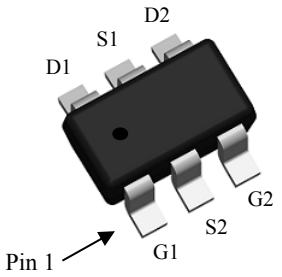
# AP10H03LI

## N- AND P-Channel Enhancement Mode MOSFET

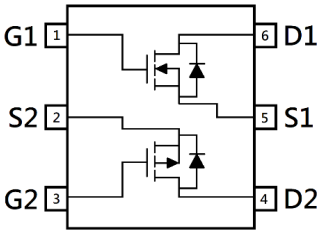
| | N-CH | P-CH |
|---|---|---|
| $BV_{DSS}$ | 30V | -30V |
| $I_D$@$V_{GS}$=(-)10V, $T_A$=25°C | 4.6A | -3.5A |
| $R_{DS(ON)}$ typ. @ $V_{GS}$=(-)10V | 19 mΩ | 41mΩ |
| $R_{DS(ON)}$ typ. @ $V_{GS}$=(-)4.5V | 25mΩ | 57mΩ |




TSOP-6

## Features

- Low On Resistance
- Low Gate Charge
- Fast Switching Characteristic




G : Gate S : Source D : Drain

## Absolute Maximum Ratings ($T_A$=25°C)

| Parameter | | Symbol | Limits | | Unit |
|---|---|---|---|---|---|
| | | | N-CH | P-CH | |
| Drain-Source Voltage | | $V_{DS}$ | 30 | -30 | V |
| Gate-Source Voltage | | $V_{GS}$ | ±20 | ±20 | |
| Continuous Drain Current @ $V_{GS}$=(-)10V, $T_A$=25°C | | $I_D$ | 4.6 | -3.5 | A |
| Continuous Drain Current @ $V_{GS}$=(-)10V, $T_A$=70°C | | | 3.7 | -2.8 | |
| Pulsed Drain Current | | $I_{DM}$ | 18 | 14 | |
| Continuous Body Diode Forward Current @ $T_A$=25°C | | $I_S$ | 0.9 | -0.9 | |
| Avalanche Current @ L=0.1mH | | $I_{AS}$ | 10 | -9 | |
| Avalanche Energy @ L=0.5mH | | $E_{AS}$ | 9 | 6.3 | mJ |
| Total Power Dissipation | $T_A$=25°C | $P_D$ | 1.1 | | W |
| | $T_A$=70°C | | 0.7 | | |
| Operating Junction and Storage Temperature Range | | $T_J$, $T_{stg}$ | -55~+150 | | °C |

## Thermal Data

| Parameter | Symbol | Steady State | Unit |
|---|---|---|---|
| Thermal Resistance, Junction-to-ambient | $R_{\theta JA}$ | 113 | °C/W |

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

| Symbol | Min. | Typ. | Max. | Unit | Test Conditions |
|---|---|---|---|---|---|
| **Static** | | | | | |
| $BV_{DSS}$ | 30 | - | - | V | $V_{GS}$=0V, $I_D$=250μA |
| $V_{GS(th)}$ | 1 | - | 2.5 | | $V_{DS}$=$V_{GS}$, $I_D$=250μA |
| $G_{FS}$ | - | 5.4 | - | S | $V_{DS}$=10V, $I_D$=3A |
| $I_{GSS}$ | - | - | ±100 | nA | $V_{GS}$=±20V, $V_{DS}$=0V |
| $I_{DSS}$ | - | - | 1 | μA | $V_{DS}$=24V, $V_{GS}$=0V |
| $R_{DS(ON)}$ | - | 19 | 25 | mΩ | $V_{GS}$=10V, $I_D$=4A |
| | - | 25 | 35 | | $V_{GS}$=4.5V, $I_D$=3A |
| **Dynamic** | | | | | |
| Ciss | - | 510 | - | pF | $V_{DS}$=15V, $V_{GS}$=0V, f=1MHz |
| Coss | - | 75 | - | | |
| Crss | - | 58 | - | | |
| Rg | - | 4.5 | - | Ω | f=1MHz |
| Qg *1, 2 | - | 13 | - | nC | $V_{DS}$=15V, $I_D$=6A, $V_{GS}$=10V |
| Qgs *1, 2 | - | 1.6 | - | | |
| Qgd *1, 2 | - | 2.5 | - | | |
| $t_{d(ON)}$ *1, 2 | - | 5.6 | - | ns | $V_{DS}$=15V, $I_D$=6A, $V_{GS}$=10V, $R_{GS}$=1Ω |
| tr *1, 2 | - | 7.5 | - | | |
| $t_{d(OFF)}$ *1, 2 | - | 26 | - | | |
| $t_f$ *1, 2 | - | 4.5 | - | | |
| **Source-Drain Diode** | | | | | |
| $V_{SD}$ *1 | - | 0.85 | 1.2 | V | $I_S$=6A, $V_{GS}$=0V |
| trr | - | 7 | - | ns | $I_F$=6A, $dI_F/dt$=100A/μs |
| Qrr | - | 3 | - | nC | |

Note:

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

*2. Independent of operating temperature

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

| Symbol | Min. | Typ. | Max. | Unit | Test Conditions |
|---|---|---|---|---|---|
| **Static** | | | | | |
| $BV_{DSS}$ | -30 | - | - | V | $V_{GS}$=0V, $I_D$=-250μA |
| $V_{GS(th)}$ | -1 | - | -2.5 | | $V_{DS}$=$V_{GS}$, $I_D$=-250μA |
| $G_{FS}$ | - | 5.4 | - | S | $V_{DS}$=-10V, $I_D$=-5A |
| $I_{GSS}$ | - | - | ±100 | nA | $V_{GS}$=±20V, $V_{DS}$=0V |
| $I_{DSS}$ | - | - | -1 | μA | $V_{DS}$=-24V, $V_{GS}$=0V |
| $R_{DS(ON)}$ | - | 41 | 54 | mΩ | $V_{GS}$=-10V, $I_D$=-3A |
| | - | 57 | 80 | | $V_{GS}$=-4.5V, $I_D$=-2A |
| **Dynamic** | | | | | |
| Ciss | - | 640 | - | pF | $V_{DS}$=-15V, $V_{GS}$=0V, f=1MHz |
| Coss | - | 75 | - | | |
| Crss | - | 65 | - | | |
| Rg | - | 25 | - | Ω | f=1MHz |
| Qg *1, 2 | - | 14 | - | nC | $V_{DS}$=-15V, $I_D$=-5A, $V_{GS}$=-10V |
| Qgs *1, 2 | - | 2 | - | | |
| Qgd *1, 2 | - | 3 | - | | |
| $t_{d(ON)}$ *1, 2 | - | 6 | - | ns | $V_{DS}$=-15V, $I_D$=-5A, $V_{GS}$=-10V, $R_{GS}$=1Ω |
| tr *1, 2 | - | 18 | - | | |
| $t_{d(OFF)}$ *1, 2 | - | 50 | - | | |
| $t_f$ *1, 2 | - | 16 | - | | |
| **Source-Drain Diode** | | | | | |
| $V_{SD}$ *1 | - | -0.8 | -1.2 | V | $I_S$=-1.7A, $V_{GS}$=0V |
| trr | - | 7.7 | - | ns | $I_F$=-1.7A, $dI_F/dt$=100A/μs |
| Qrr | - | 2.9 | - | nC | |

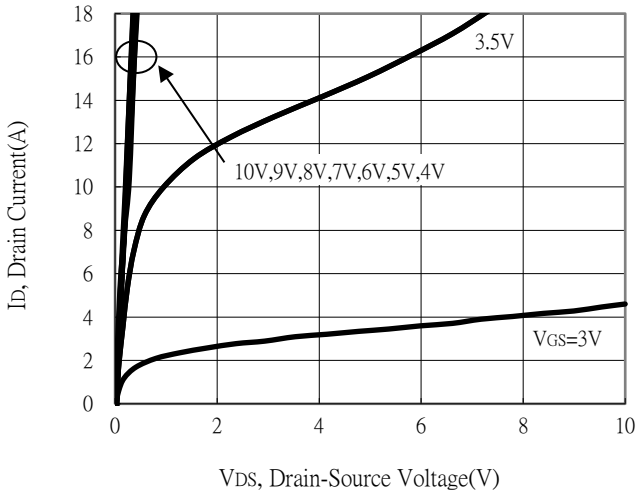
Note:

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

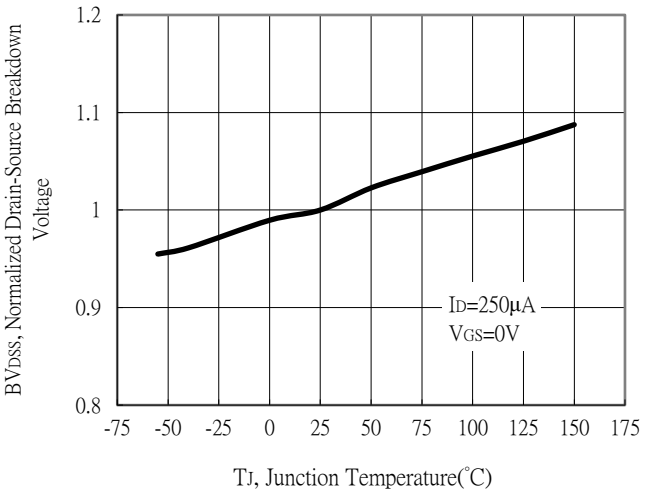
*2. Independent of operating temperature

## Typical Characteristics : Q1( N-channel )

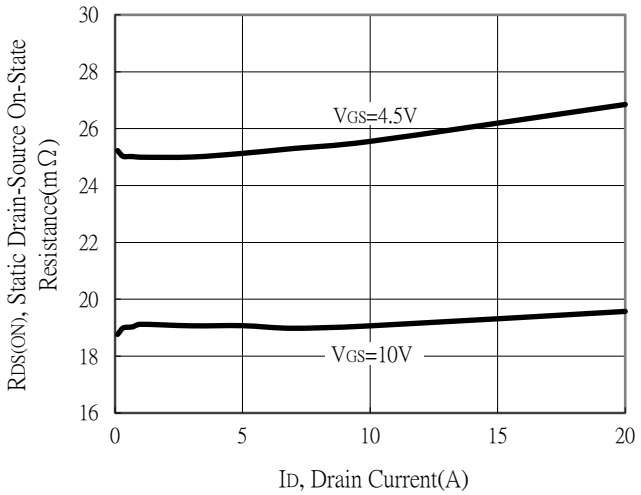
Typical Output Characteristics



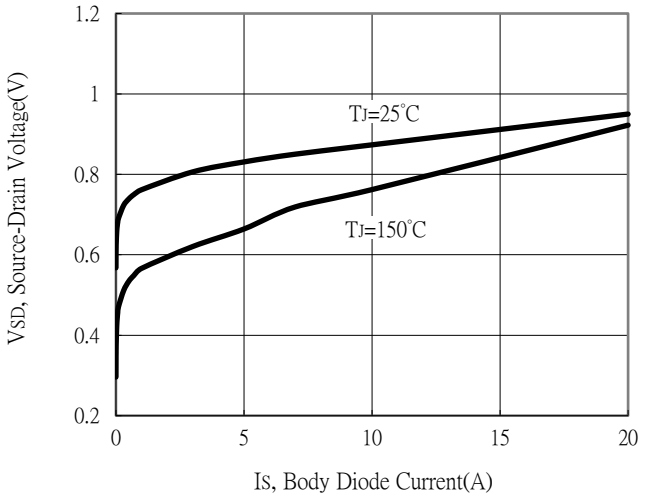

Breakdown Voltage vs Ambient Temperature



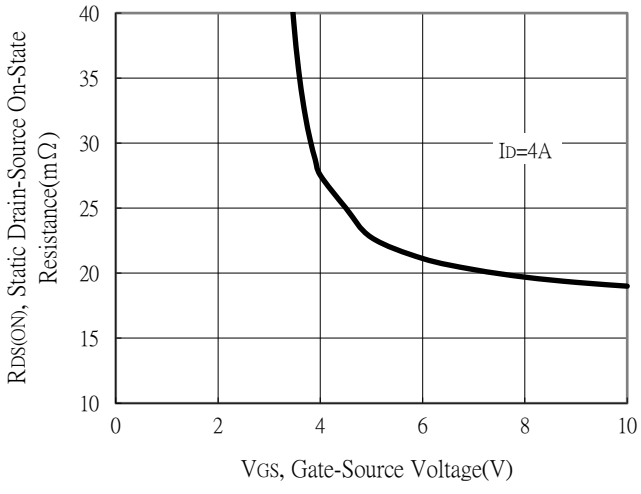

Static Drain-Source On-State resistance vs Drain Current



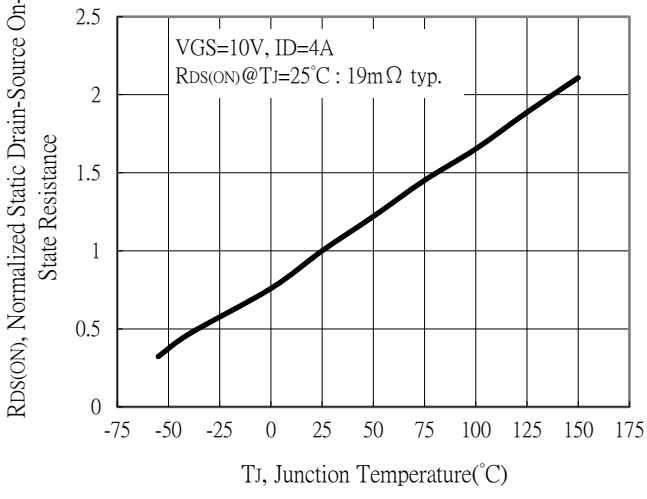

Body Diode Current vs Source-Drain Voltage




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

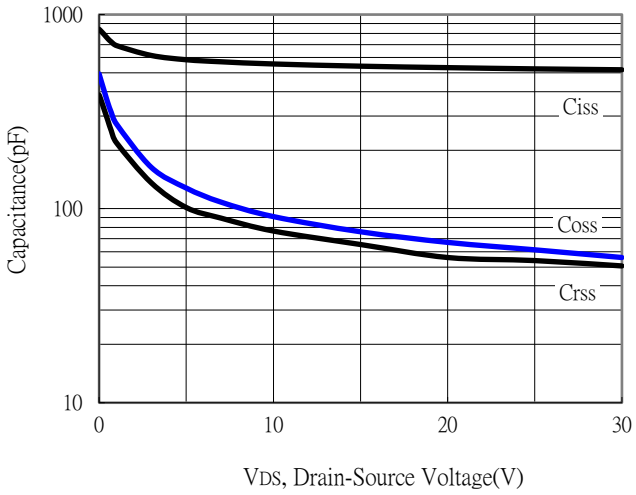



Drain-Source On-State Resistance vs Junction Temperature

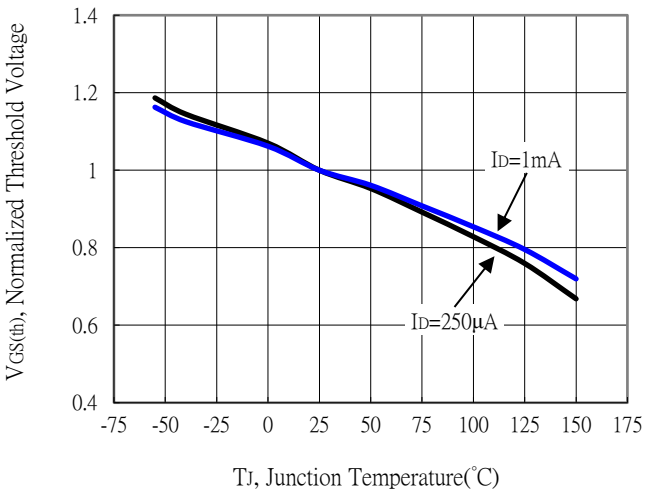


## Typical Characteristics (Cont.) : Q1( N-channel)

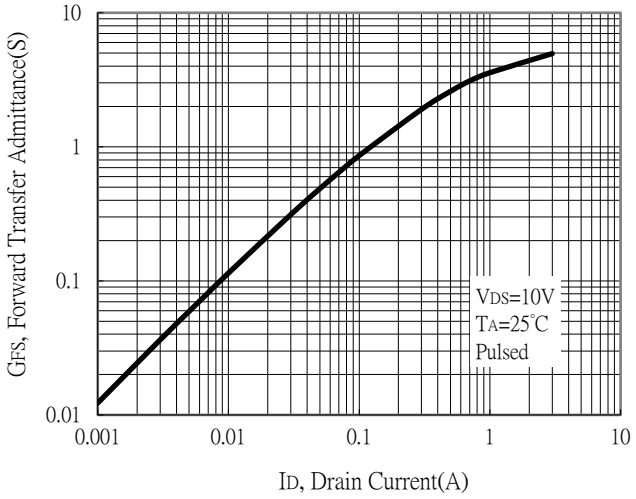
Capacitance vs Drain-to-Source Voltage



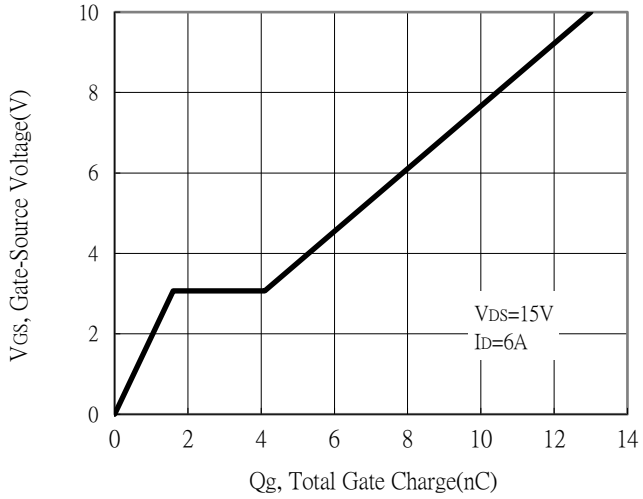

Threshold Voltage vs Junction Temperature



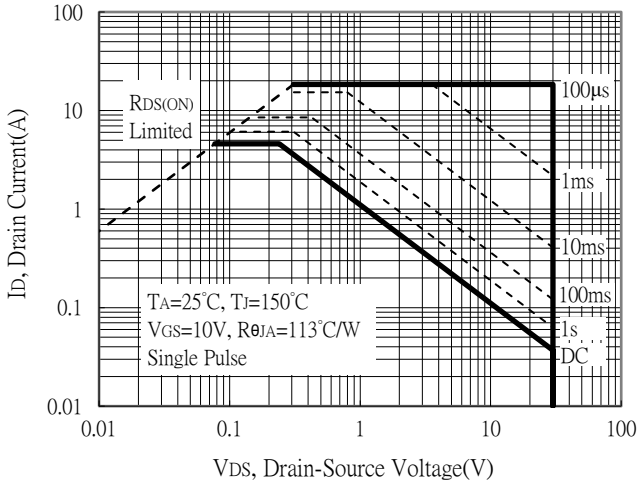

Forward Transfer Admittance vs Drain Current



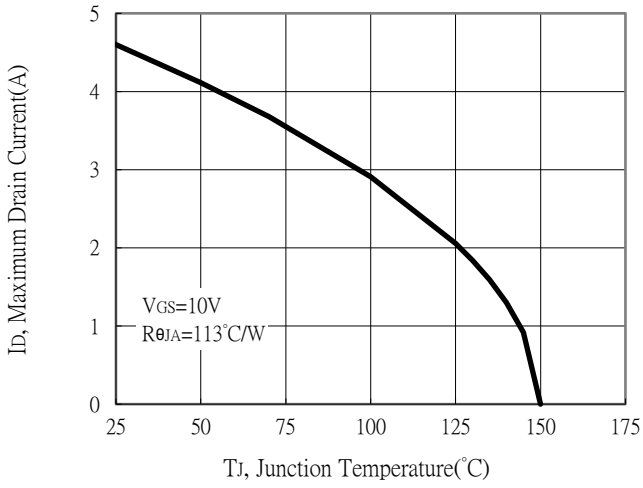

Gate Charge Characteristics




Maximum Safe Operating Area

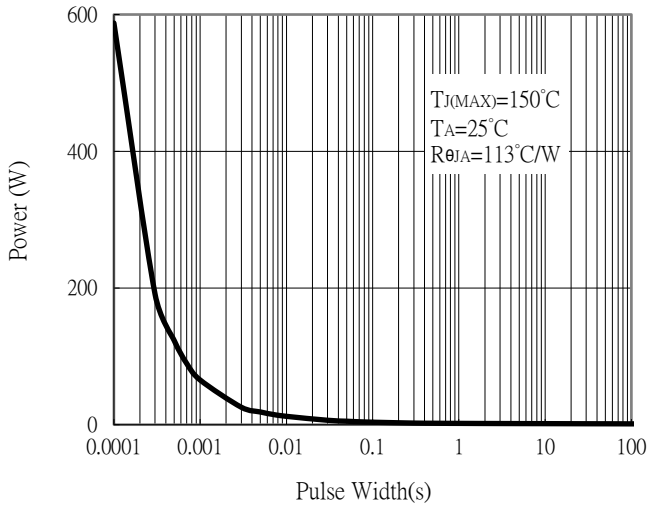



Maximum Drain Current vs Junction Temperature

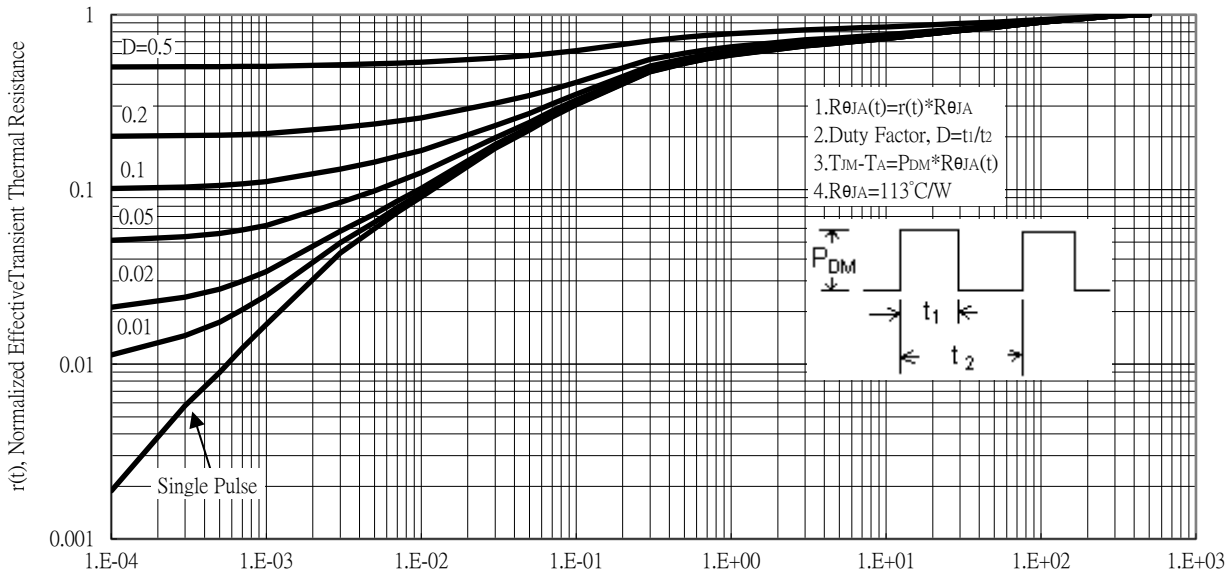


## Typical Characteristics (Cont.) : Q1( N-channel)

Single Pulse Power Rating, Junction to Ambient

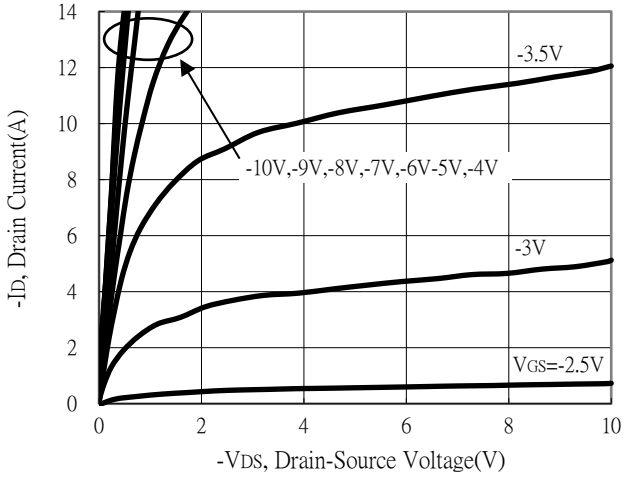



Transient Thermal Response Curves

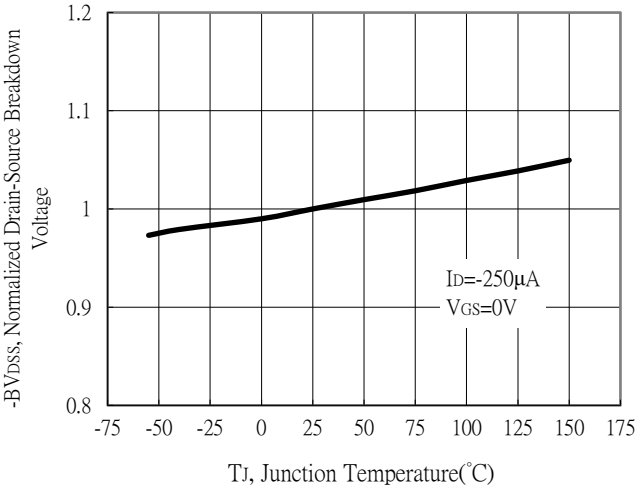


## Typical Characteristics : Q2( P-channel)

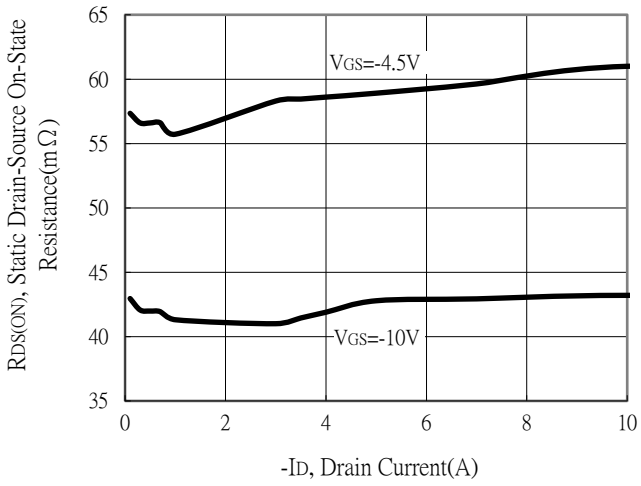
Typical Output Characteristics



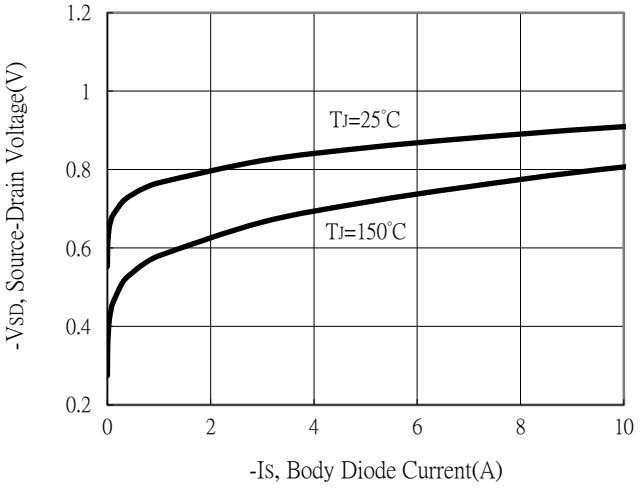

Breakdown Voltage vs Ambient Temperature



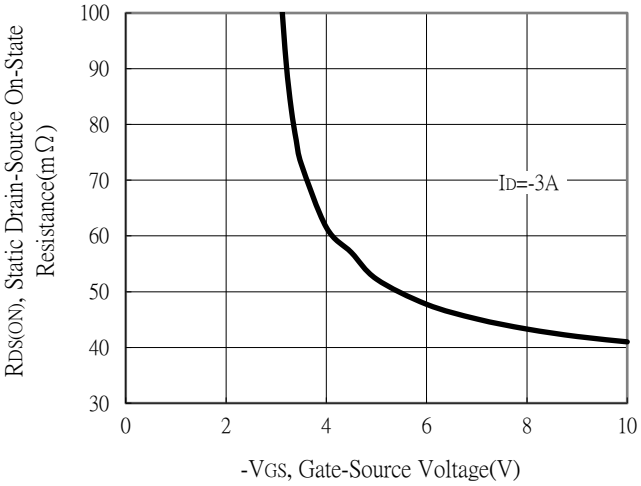

Static Drain-Source On-State resistance vs Drain Current



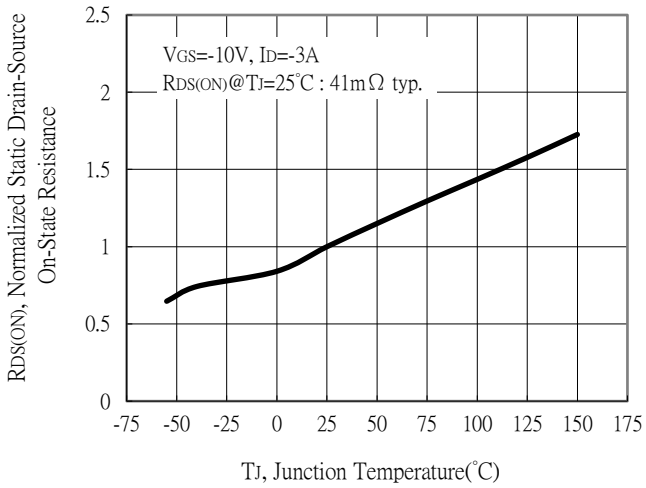

Body Diode Current vs Source-Drain Voltage




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

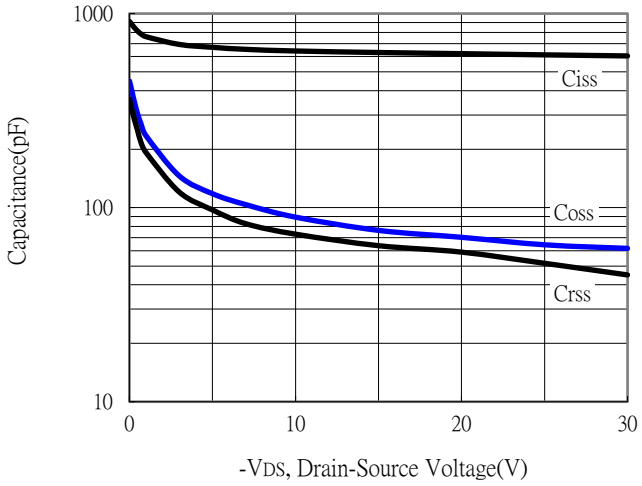



Drain-Source On-State Resistance vs Junction Temperature

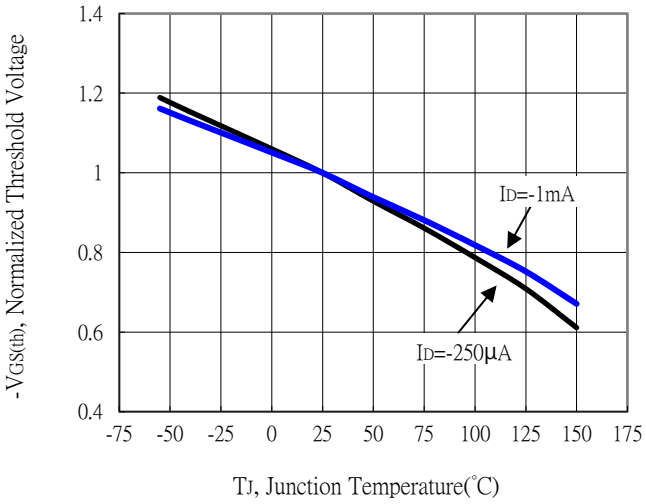


## Typical Characteristics (Cont.) : Q2(P-channel)

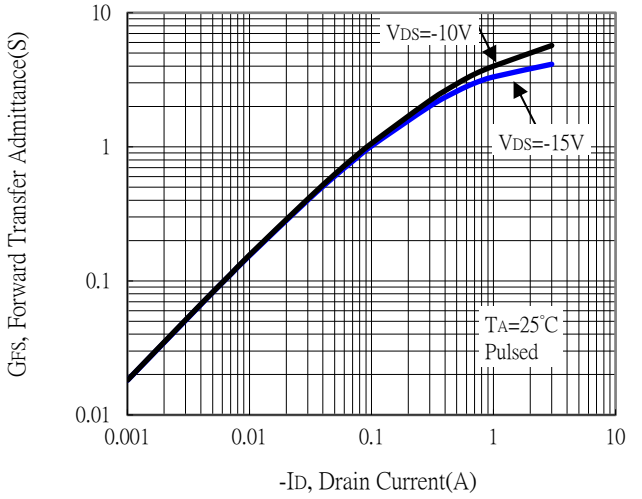
Capacitance vs Drain-to-Source Voltage



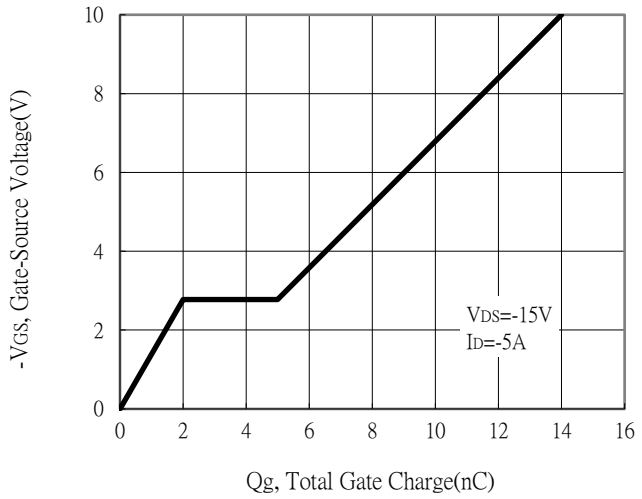

Threshold Voltage vs Junction Temperature



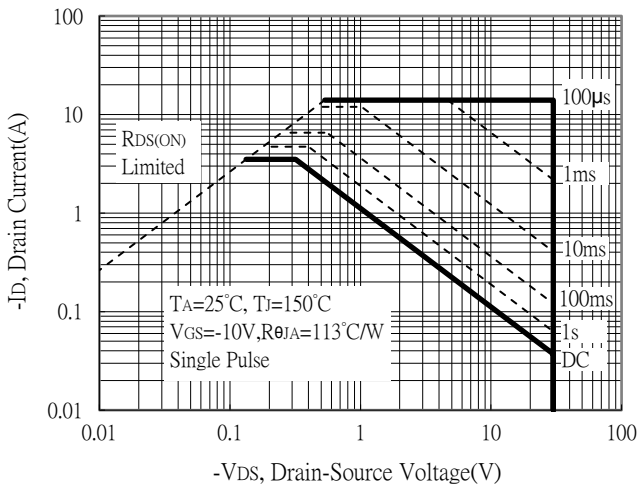

Forward Transfer Admittance vs Drain Current



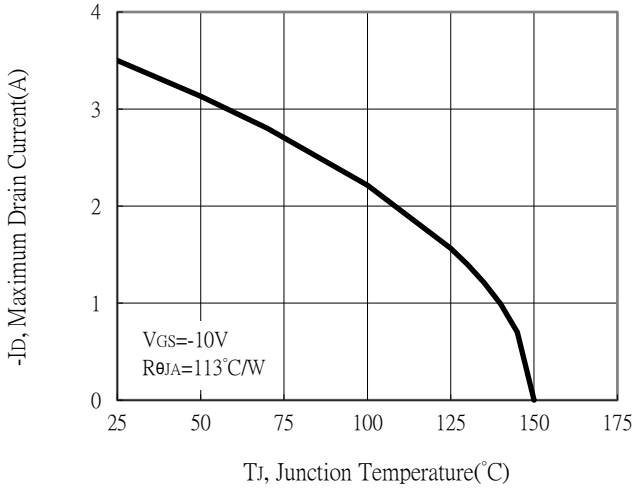

Gate Charge Characteristics




Maximum Safe Operating Area

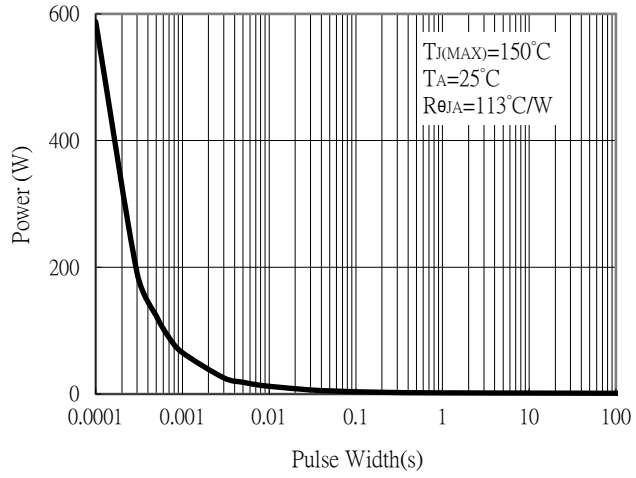



Maximum Drain Current vs Junction Temperature

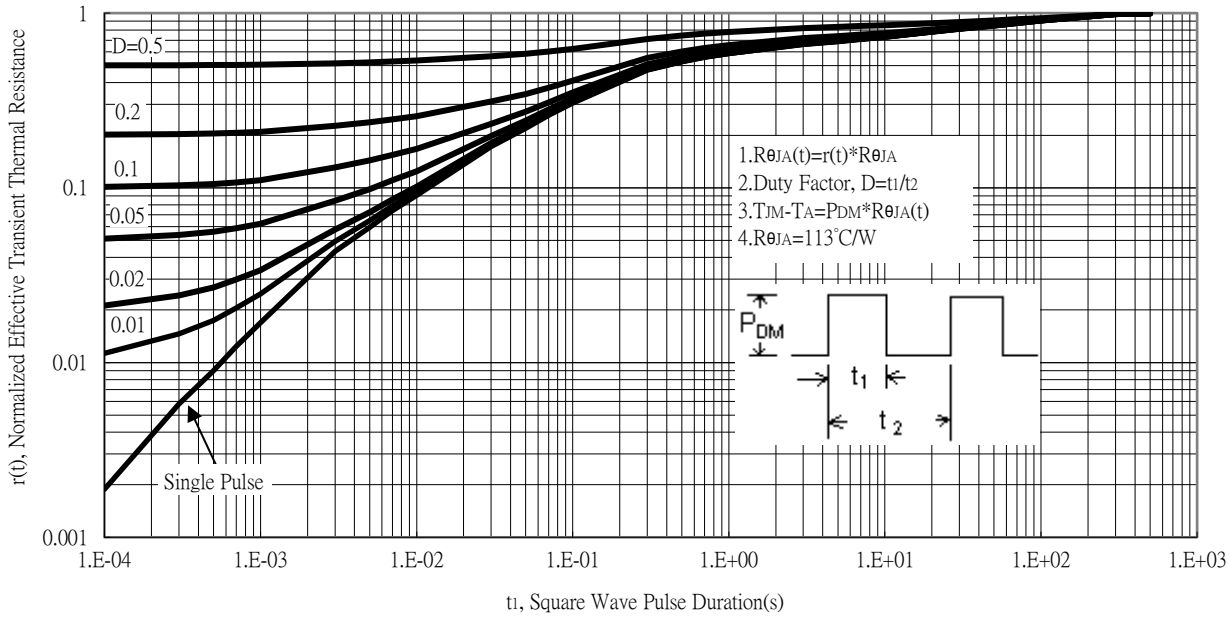


## Typical Characteristics (Cont.) : Q2(P-channel)

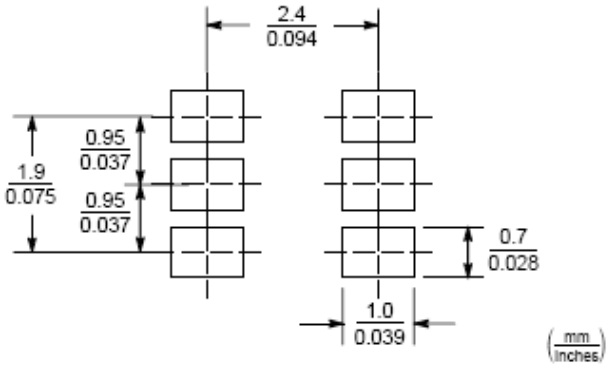
Single Pulse Power Rating, Junction to Ambient



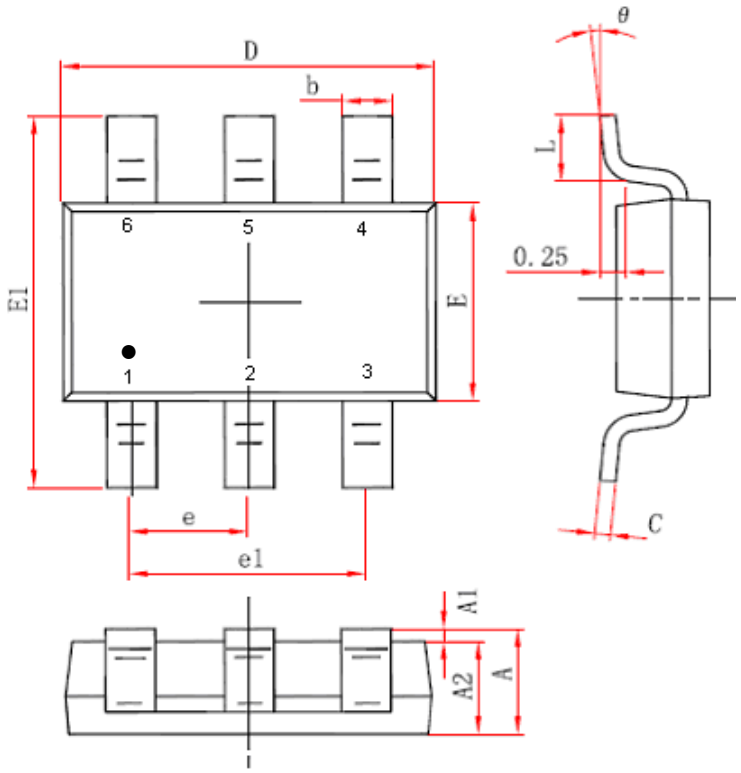

Transient Thermal Response Curves

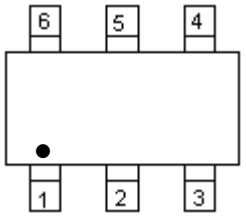



## Recommended Soldering Footprint



## TSOP-6 Dimension




Style:
Pin 1. Gate (G1)
Pin 2. Source (S2)
Pin 3. Gate (G2)
Pin 4. Drain (D2)
Pin 5. Source (S1)
Pin 6. Drain (D1)

| DIM | Millimeters | | Inches | | DIM | Millimeters | | Inches | |
|---|---|---|---|---|---|---|---|---|---|
| | Min. | Max. | Min. | Max. | | Min. | Max. | Min. | Max. |
| A | 0.700 | 0.900 | 0.028 | 0.035 | E | 1.600 | 1.700 | 0.063 | 0.067 |
| A1 | 0.000 | 0.100 | 0.000 | 0.004 | E1 | 2.650 | 2.950 | 0.104 | 0.116 |
| A2 | 0.700 | 0.800 | 0.028 | 0.031 | e | 0.95 BSC | | 0.037 BSC | |
| b | 0.350 | 0.500 | 0.014 | 0.020 | e1 | 1.90 BSC | | 0.075 BSC | |
| c | 0.080 | 0.200 | 0.003 | 0.008 | L | 0.300 | 0.600 | 0.012 | 0.024 |
| D | 2.820 | 3.020 | 0.111 | 0.119 | θ | 0° | 8° | 0° | 8° |

Notes : 1.Controlling dimension : millimeters.