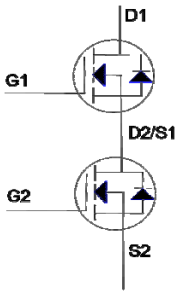
杰力科技股份有限公司
Excelliance MOS Corporation

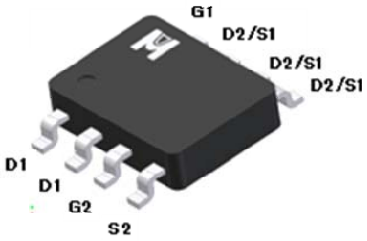
**EMB15K03GP**

**Dual Asymmetric N-Channel Logic Level Enhancement Mode Field Effect Transistor**

Product Summary:

| | N-CH-Q1 | N-CH-Q2 |
|---|---|---|
| $BV_{DSS}$ | 30V | 30V |
| $RD_{SON\ (MAX.)}$ | 22mΩ | 15.5mΩ |
| ID | 8A | 9A |




UIS, Rg 100% Tested

Pb-Free Lead Plating & Halogen Free

**ABSOLUTE MAXIMUM RATINGS ($T_C$ = 25 °C Unless Otherwise Noted)**

| PARAMETERS/TEST CONDITIONS | | SYMBOL | LIMITS | | UNIT |
|---|---|---|---|---|---|
| Gate-Source Voltage | | $V_{GS}$ | ±20 | ±20 | V |
| Continuous Drain Current | $T_C$ = 25 °C | $I_D$ | 8 | 9 | A |
| | $T_C$ = 100 °C | | 5.5 | 6 | |
| Pulsed Drain Current[1] | | $I_{DM}$ | 32 | 36 | |
| Avalanche Current | | $I_{AS}$ | 10 | 10 | |
| Avalanche Energy | L = 0.1mH, ID=10A, RG=25Ω | $E_{AS}$ | 5 | 5 | mJ |
| Repetitive Avalanche Energy[2] | L = 0.05mH | $E_{AR}$ | 2.5 | 2.5 | |
| Power Dissipation | $T_C$ = 25 °C | $P_D$ | 2 | | W |
| | $T_C$ = 100 °C | | 1.1 | | |
| Operating Junction & Storage Temperature Range | | $T_j$, $T_{stg}$ | -55 to 150 | | °C |

**THERMAL RESISTANCE RATINGS**

| THERMAL RESISTANCE | SYMBOL | TYPICAL | MAXIMUM | UNIT |
|---|---|---|---|---|
| Junction-to-Case | $R_{\theta JC}$ | | 25 | °C / W |
| Junction-to-Ambient[3] | $R_{\theta JA}$ | | 62.5 | |

[1]Pulse width limited by maximum junction temperature.

[2]Duty cycle ≤ 1%

[3]62.5°C / W when mounted on a 1 $in^2$ pad of 2 oz copper.

**ELECTRICAL CHARACTERISTICS ($T_C$ = 25 °C, Unless Otherwise Noted)**

| PARAMETER | SYMBOL | TEST CONDITIONS | | LIMITS | | | UNIT |
|---|---|---|---|---|---|---|---|
| | | | | MIN | TYP | MAX | |
| **STATIC** | | | | | | | |
| Drain-Source Breakdown Voltage | $V_{(BR)DSS}$ | $V_{GS}$ = 0V, $I_D$ = 250μA | Q1 | 30 | | | V |
| | | | Q2 | 30 | | | |
| Gate Threshold Voltage | $V_{GS(th)}$ | $V_{DS}$ = $V_{GS}$, $I_D$ = 250μA | Q1 | 1 | 1.5 | 3 | |
| | | | Q2 | 1 | 1.7 | 3 | |
| Gate-Body Leakage | $I_{GSS}$ | $V_{DS}$ = 0V, $V_{GS}$ = ±20V | Q1 | | | ±100 | nA |
| | | | Q2 | | | ±100 | |
| Zero Gate Voltage Drain Current | $I_{DSS}$ | $V_{DS}$ = 24V, $V_{GS}$ = 0V | Q1 | | | 1 | μA |
| | | | Q2 | | | 1 | |
| | | $V_{DS}$ = 20V, $V_{GS}$ = 0V, $T_J$ = 125 °C | Q1 | | | 25 | |
| | | | Q2 | | | 25 | |
| On-State Drain Current[1] | $I_{D(ON)}$ | $V_{DS}$ = 10V, $V_{GS}$ = 10V | Q1 | 8 | | | A |
| | | | Q2 | 9 | | | |
| Drain-Source On-State Resistance[1] | $R_{DS(ON)}$ | $V_{GS}$ = 10V, $I_D$ = 8A | Q1 | | 19 | 22 | mΩ |
| | | $V_{GS}$ = 10V, $I_D$ = 9A | Q2 | | 13.5 | 15.5 | |
| | | $V_{GS}$ = 4.5V, $I_D$ = 5A | Q1 | | 29 | 36 | |
| | | $V_{GS}$ = 4.5V, $I_D$ = 6A | Q2 | | 21 | 26 | |
| Forward Transconductance[1] | $g_{fs}$ | $V_{DS}$ = 5V, $I_D$ = 8A | Q1 | | 12 | | S |
| | | $V_{DS}$ = 5V, $I_D$ = 9A | Q2 | | 15 | | |
| **DYNAMIC** | | | | | | | |
| Input Capacitance | $C_{iss}$ | $V_{GS}$ = 0V, $V_{DS}$ = 15V, f = 1MHz | Q1 | | 520 | | pF |
| | | | Q2 | | 597 | | |
| Output Capacitance | $C_{oss}$ | | Q1 | | 88 | | |
| | | | Q2 | | 111 | | |
| Reverse Transfer Capacitance | $C_{rss}$ | | Q1 | | 62 | | |
| | | | Q2 | | 96 | | |
| Gate Resistance | $R_g$ | $V_{GS}$ = 15mV, $V_{DS}$ = 0V, f = 1MHz | Q1 | | 2.0 | | Ω |
| | | | Q2 | | 2.0 | | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Total Gate Charge[1,2] | $Q_g$($V_{GS}$=10V) | $V_{DS}$ = 15V, $V_{GS}$ = 10V, $I_D$ = 8A | Q1 | | 11.5 | | nC |
| | | | Q2 | | 14 | | |
| | $Q_g$($V_{GS}$=4.5V) | | Q1 | | 5 | | |
| | | | Q2 | | 7.2 | | |
| Gate-Source Charge[1,2] | $Q_{gs}$ | | Q1 | | 1.6 | | |
| | | | Q2 | | 1.8 | | |
| Gate-Drain Charge[1,2] | $Q_{gd}$ | | Q1 | | 2.8 | | |
| | | | Q2 | | 4.7 | | |
| Turn-On Delay Time[1,2] | $t_{d(on)}$ | $V_{DS}$ = 15V, $I_D$ = 1A, $V_{GS}$ = 10V, $R_{GS}$ = 6Ω | Q1 | | 6 | | nS |
| | | | Q2 | | 8 | | |
| Rise Time[1,2] | $t_r$ | | Q1 | | 5 | | |
| | | | Q2 | | 6 | | |
| Turn-Off Delay Time[1,2] | $t_{d(off)}$ | | Q1 | | 15 | | |
| | | | Q2 | | 18 | | |
| Fall Time[1,2] | $t_f$ | | Q1 | | 3 | | |
| | | | Q2 | | 4 | | |
| **SOURCE-DRAIN DIODE RATINGS AND CHARACTERISTICS ($T_C$ = 25 °C)** | | | | | | | |
| Continuous Current | $I_S$ | | Q1 | | | 2.3 | A |
| | | | Q2 | | | 2.5 | |
| Pulsed Current[3] | $I_{SM}$ | | Q1 | | | 9.2 | |
| | | | Q2 | | | 10 | |
| Forward Voltage[1] | $V_{SD}$ | $I_F$ = $I_S$, $V_{GS}$ = 0V | Q1 | | | 1.2 | V |
| | | | Q2 | | | 1.2 | |
| Reverse Recovery Time | $t_{rr}$ | $I_F$ = $I_S$, $dI_F/dt$ = 100A / μS | Q1 | | 15 | | nS |
| | | | Q2 | | 18 | | |
| Reverse Recovery Charge | $Q_{rr}$ | | Q1 | | 3 | | nC |
| | | | Q2 | | 5 | | |

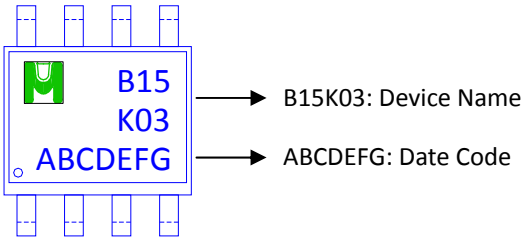
[1]Pulse test : Pulse Width ≤ 300 μsec, Duty Cycle ≤ 2%.

[2]Independent of operating temperature.

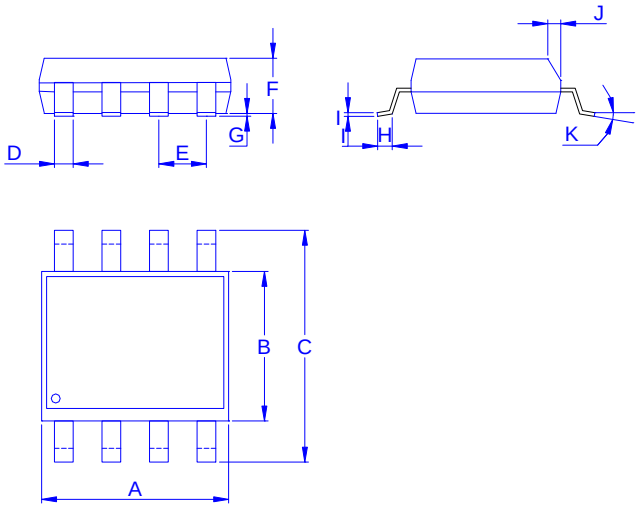
[3]Pulse width limited by maximum junction temperature.

## Ordering & Marking Information:

Device Name: EMB15K03GP for Asymmetric SOP-8



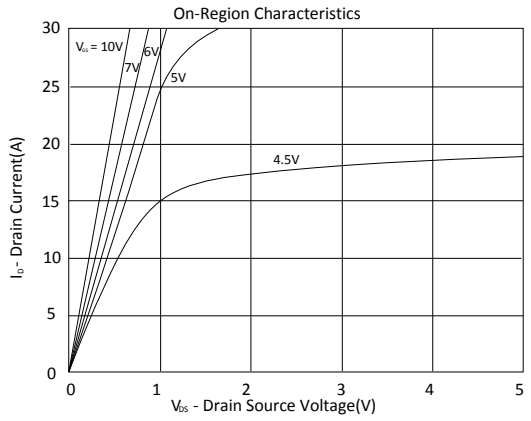

## Outline Drawing

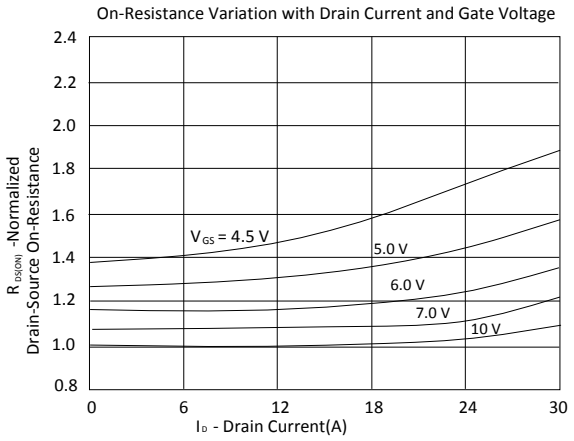


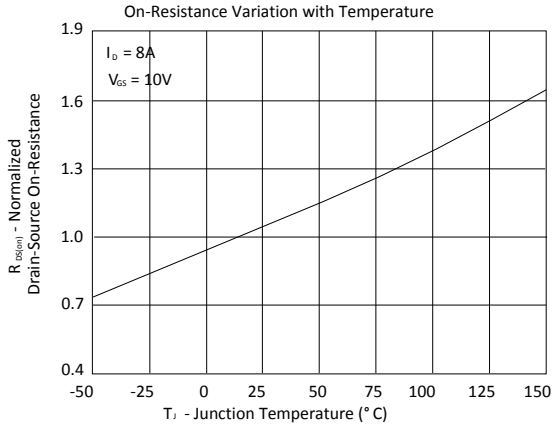

Dimension in mm

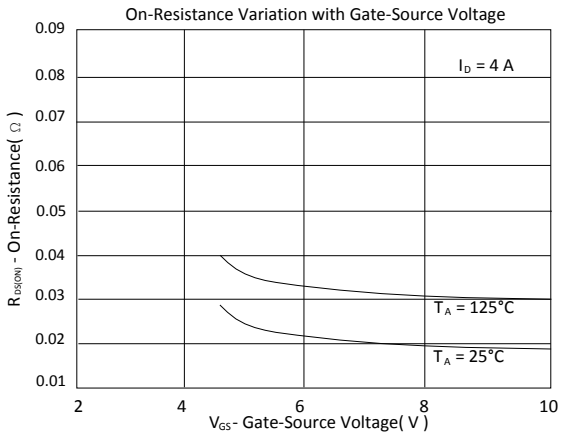
| Dimension | A | B | C | D | E | F | G | H | I | J | K |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Min. | 4.70 | 3.70 | 5.80 | 0.33 | | 1.20 | 0.08 | 0.40 | 0.19 | 0.25 | 0° |
| Typ. | | | | | 1.27 | | | | | | |
| Max. | 5.10 | 4.10 | 6.20 | 0.51 | | 1.62 | 0.28 | 0.83 | 0.26 | 0.50 | 8° |

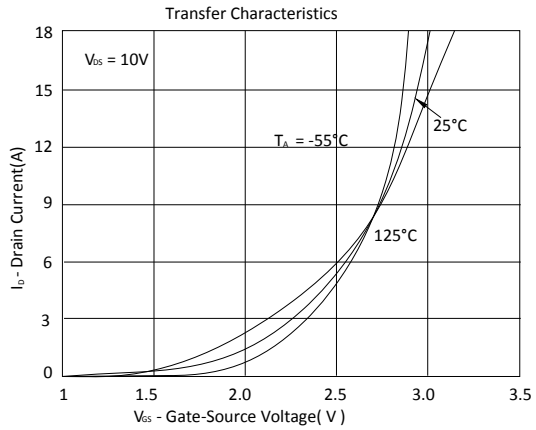
N-Channel-Q1

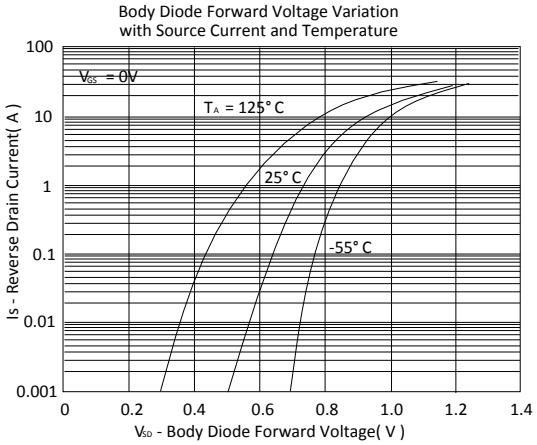

On-Region Characteristics
$V_{GS}$ = 10V
7V
6V
5V
4.5V
$I_D$ - Drain Current(A)
$V_{DS}$ - Drain Source Voltage(V)


On-Resistance Variation with Drain Current and Gate Voltage
$R_{DS(ON)}$ -Normalized
Drain-Source On-Resistance
$V_{GS}$ = 4.5 V
5.0 V
6.0 V
7.0 V
10 V
$I_D$ - Drain Current(A)

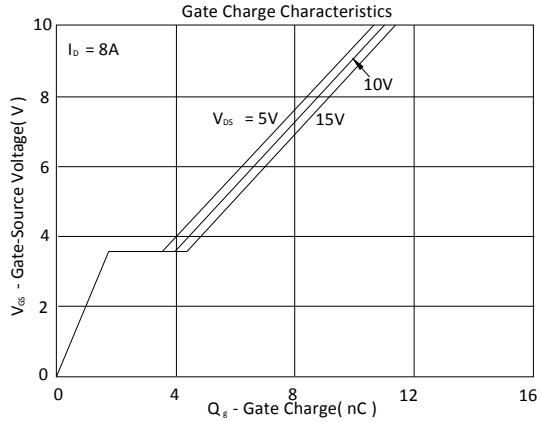

On-Resistance Variation with Temperature
$I_D$ = 8A
$V_{GS}$ = 10V
$R_{DS(on)}$ - Normalized
Drain-Source On-Resistance
$T_J$ - Junction Temperature (° C)


On-Resistance Variation with Gate-Source Voltage
$I_D$ = 4 A
$R_{DS(ON)}$ - On-Resistance( Ω )
$T_A$ = 125°C
$T_A$ = 25°C
$V_{GS}$- Gate-Source Voltage( V )

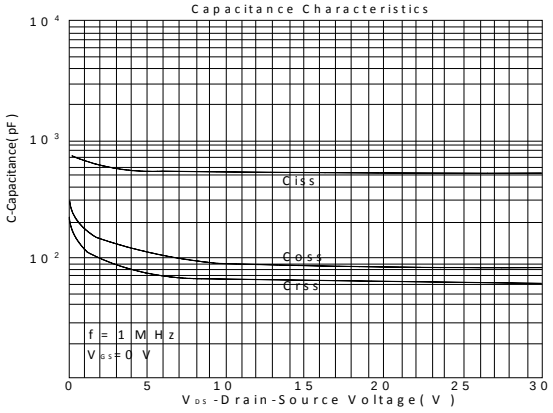

Transfer Characteristics
$V_{DS}$ = 10V
$T_A$ = -55°C
25°C
125°C
$I_D$ - Drain Current(A)
$V_{GS}$ - Gate-Source Voltage( V )


Body Diode Forward Voltage Variation
with Source Current and Temperature
$V_{GS}$ = 0V
$T_A$ = 125° C
25° C
-55° C
Is - Reverse Drain Current( A )
$V_{SD}$ - Body Diode Forward Voltage( V )

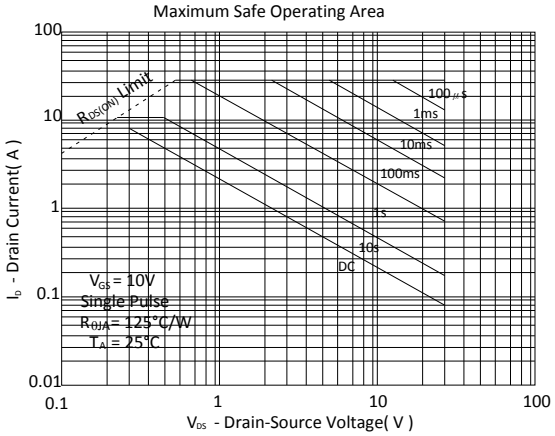
Gate Charge Characteristics



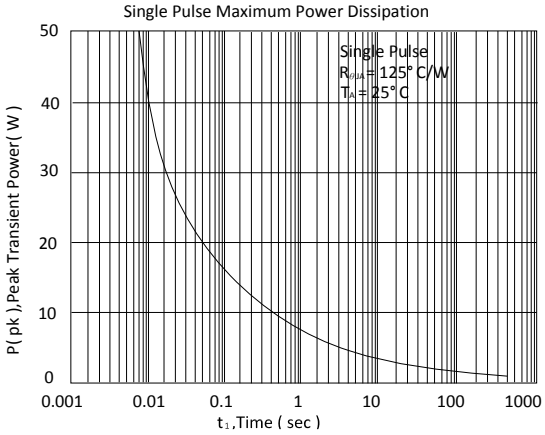

Capacitance Characteristics



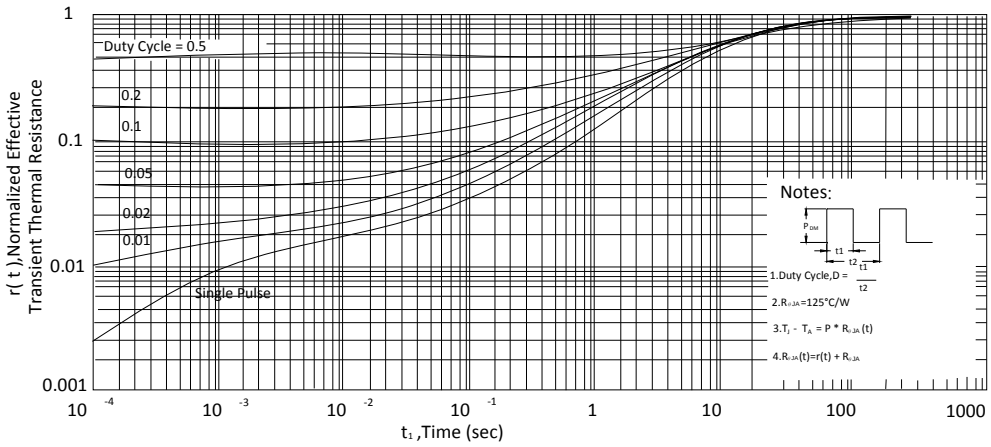

Maximum Safe Operating Area



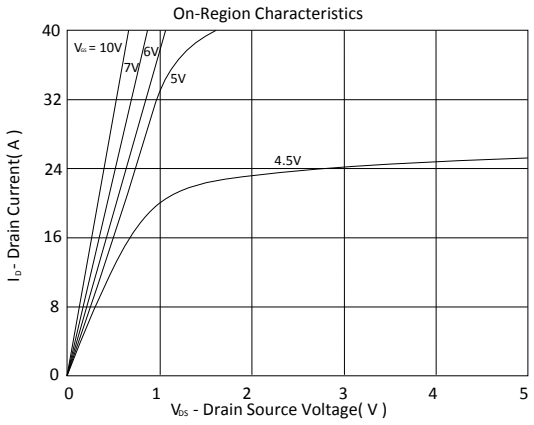

Single Pulse Maximum Power Dissipation

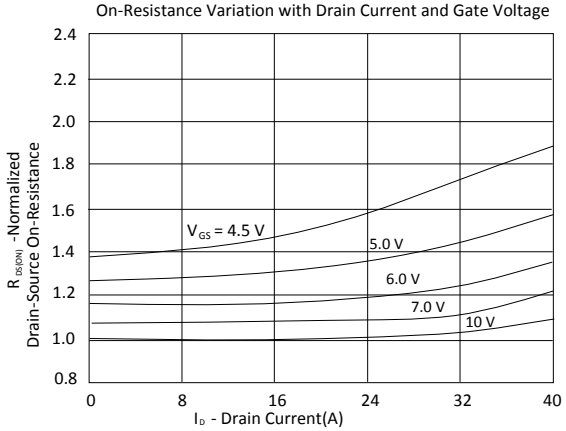


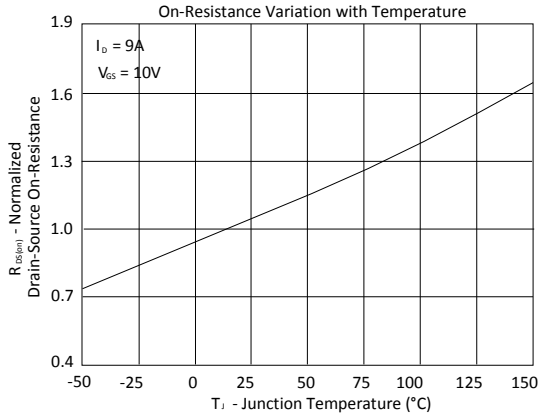

Transient Thermal Response Curve

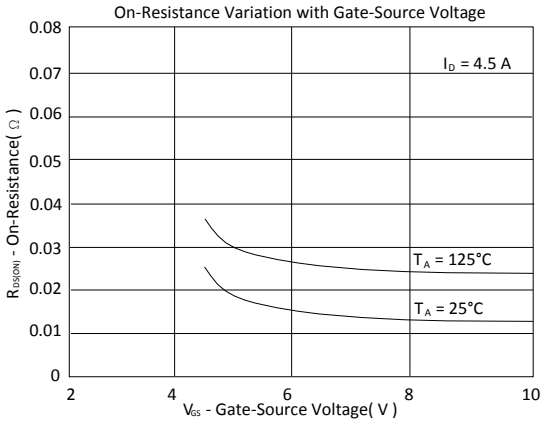


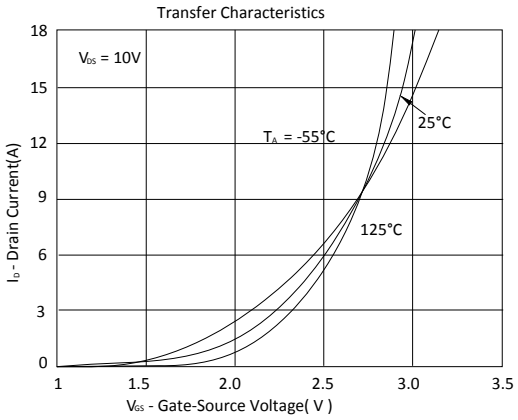
N-Channel-Q2

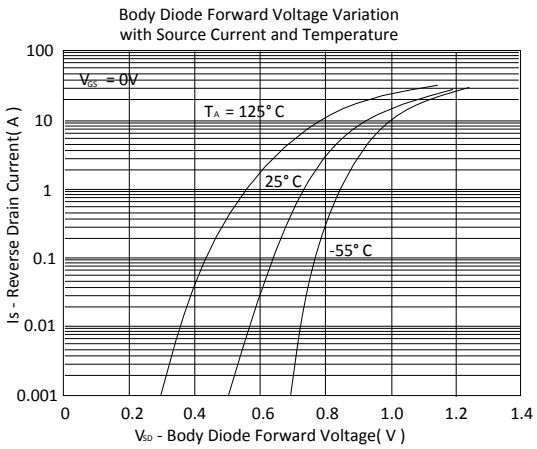

On-Region Characteristics
$V_{GS}$ = 10V
7V
6V
5V
4.5V
$I_D$ - Drain Current( A )
$V_{DS}$ - Drain Source Voltage( V )

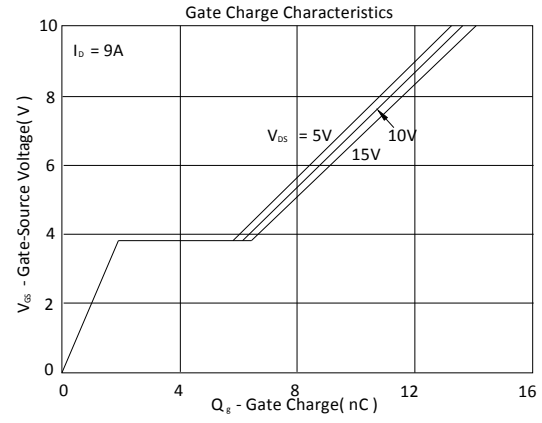

On-Resistance Variation with Drain Current and Gate Voltage
$V_{GS}$ = 4.5 V
5.0 V
6.0 V
7.0 V
10 V
$R_{DS(ON)}$ -Normalized
Drain-Source On-Resistance
$I_D$ - Drain Current(A)

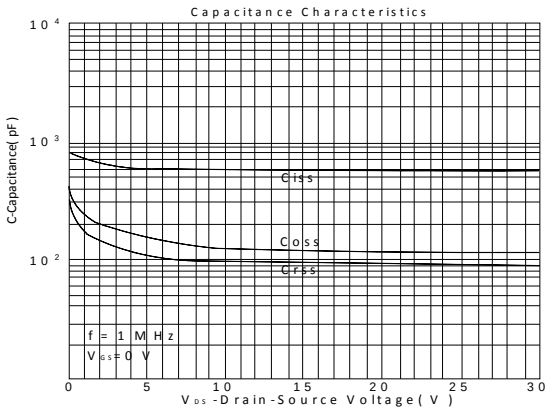

On-Resistance Variation with Temperature
$I_D$ = 9A
$V_{GS}$ = 10V
$R_{DS(on)}$ - Normalized
Drain-Source On-Resistance
$T_J$ - Junction Temperature (°C)

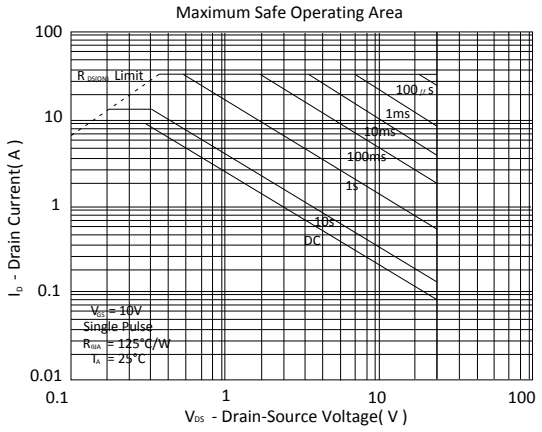

On-Resistance Variation with Gate-Source Voltage
$I_D$ = 4.5 A
$T_A$ = 125°C
$T_A$ = 25°C
$R_{DS(ON)}$ - On-Resistance( Ω )
$V_{GS}$ - Gate-Source Voltage( V )

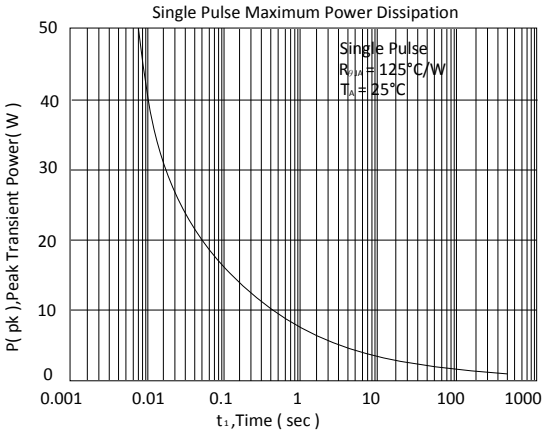

Transfer Characteristics
$V_{DS}$ = 10V
$T_A$ = -55°C
25°C
125°C
$I_D$ - Drain Current(A)
$V_{GS}$ - Gate-Source Voltage( V )

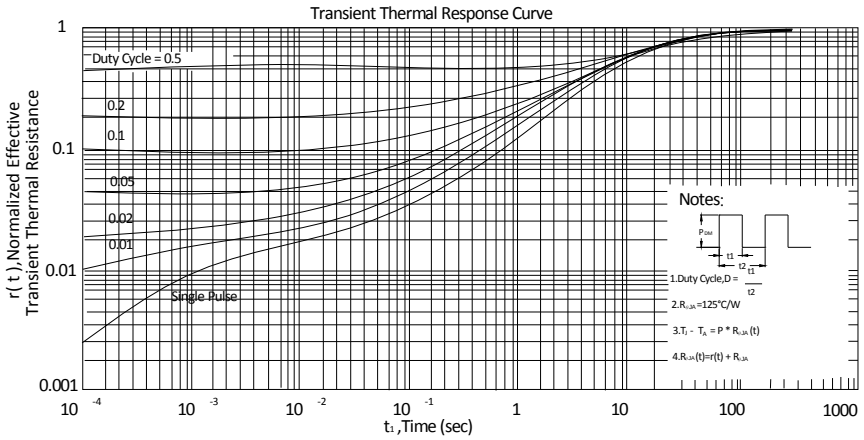

Body Diode Forward Voltage Variation
with Source Current and Temperature
$V_{GS}$ = 0V
$T_A$ = 125° C
25° C
-55° C
Is - Reverse Drain Current( A )
$V_{SD}$ - Body Diode Forward Voltage( V )


Gate Charge Characteristics
$I_D$ = 9A
$V_{DS}$ = 5V
10V
15V
$V_{GS}$ - Gate-Source Voltage( V )
$Q_g$ - Gate Charge( nC )


Capacitance Characteristics
Ciss
Coss
Crss
f = 1 MHz
$V_{GS}$ = 0 V
C-Capacitance( pF )
$V_{DS}$ -Drain-Source Voltage( V )


Maximum Safe Operating Area
$R_{DS(ON)}$ Limit
100μs
1ms
10ms
100ms
1s
10s
DC
$V_{GS}$ = 10V
Single Pulse
$R_{\theta JA}$ = 125°C/W
$T_A$ = 25°C
$I_D$ - Drain Current( A )
$V_{DS}$ - Drain-Source Voltage( V )


Single Pulse Maximum Power Dissipation
Single Pulse
$R_{\theta JA}$ = 125°C/W
$T_A$ = 25°C
P( pk ),Peak Transient Power( W )
$t_1$,Time ( sec )


Transient Thermal Response Curve
Duty Cycle = 0.5
0.2
0.1
0.05
0.02
0.01
Single Pulse
Notes:
1.Duty Cycle,D =
2.$R_{\theta JA}$=125°C/W
3.$T_J$ - $T_A$ = P * $R_{\theta JA}$ (t)
4.$R_{\theta JA}$(t)=r(t) + $R_{\theta JA}$
r( t ),Normalized Effective Transient Thermal Resistance
$t_1$,Time (sec)