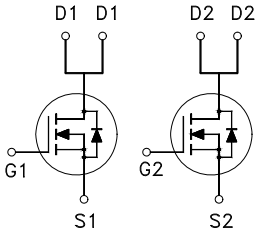
杰力科技股份有限公司
Excelliance MOS Corporation

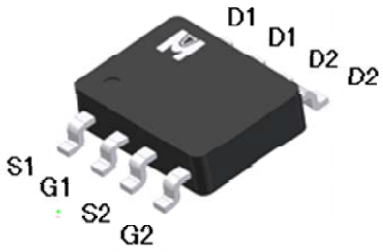
EMB08K04G

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

Product Summary:

| | N-CH-Q1 | N-CH-Q2 |
|---|---|---|
| $BV_{DSS}$ | 40V | 40V |
| $R_{DSON\ (MAX.)}$ | 17.5mΩ | 8.8mΩ |
| $I_D$ | 7.4A | 10.5A |




UIS, Rg 100% Tested

Pb-Free Lead Plating & Halogen Free

GP
GREEN PRODUCT

## ABSOLUTE MAXIMUM RATINGS ($T_A$ = 25 °C Unless Otherwise Noted)

| PARAMETERS/TEST CONDITIONS | | SYMBOL | LIMITS | | UNIT |
|---|---|---|---|---|---|
| | | | Q1 | Q2 | |
| Gate-Source Voltage | | $V_{GS}$ | ±20 | ±20 | V |
| Continuous Drain Current | $T_A$ = 25 °C | $I_D$ | 7.4 | 10.5 | A |
| | $T_A$ = 70 °C | | 5.6 | 8.4 | |
| Pulsed Drain Current[1] | | $I_{DM}$ | 30 | 42 | |
| Avalanche Current | | $I_{AS}$ | 7.5 | 10.5 | |
| Avalanche Energy | L = 0.1mH, $R_G$=25Ω | $E_{AS}$ | 2.8 | 5.5 | mJ |
| Repetitive Avalanche Energy[2] | L = 0.05mH | $E_{AR}$ | 1.4 | 2.7 | |
| Power Dissipation | $T_A$ = 25 °C | $P_D$ | 2 | | W |
| | $T_A$ = 100 °C | | 0.8 | | |
| 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 ($T_J$ = 25 °C, Unless Otherwise Noted)**

| PARAMETER | SYMBOL | TEST CONDITIONS | | LIMITS MIN | LIMITS TYP | LIMITS MAX | UNIT |
|---|---|---|---|---|---|---|---|
| **STATIC** | | | | | | | |
| Drain-Source Breakdown Voltage | $V_{(BR)DSS}$ | $V_{GS}$ = 0V, $I_D$ = 250μA | Q1 | 40 | | | V |
| | | | Q2 | 40 | | | |
| Gate Threshold Voltage | $V_{GS(th)}$ | $V_{DS}$ = $V_{GS}$, $I_D$ = 250μA | Q1 | 1 | 1.7 | 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 | $I_{DSS}$ | $V_{DS}$ = 32V, $V_{GS}$ = 0V | Q1 | | | 1 | μA |
| | | | Q2 | | | 1 | |
| | | $V_{DS}$ = 30V, $V_{GS}$ = 0V, $T_J$ = 125 °C | Q1 | | | 25 | |
| | | | Q2 | | | 25 | |
| On-State Drain Current[1] | $I_{D(ON)}$ | $V_{DS}$ = 10V, $V_{GS}$ = 10V | Q1 | 7.4 | | | A |
| | | | Q2 | 10.5 | | | |
| Drain-Source On-State Resistance[1] | $R_{DS(ON)}$ | $V_{GS}$ = 10V, $I_D$ = 6A | Q1 | | 15.5 | 17.5 | mΩ |
| | | $V_{GS}$ = 10V, $I_D$ = 10A | Q2 | | 8.0 | 8.8 | |
| | | $V_{GS}$ = 4.5V, $I_D$ = 4A | Q1 | | 22 | 32 | |
| | | $V_{GS}$ = 4.5V, $I_D$ = 8A | Q2 | | 11 | 15 | |
| Forward Transconductance[1] | $g_{fs}$ | $V_{DS}$ = 5V, $I_D$ = 6A | Q1 | | 15 | | S |
| | | $V_{DS}$ = 5V, $I_D$ = 10A | Q2 | | 18 | | |
| **DYNAMIC** | | | | | | | |
| Input Capacitance | $C_{iss}$ | $V_{GS}$ = 0V, $V_{DS}$ = 20V, f = 1MHz | Q1 | | 707 | | pF |
| | | | Q2 | | 1962 | | |
| Output Capacitance | $C_{oss}$ | | Q1 | | 98 | | |
| | | | Q2 | | 245 | | |
| Reverse Transfer Capacitance | $C_{rss}$ | | Q1 | | 81 | | |
| | | | Q2 | | 225 | | |
| Gate Resistance | $R_g$ | $V_{GS}$ = 15mV, $V_{DS}$ = 0V, f = 1MHz | Q1 | | 1.5 | | Ω |
| | | | Q2 | | 1.4 | | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Total Gate Charge[1,2] | $Q_g$($V_{GS}$=10V) | Q1<br>$V_{DD}$ = 20V, $V_{GS}$ = 10V,<br>$I_D$ = 6A<br>Q2<br>$V_{DD}$ = 20V, $V_{GS}$ = 10V,<br>$I_D$ = 10A | Q1 | | 18 | | nC |
| | | | Q2 | | 47 | | |
| | $Q_g$($V_{GS}$=4.5V) | | Q1 | | 10 | | |
| | | | Q2 | | 24 | | |
| Gate-Source Charge[1,2] | $Q_{gs}$ | | Q1 | | 2.4 | | |
| | | | Q2 | | 6.8 | | |
| Gate-Drain Charge[1,2] | $Q_{gd}$ | | Q1 | | 6.0 | | |
| | | | Q2 | | 16 | | |
| Turn-On Delay Time[1,2] | $t_{d(on)}$ | $V_{DD}$ = 20V,<br>$I_D$ = 1A, $V_{GS}$ = 10V, $R_{GS}$ = 2.7Ω | Q1 | | 6 | | nS |
| | | | Q2 | | 10 | | |
| Rise Time[1,2] | $t_r$ | | Q1 | | 10 | | |
| | | | Q2 | | 18 | | |
| Turn-Off Delay Time[1,2] | $t_{d(off)}$ | | Q1 | | 18 | | |
| | | | Q2 | | 20 | | |
| Fall Time[1,2] | $t_f$ | | Q1 | | 12 | | |
| | | | Q2 | | 15 | | |
| **SOURCE-DRAIN DIODE RATINGS AND CHARACTERISTICS ($T_C$ = 25 °C)** | | | | | | | |
| Continuous Current | $I_S$ | | Q1 | | | 7.5 | A |
| | | | Q2 | | | 10.5 | |
| Pulsed Current[3] | $I_{SM}$ | | Q1 | | | 30 | |
| | | | Q2 | | | 42 | |
| Forward Voltage[1] | $V_{SD}$ | $I_F$ = 6A, $V_{GS}$ = 0V<br>$I_F$ = 10A, $V_{GS}$ = 0V | Q1 | | | 1.3 | V |
| | | | Q2 | | | 1.3 | |
| Reverse Recovery Time | $t_{rr}$ | Q1<br>$I_F$ = 6A, $dI_F/dt$ = 100A / μS | Q1 | | 18 | | nS |
| | | | Q2 | | 22 | | |
| Reverse Recovery Charge | $Q_{rr}$ | Q2<br>$I_F$ = 10A, $dI_F/dt$ = 100A / μS | Q1 | | 5 | | nC |
| | | | Q2 | | 6 | | |

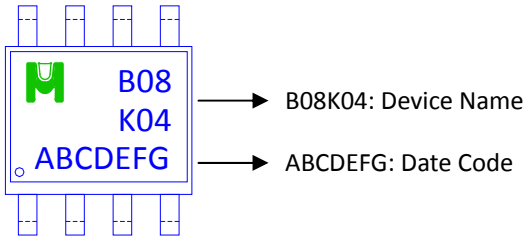
[1]Pulse test : Pulse Width ≤ 300 μsec, Duty Cycle ≤ 2%.

[2]Independent of operating temperature.

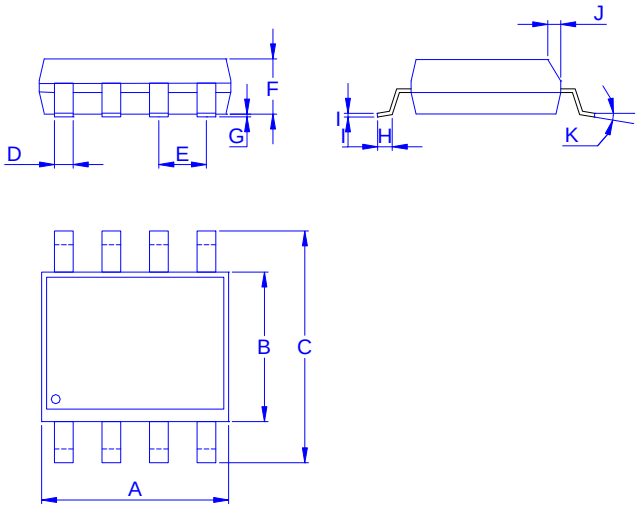
[3]Pulse width limited by maximum junction temperature.

## Ordering & Marking Information:

Device Name: EMB08K04G for SOP-8




## Outline Drawing

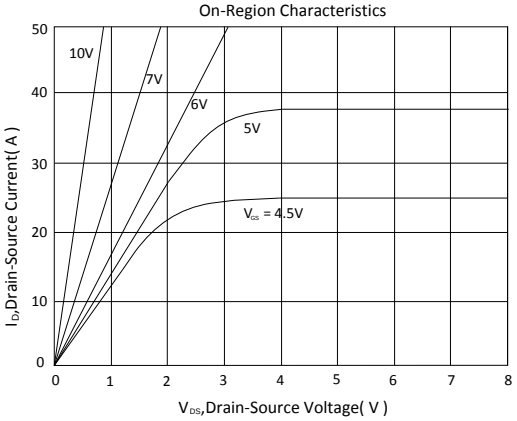



Dimension in mm

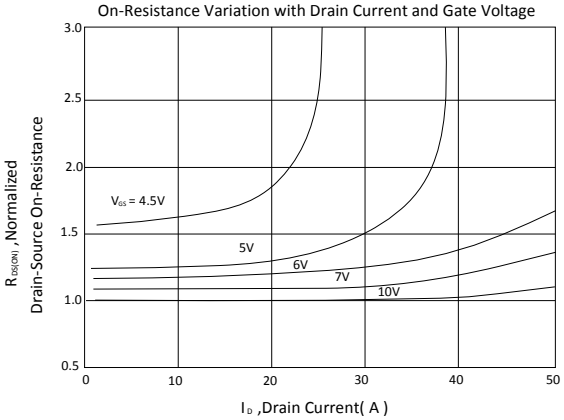
| Dimension | A | B | C | D | E | F | G | H | I | J | K |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Min. | 4.70 | 3.70 | 5.80 | 0.33 | | 1.20 | 0.08 | 0.40 | 0.19 | 0.25 | 0° |
| Typ. | | | | | 1.27 | | | | | | |
| Max. | 5.10 | 4.10 | 6.20 | 0.51 | | 1.62 | 0.28 | 0.83 | 0.26 | 0.50 | 8° |

## Q1 TYPICAL CHARACTERISTICS

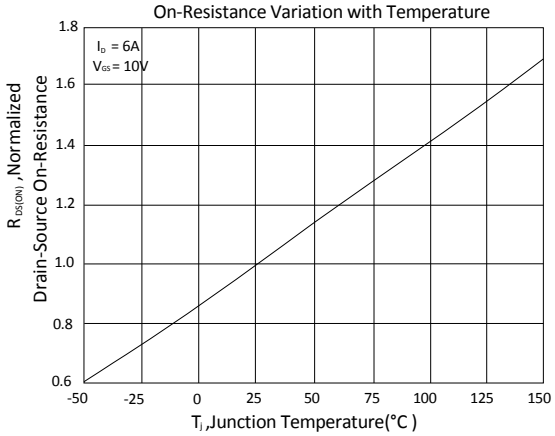
On-Region Characteristics



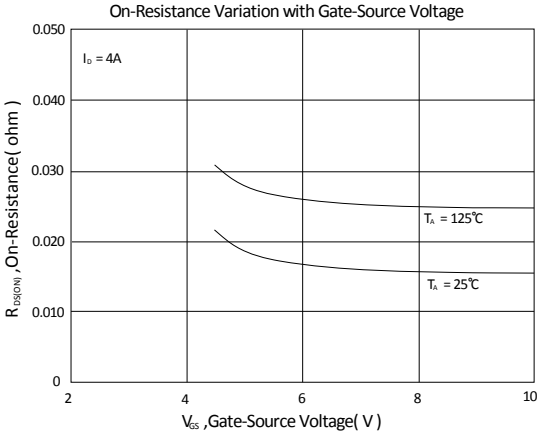

On-Resistance Variation with Drain Current and Gate Voltage



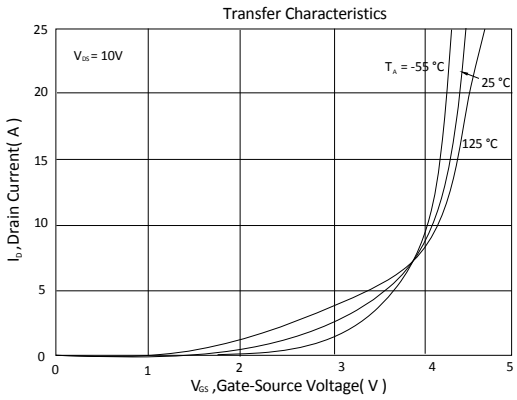

On-Resistance Variation with Temperature



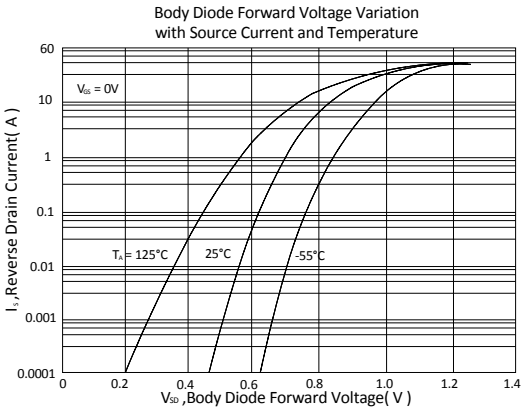

On-Resistance Variation with Gate-Source Voltage

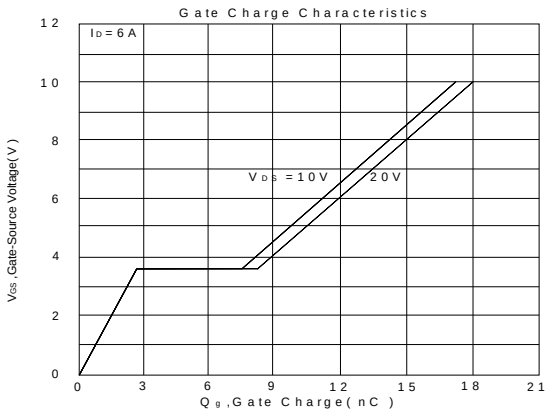


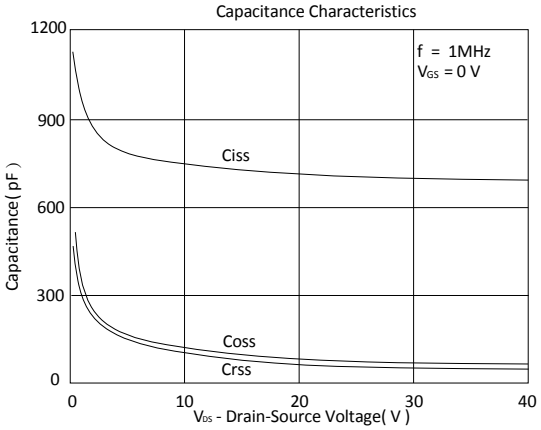

Transfer Characteristics

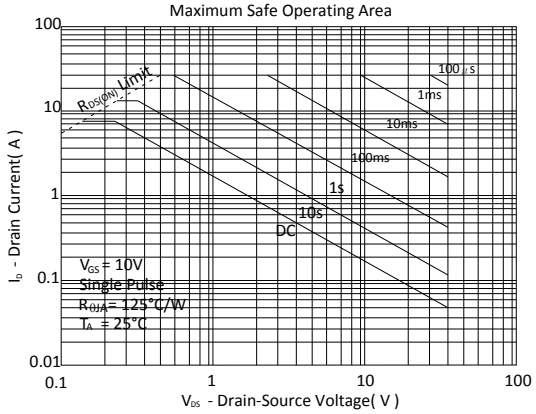


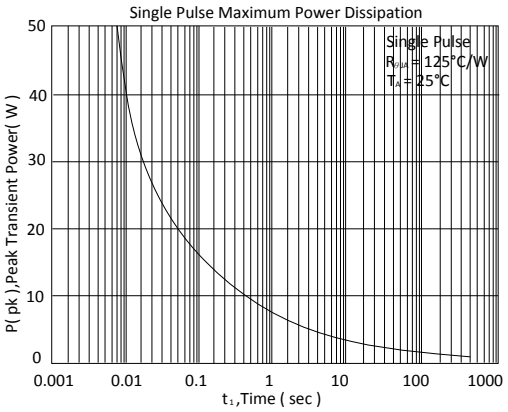

Body Diode Forward Voltage Variation
with Source Current and Temperature

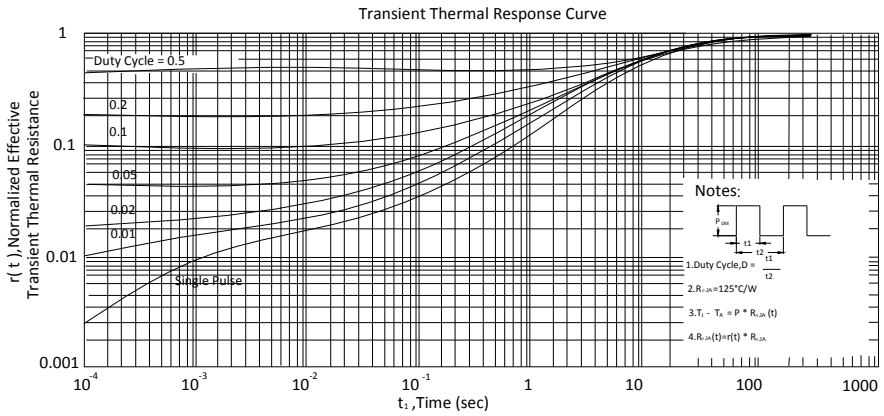



Gate Charge Characteristics
I D = 6 A
V D S = 1 0 V
2 0 V
V GS ,Gate-Source Voltage( V )
Q g ,G a t e C h a r g e ( n C )


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

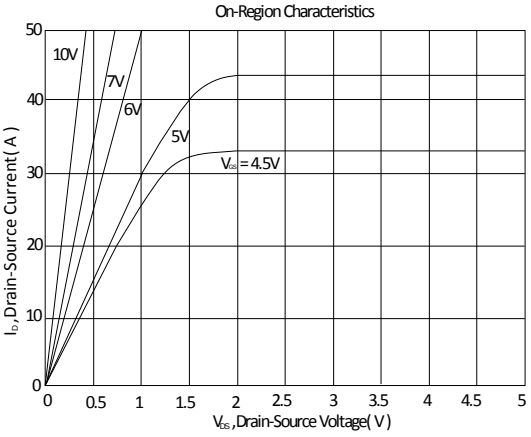

Maximum Safe Operating Area
R DS(ON) Limit
100 μ s
1ms
10ms
100ms
1s
10s
DC
V GS = 10V
Single Pulse
R θJA = 125°C/W
T A = 25°C
I D - Drain Current( A )
V DS - Drain-Source Voltage( V )


Single Pulse Maximum Power Dissipation
Single Pulse
R θJA = 125°C/W
T A = 25°C
P( pk ),Peak Transient Power( W )
t 1 ,Time ( sec )

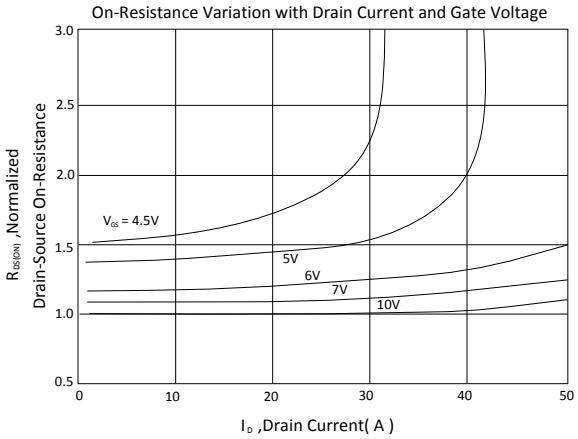

Transient Thermal Response Curve
Duty Cycle = 0.5
0.2
0.1
0.05
0.02
0.01
Single Pulse
Notes:
1.Duty Cycle,D =
2.R θJA =125°C/W
3.T J - T A = P * R θJA (t)
4.R θJA (t)=r(t) * R θJA
r( t ),Normalized Effective Transient Thermal Resistance
t 1 ,Time (sec)

## Q2 TYPICAL CHARACTERISTICS

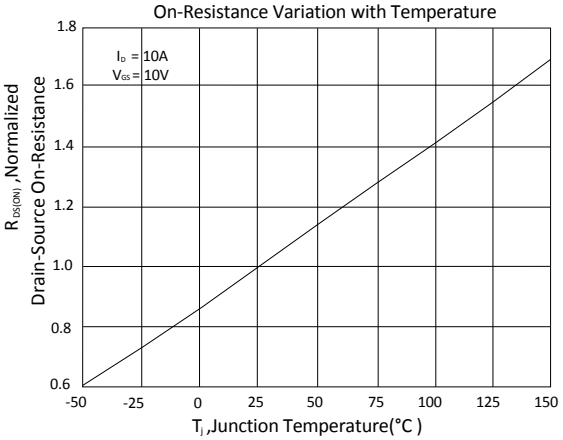
On-Region Characteristics



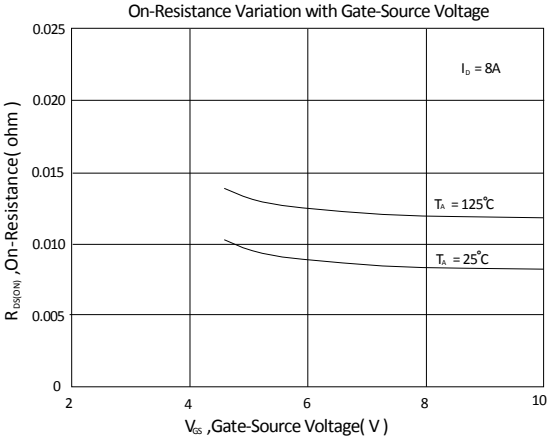

On-Resistance Variation with Drain Current and Gate Voltage



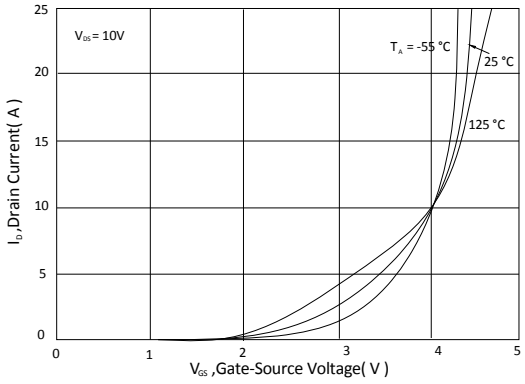

On-Resistance Variation with Temperature



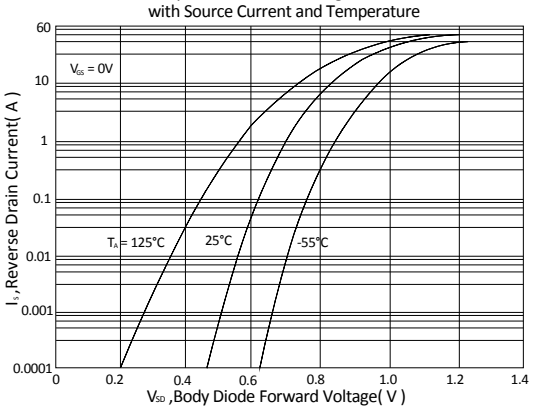

On-Resistance Variation with Gate-Source Voltage

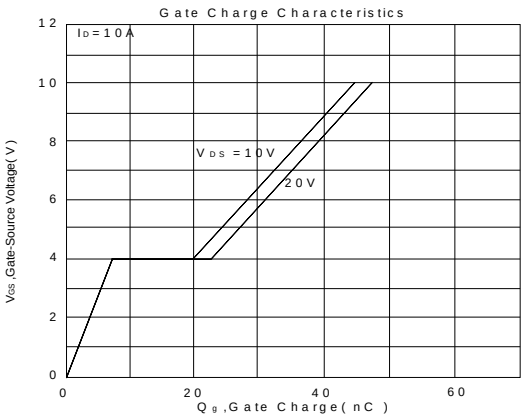


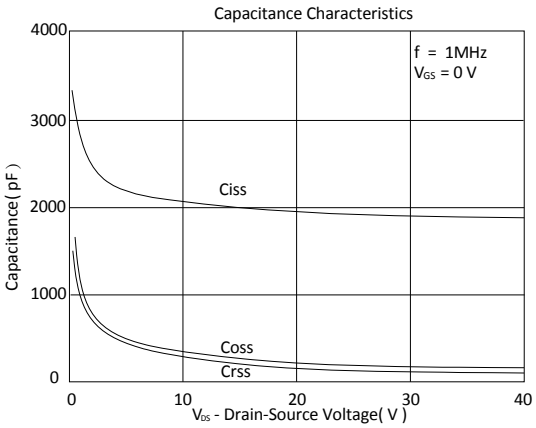

Transfer Characteristics

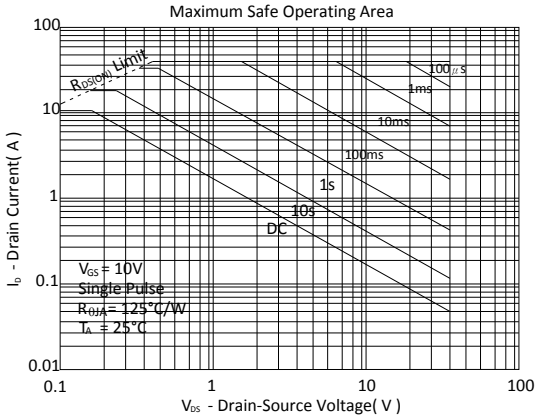


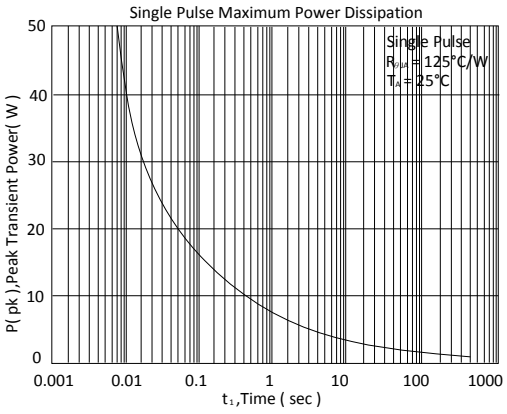

Body Diode Forward Voltage Variation with Source Current and Temperature

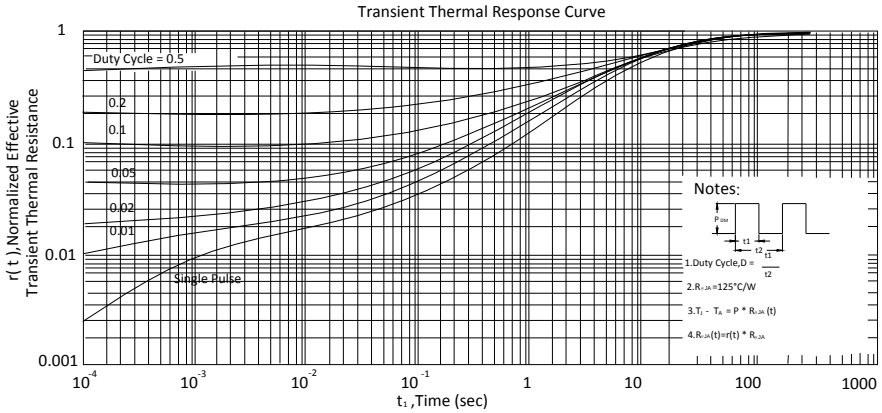



Gate Charge Characteristics
ID = 10A
VDS = 10V
20V
VGS ,Gate-Source Voltage( V )
Qg ,Gate Charge( nC )


Capacitance Characteristics
f = 1MHz
VGS = 0 V
Ciss
Coss
Crss
Capacitance( pF )
VDS - Drain-Source Voltage( V )


Maximum Safe Operating Area
RDS(ON) Limit
100μs
1ms
10ms
100ms
1s
10s
DC
VGS = 10V
Single Pulse
RθJA= 125°C/W
TA = 25°C
ID - Drain Current( A )
VDS - Drain-Source Voltage( V )


Single Pulse Maximum Power Dissipation
Single Pulse
RθJA = 125°C/W
TA = 25°C
P( pk ),Peak Transient Power( W )
t1 ,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 = t1/t2
2.RθJA=125°C/W
3.TJ - TA = P * RθJA (t)
4.RθJA(t)=r(t) * RθJA
r( t ),Normalized Effective Transient Thermal Resistance
t1 ,Time (sec)