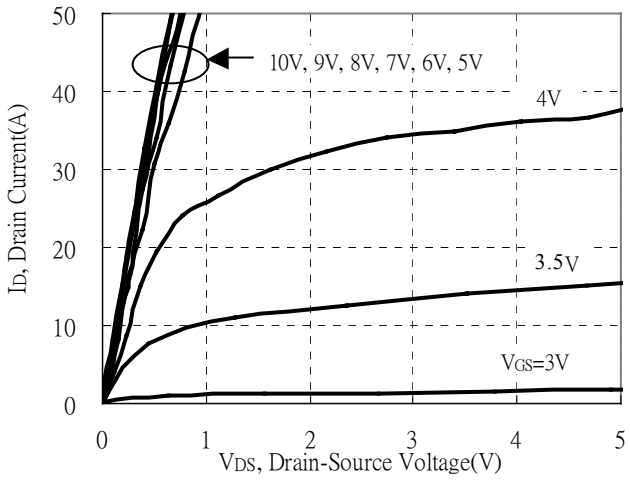
## Recommended Soldering Footprint



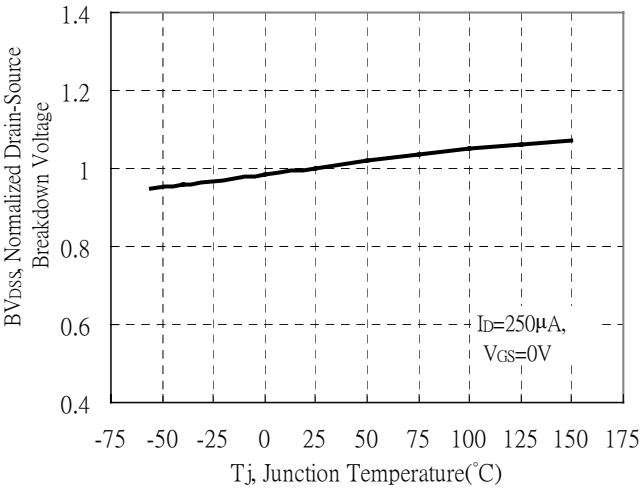

unit : mm

## Typical Characteristics : Q1( N-channel )

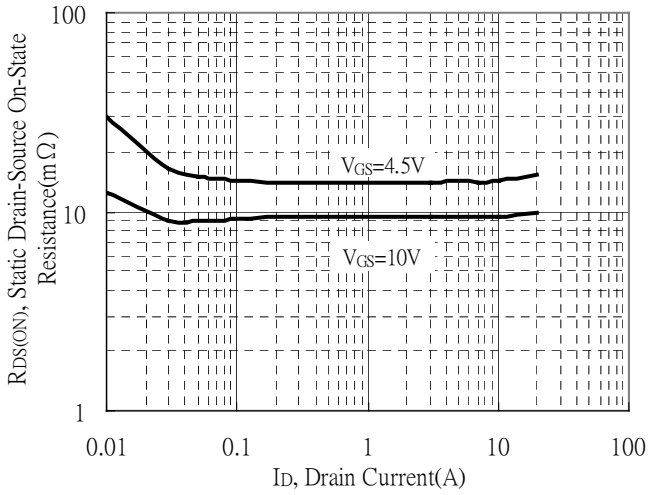
Typical Output Characteristics



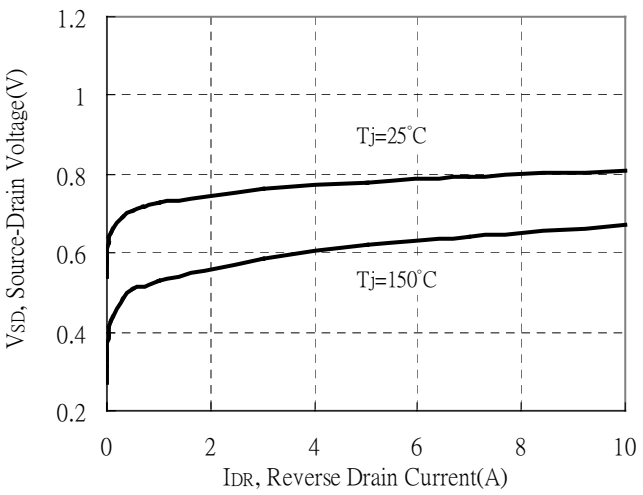

Brekdown Voltage vs Ambient Temperature



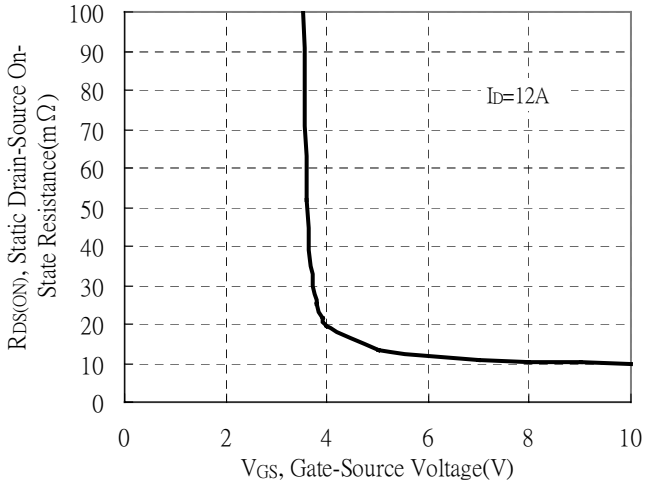

Static Drain-Source On-State resistance vs Drain Current



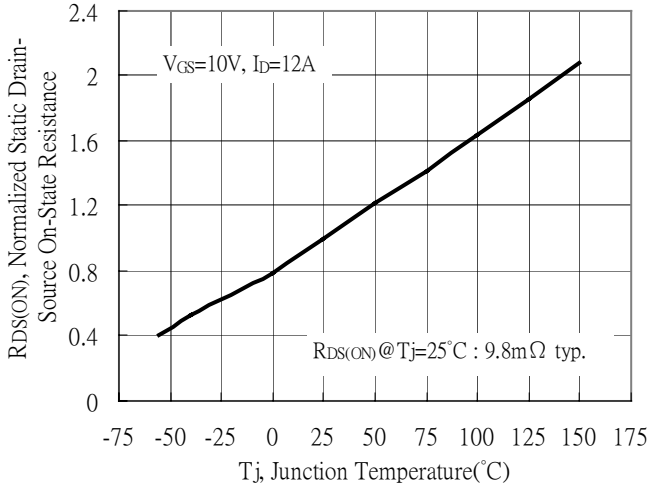

Reverse Drain Current vs Source-Drain Voltage




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

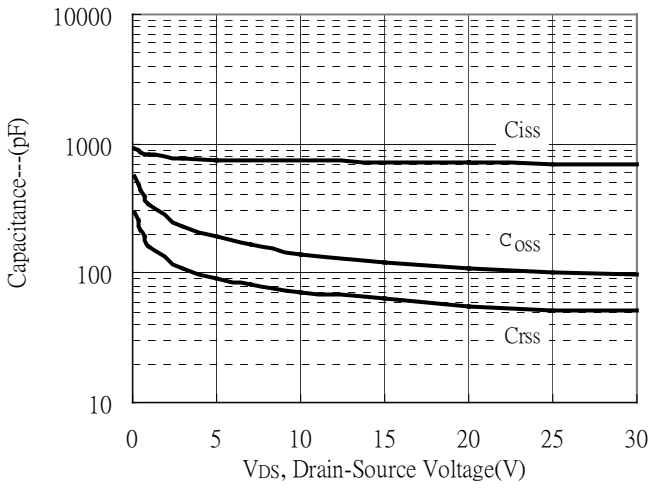



Drain-Source On-State Resistance vs Junction Tempearture

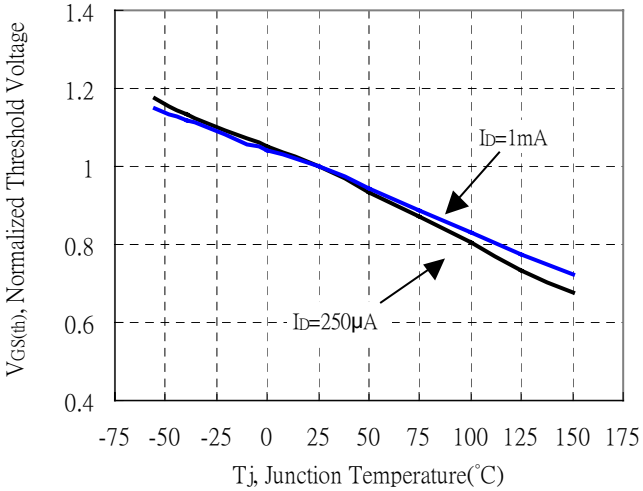


## Typical Characteristics(Cont.) : Q1( N-channel)

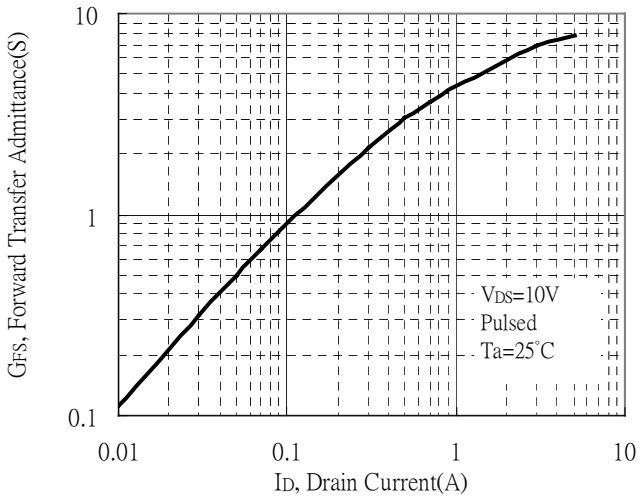
Capacitance vs Drain-to-Source Voltage



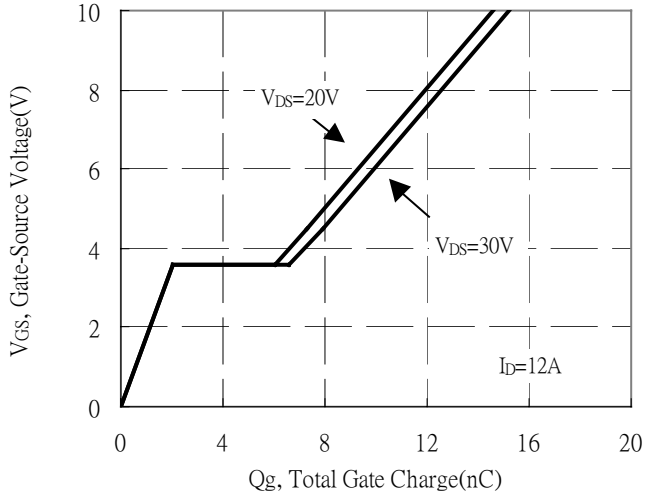

Threshold Voltage vs Junction Tempearture



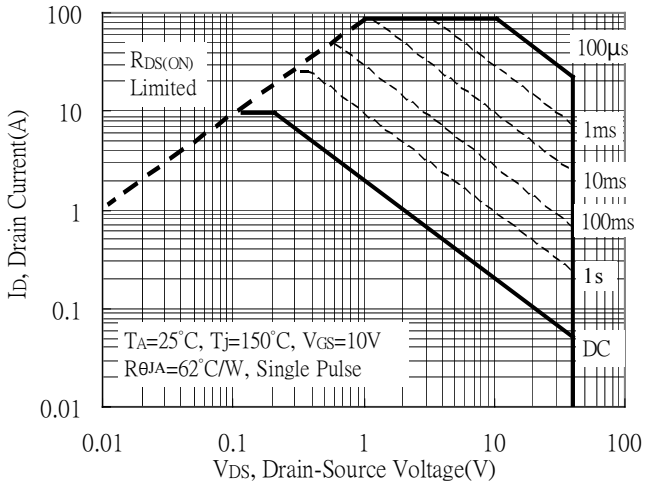

Forward Transfer Admittance vs Drain Current



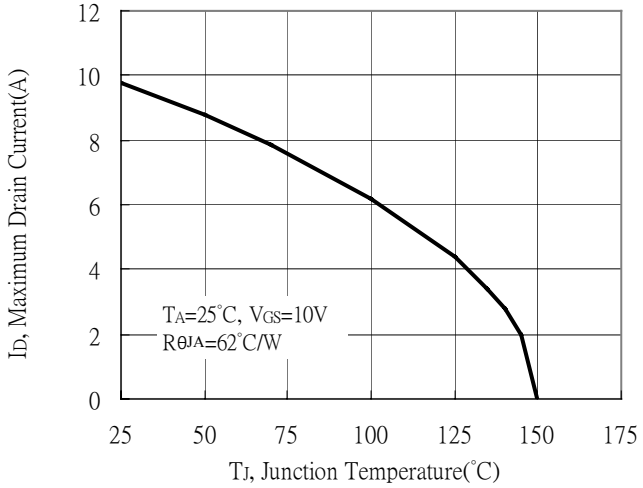

Gate Charge Characteristics




Maximum Safe Operating Area

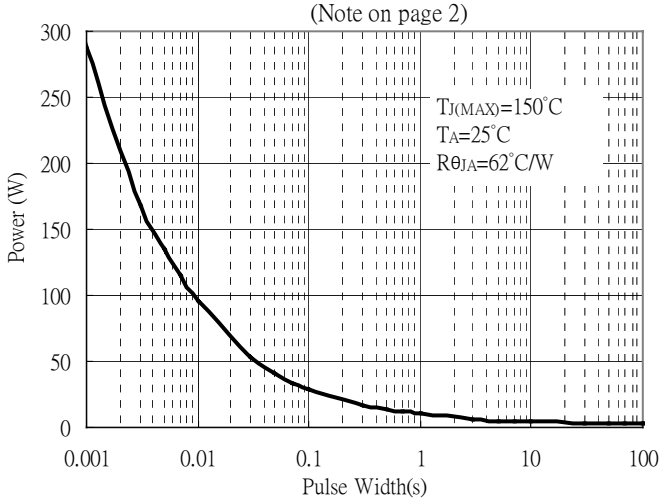



Maximum Drain Current vs JunctionTemperature

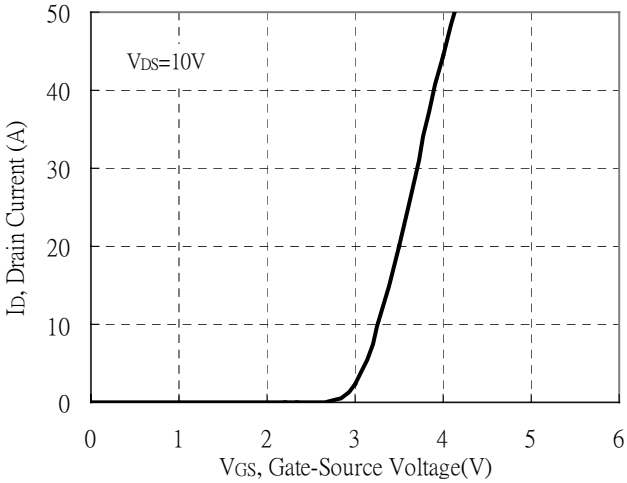


## Typical Characteristics(Cont.) : Q1( N-channel)

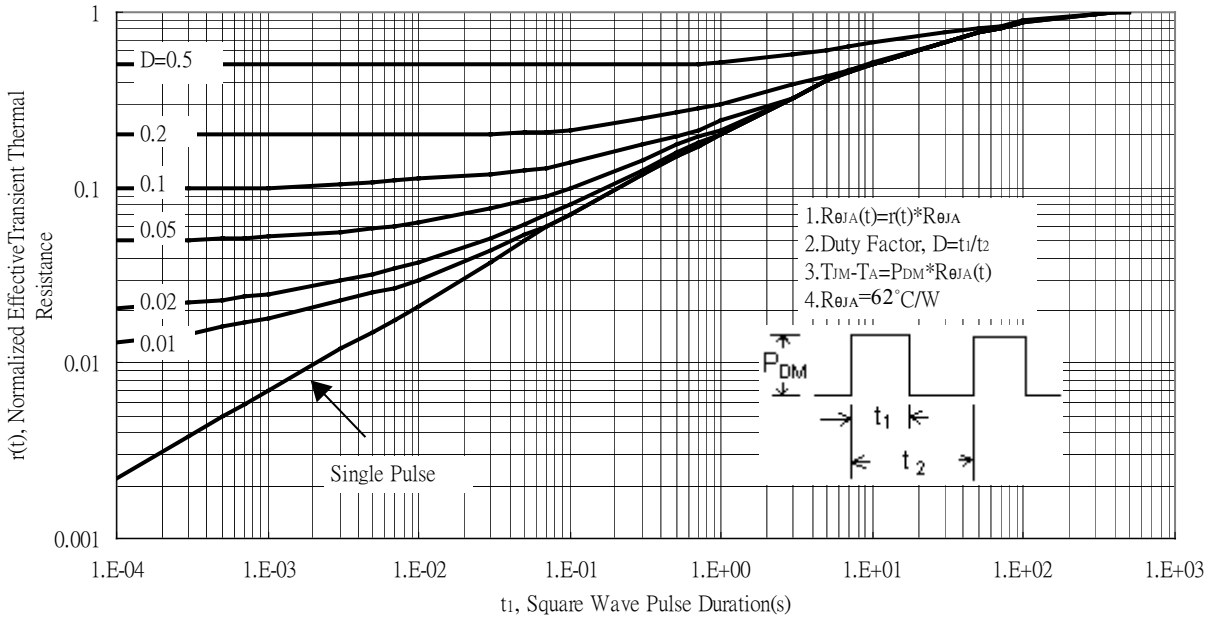
Single Pulse Power Rating, Junction to Ambient
(Note on page 2)




Typical Transfer Characteristics

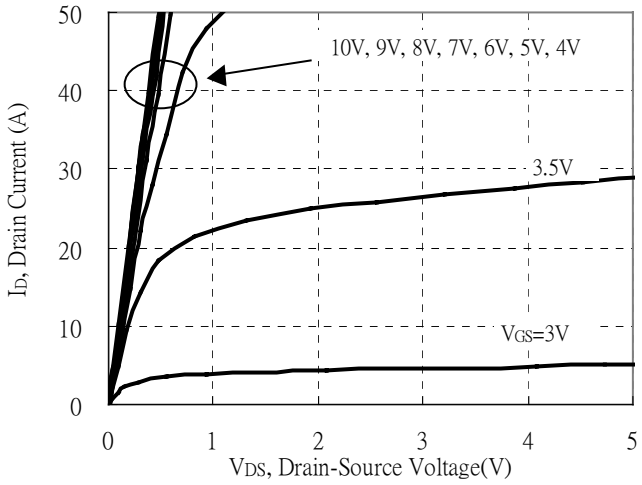



Transient Thermal Response Curves

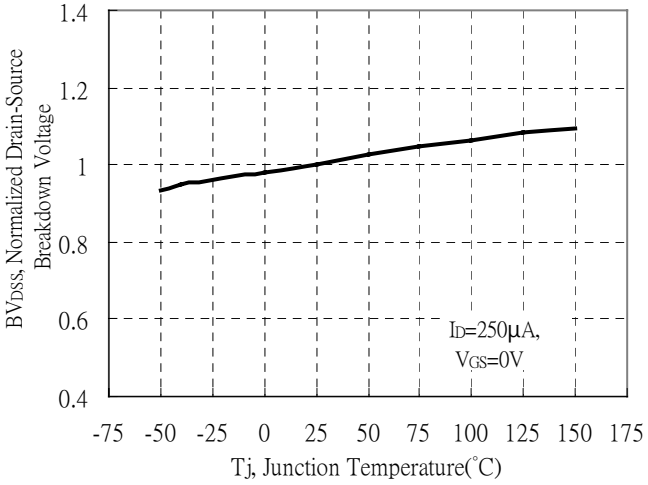


## Typical Characteristics : Q2( N-channel)

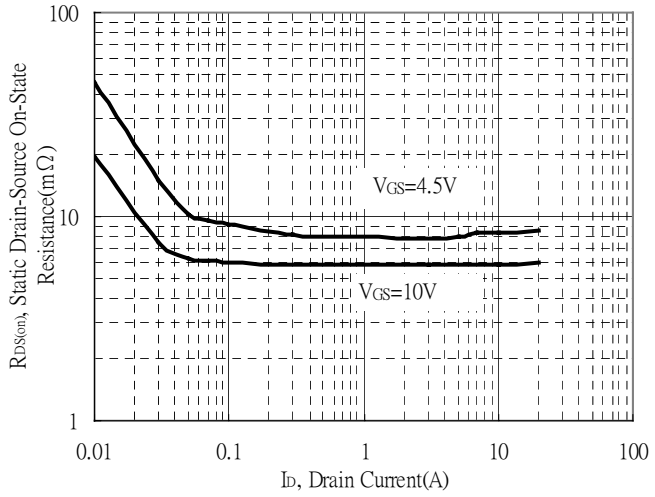
Typical Output Characteristics



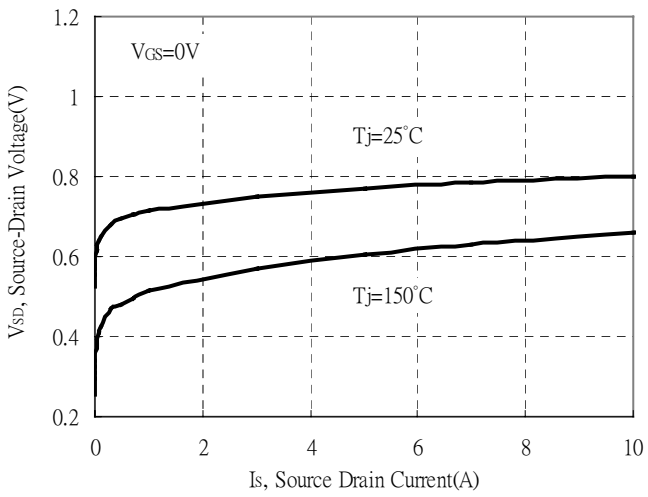

Brekdown Voltage vs Ambient Temperature



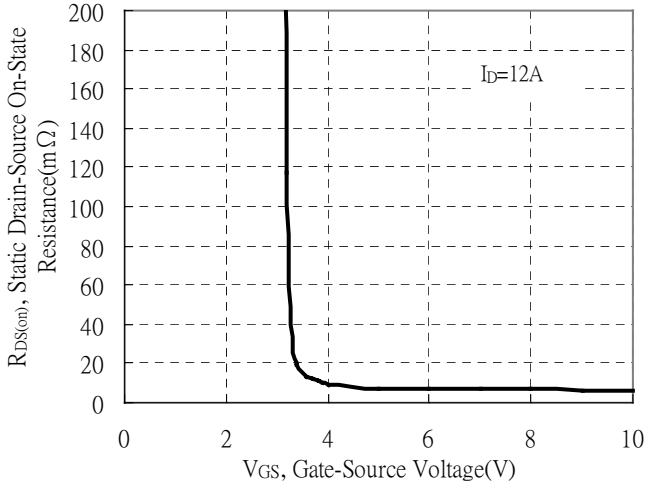

Static Drain-Source On-State resistance vs Drain Current



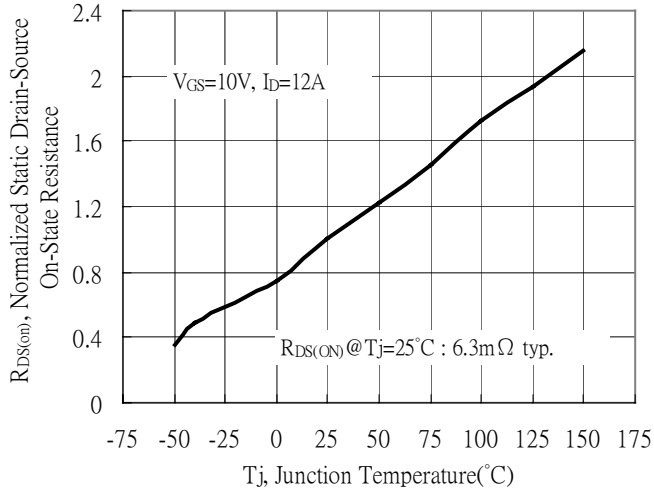

Source Drain Current vs Source-Drain Voltage




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

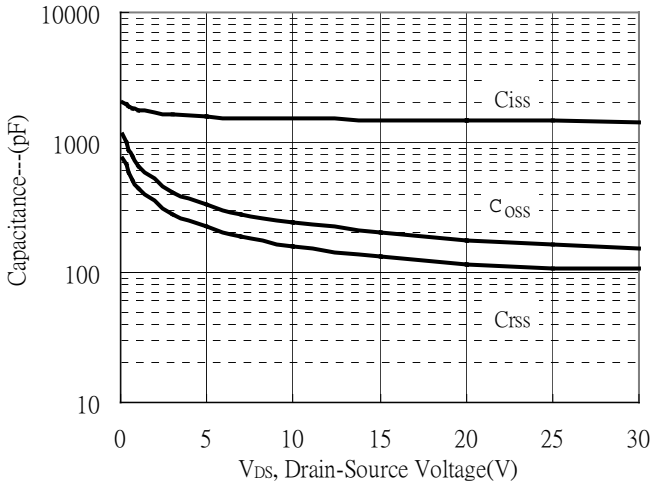



Drain-Source On-State Resistance vs Junction Tempearture

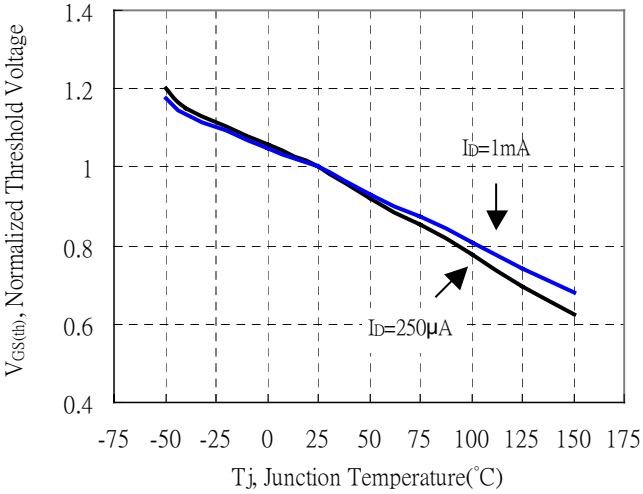


## Typical Characteristics(Cont.) : Q2(N-channel)

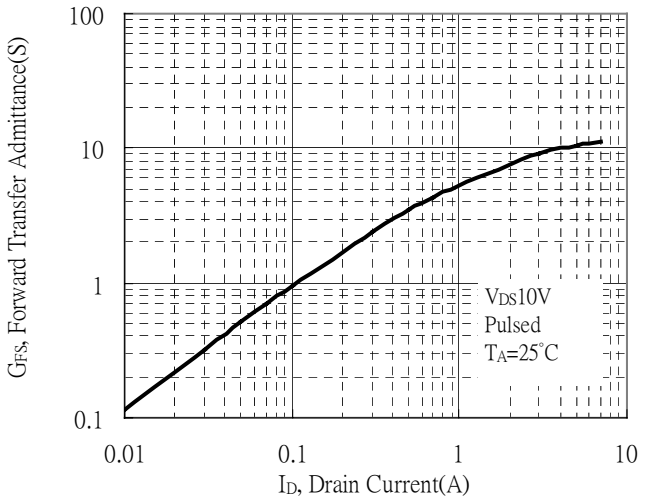
Capacitance vs Drain-to-Source Voltage



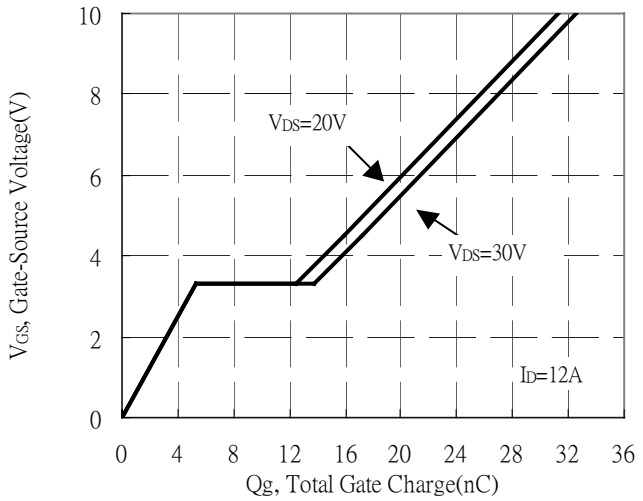

Threshold Voltage vs Junction Tempearture



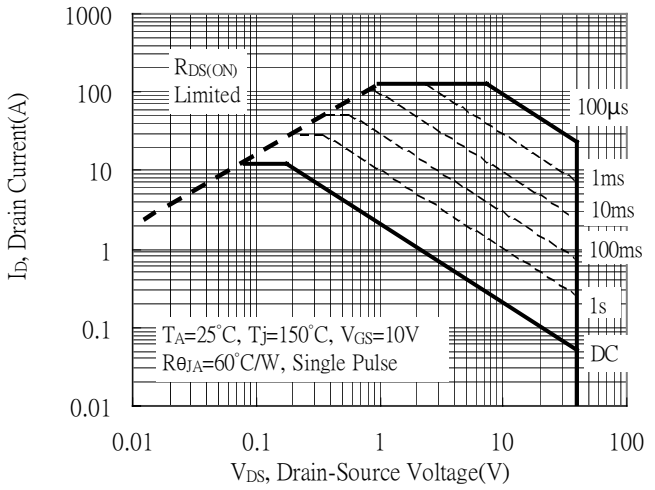

Forward Transfer Admittance vs Drain Current



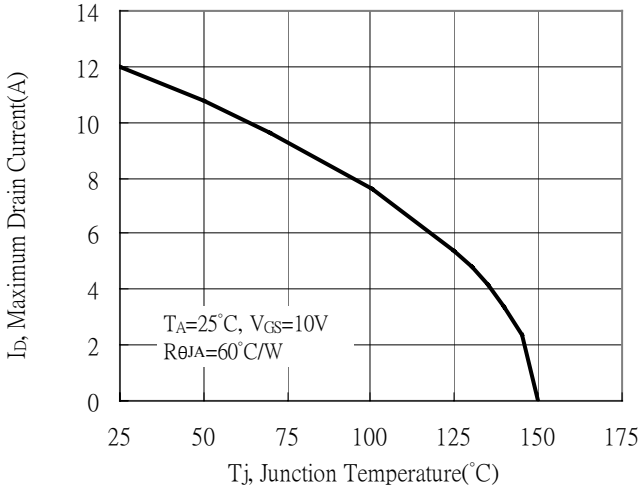

Gate Charge Characteristics




Maximum Safe Operating Area

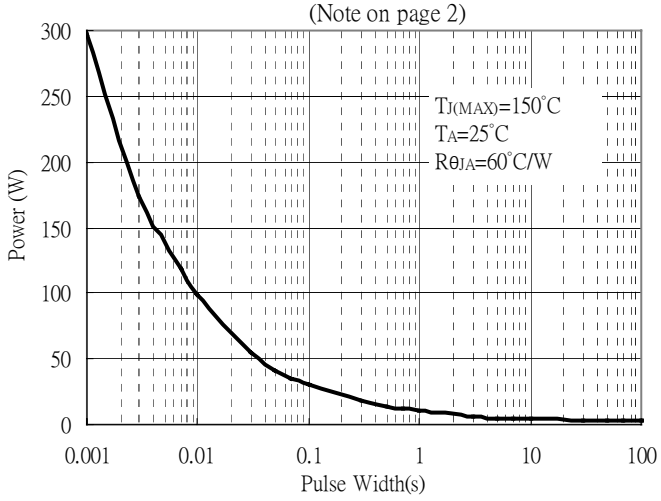



Maximum Drain Current vs Junction Temperature

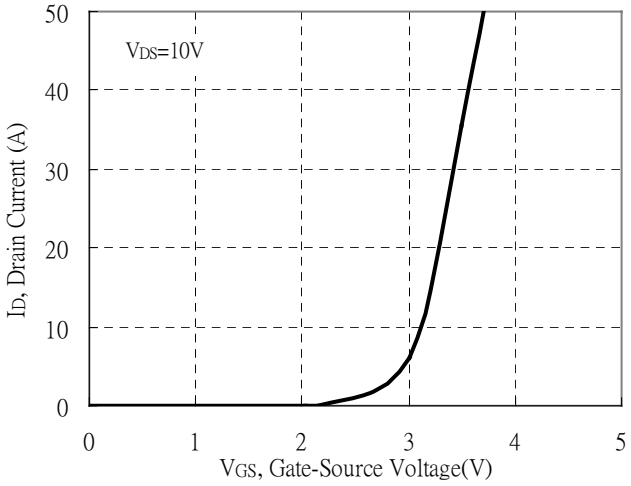


## Typical Characteristics(Cont.) : Q2(N-channel)

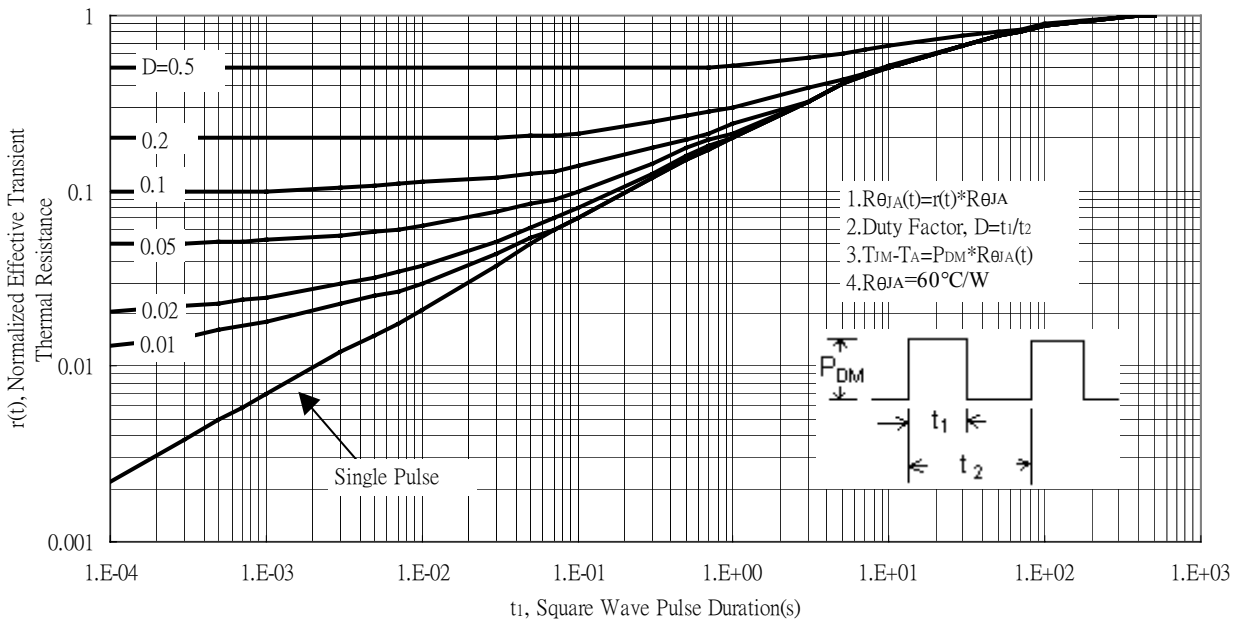
Single Pulse Power Rating, Junction to Ambient
(Note on page 2)



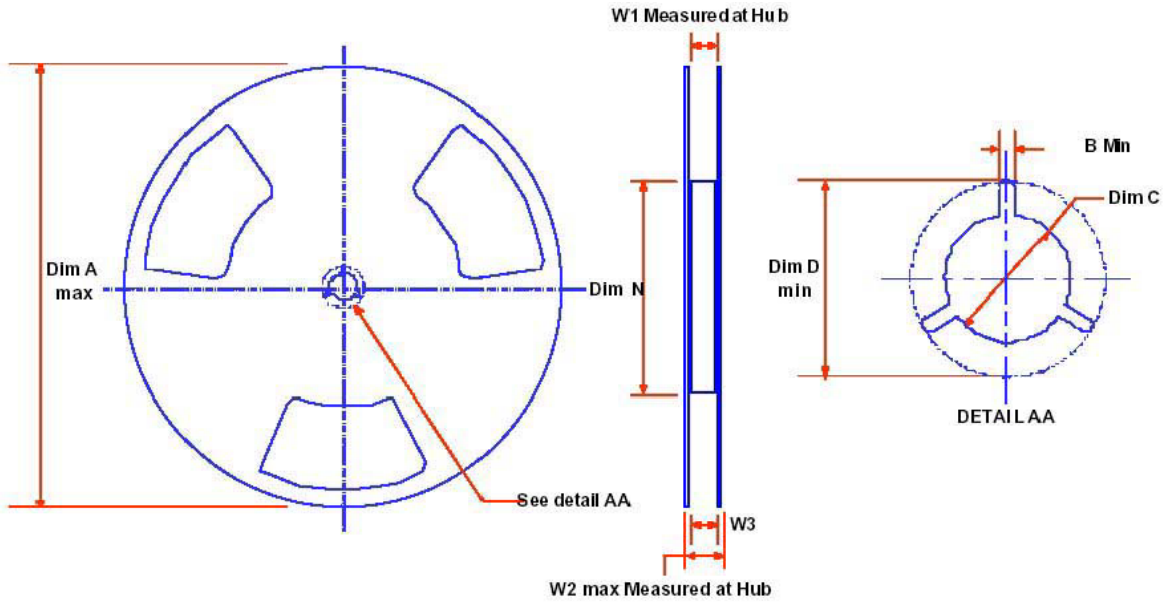

Typical Transfer Characteristics




Transient Thermal Response Curves



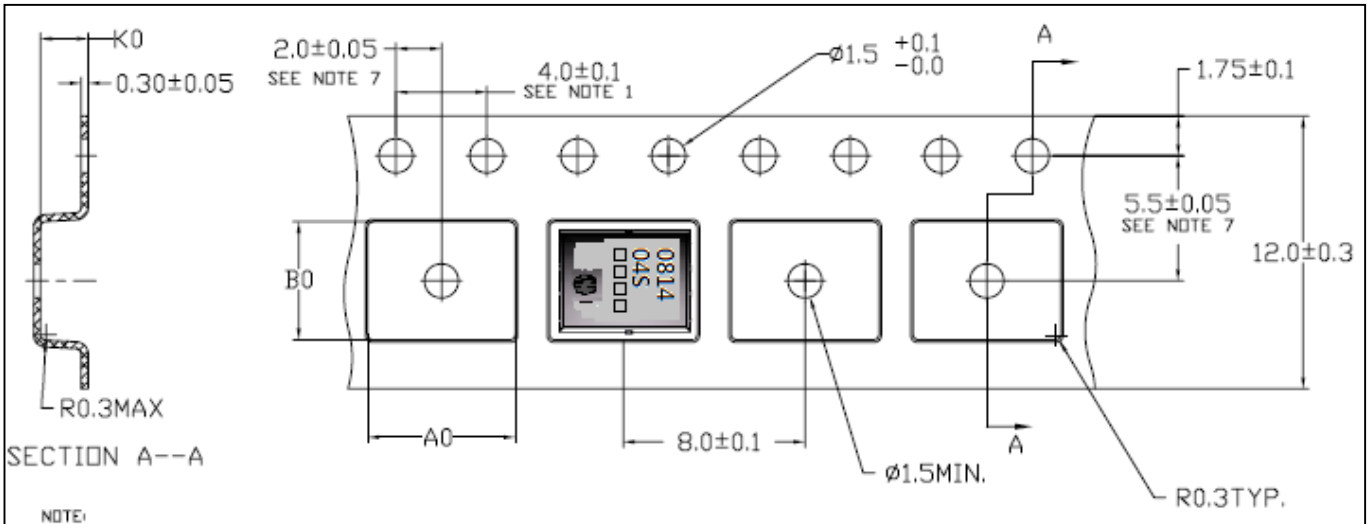
## Reel Dimension




Dimensions are in inches and millimeters

| Tape Size | Reel Option | Dim A | Dim B | Dim C | Dim D | Dim N | Dim W1 | Dim W2 | Dim W3 (LSL-USL) |
|---|---|---|---|---|---|---|---|---|---|
| 12mm | 13" Dia (STD/L99Z) | 13.00<br>330+/-1 | 0.059<br>1.5 Min. | 0.512<br>13.0 Min. | 0.795<br>20.2 (ref.) | 7.00<br>178+0/-2 | 0.488 +0.078/-0.000<br>12.4 +2/0 | 0.724<br>18.4 (ref.) | 0.469 – 0.606<br>11.9 – 15.4 |

## Carrier Tape Dimension



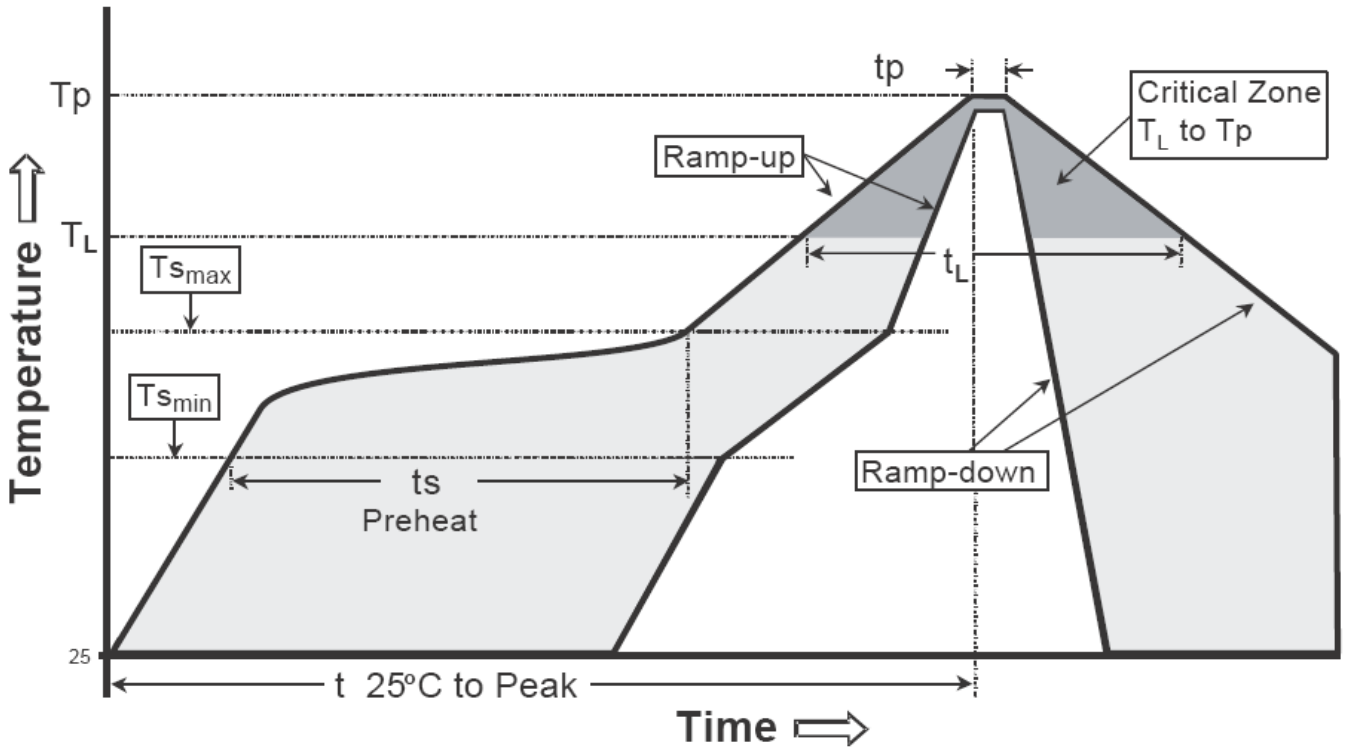

NOTE:
1. 10 SPROCKET HOLE PITCH CUMULATIVE TOLERANCE ±0.2
2. CAMBER NOT TO EXCEED 1mm IN 100mm, NONCUMULATIVE OVER 250mm.
3. MATERIAL: BLACK STATIC DISSIPATIVE PS.(POLYSTYRENE)
4. ALL DIMENSIONS ARE IN MILLIMETERS (UNLESS OTHERWISE SPECIFIED)
5. A0 AND B0 MEASURED ON A PLANE 0.3mm ABOVE THE BOTTOM OF THE POCKET
6. K0 MEASURED FROM A PLANE ON THE INSIDE BOTTOM OF THE POCKET TO THE TOP SURFACE OF THE CARRIER
7. POCKET POSITION RELATIVE TO SPROCKET HOLE MEASURED AS TRUE POSITION OF POCKET, NOT POCKET HOLE
8. SURFACE RESISTIVITY
   *1X10E4~1X10E11 OHMS/SQ.*
   1X10E4~1X10E6 OHMS/SQ. for Fairchild Only

A0=6.5±0.1
B0=5.3±0.1
K0=1.4±0.1

## Recommended wave soldering condition

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

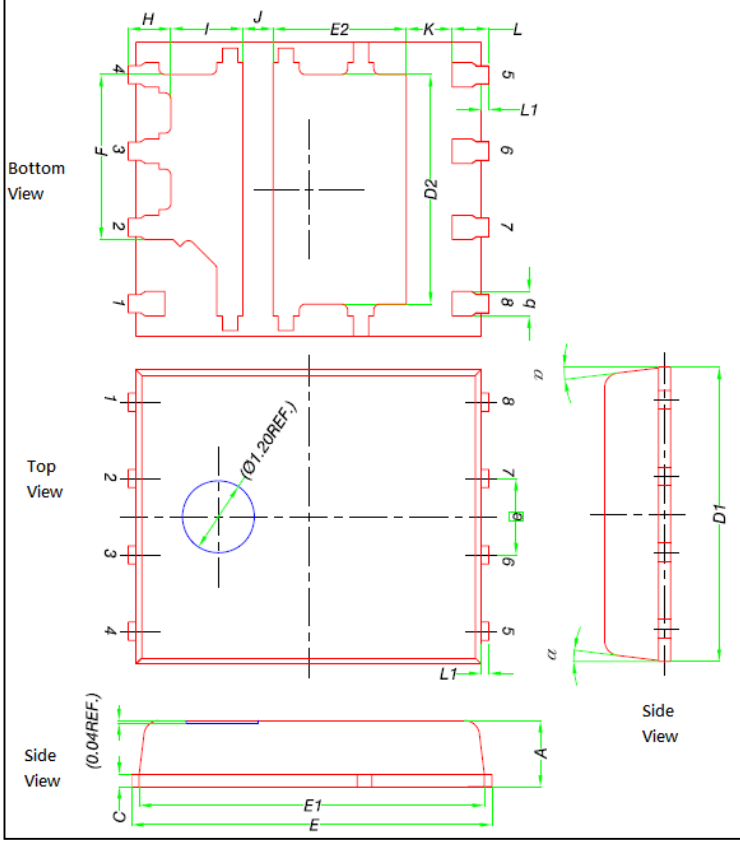
## Recommended temperature profile for IR reflow

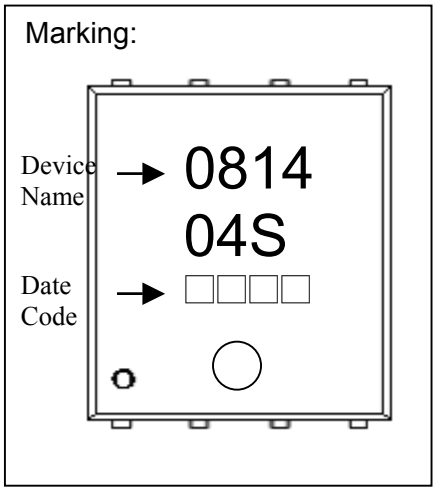



| Profile feature | Sn-Pb eutectic Assembly | Pb-free Assembly |
|---|---|---|
| Average ramp-up rate (Tsmax to Tp) | 3°C/second max. | 3°C/second max. |
| Preheat<br>−Temperature Min($T_S$ min)<br>−Temperature Max($T_S$ max)<br>−Time($t_{s\ min}$ to $t_{s\ max}$) | <br>100°C<br>150°C<br>60-120 seconds | <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.

## DFN5x6 Dimension




8-Lead DFN5x6 Plastic Package
CYS Package Code : H8

Note:
1. All Dimension Are In mm.
2. Package Body Sizes Exclude Mold Flash, Protrusion Or Gate Burrs. Mold Flash, Protrusion Or Gate Burrs Shall Not Exceed 0.10 mm Per Side.
3. Package Body Sizes Determined At The Outermost Extremes Of The Plastic Body Exclusive Of Mold Flash, Tie Bar , Tie Bar Burrs, Gate Burrs And Interlead Flash, But Including Any Mismatch Between The Top And Bottom Of The Plastic Body.
4. The Package Top May Be Smaller Than The Package Bottom.

| DIM | Millimeters | | Inches | | DIM | Millimeters | | Inches | |
|---|---|---|---|---|---|---|---|---|---|
| | Min. | Max. | Min. | Max. | | Min. | Max. | Min. | Max. |
| A | 0.90 | 1.10 | 0.035 | 0.043 | F | 2.55 | 2.90 | 0.100 | 0.114 |
| b | 0.33 | 0.51 | 0.013 | 0.020 | H | 0.61 | 0.81 | 0.024 | 0.032 |
| C | 0.20 | 0.30 | 0.008 | 0.012 | I | 1.10 | 1.30 | 0.043 | 0.051 |
| D1 | 4.80 | 5.00 | 0.189 | 0.197 | J | 0.40 | 0.60 | 0.016 | 0.024 |
| D2 | 3.61 | 3.96 | 0.142 | 0.156 | K | 0.50 | - | 0.020 | - |
| E | 5.90 | 6.10 | 0.232 | 0.240 | L | 0.51 | 0.71 | 0.020 | 0.028 |
| E1 | 5.70 | 5.80 | 0.224 | 0.228 | L1 | 0.06 | 0.20 | 0.002 | 0.008 |
| E2 | 2.02 | 2.42 | 0.080 | 0.095 | $\alpha$ | 0° | 12° | 0° | 12° |
| e | 1.27 BSC | | 0.050 BSC | | | | | | |

Notes: 1.Controlling dimension: millimeters.
2.Maximum lead thickness includes lead finish thickness, and minimum lead thickness is the minimum thickness of base material.
3.If there is any question with packing specification or packing method, please contact your local CYStek sales office.

Material:

- Lead: Pure tin plated.
- Mold Compound: Epoxy resin family, flammability solid burning class: UL94V-0.