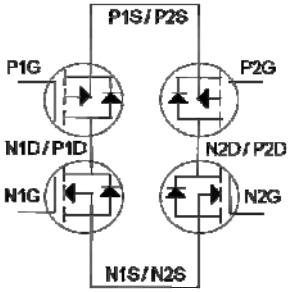
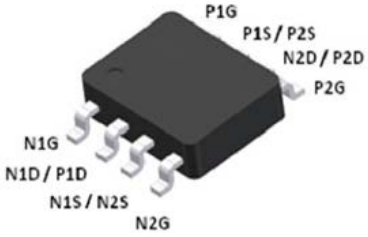
**2N & 2P-Channel Logic Level Enhancement Mode Field Effect Transistor**

Product Summary:

| | N-CH | P-CH |
|---|---|---|
| $BV_{DSS}$ | 30V | -30V |
| $R_{DSON\ (MAX.)}$ | 40mΩ | 45mΩ |
| $I_D$ | 5.5A | -4.5A |




Pb-Free Lead Plating & Halogen Free

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

| PARAMETERS/TEST CONDITIONS | | SYMBOL | LIMITS | | UNIT |
|---|---|---|---|---|---|
| Gate-Source Voltage | | $V_{GS}$ | N-CH | P-CH | V |
| | | | ±20 | ±20 | |
| Continuous Drain Current | $T_A$ = 25 °C | $I_D$ | 5.5 | -4.5 | A |
| | $T_A$ = 100 °C | | 4.6 | -3.8 | |
| Pulsed Drain Current[1] | | $I_{DM}$ | 22 | -18 | |
| Power Dissipation | $T_A$ = 25 °C | $P_D$ | 1.38 | | W |
| | $T_A$ = 100 °C | | 0.75 | | |
| 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 | $R_{\theta JC}$ | | 36 | °C / W |
| Junction-to-Ambient[3] | $R_{\theta JA}$ | | 90 | |

[1]Pulse width limited by maximum junction temperature.

[2]Duty cycle ≤ 1%

[3]90°C / W when mounted on a 1 $in^2$ pad of 2 oz copper.

**ELECTRICAL CHARACTERISTICS ($T_A$ = 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 | N-CH | 30 | | | V |
| | | $V_{GS}$ = 0V, $I_D$ = -250μA | P-CH | -30 | | | |
| Gate Threshold Voltage | $V_{GS(th)}$ | $V_{DS}$ = $V_{GS}$, $I_D$ = 250μA | N-CH | 1.0 | 1.5 | 3.0 | |
| | | $V_{DS}$ = $V_{GS}$, $I_D$ = -250μA | P-CH | -1.0 | -1.5 | -3.0 | |
| Gate-Body Leakage | $I_{GSS}$ | $V_{DS}$ = 0V, $V_{GS}$ = ±20V | N-CH | | | ±100 | nA |
| | | $V_{DS}$ = 0V, $V_{GS}$ = ±20V | P-CH | | | ±100 | |
| Zero Gate Voltage Drain Current | $I_{DSS}$ | $V_{DS}$ = 24V, $V_{GS}$ = 0V | N-CH | | | 1 | μA |
| | | $V_{DS}$ = -24V, $V_{GS}$ = 0V | P-CH | | | -1 | |
| | | $V_{DS}$ = 20V, $V_{GS}$ = 0V, $T_J$ = 125 °C | N-CH | | | 25 | |
| | | $V_{DS}$ = -20V, $V_{GS}$ = 0V, $T_J$ = 125 °C | P-CH | | | -25 | |
| On-State Drain Current[1] | $I_{D(ON)}$ | $V_{DS}$ = 5V, $V_{GS}$ = 10V | N-CH | 5.5 | | | A |
| | | $V_{DS}$ = -5V, $V_{GS}$ = -10V | P-CH | -4.5 | | | |
| Drain-Source On-State Resistance[1] | $R_{DS(ON)}$ | $V_{GS}$ = 10V, $I_D$ = 5.5A | N-CH | | 35 | 40 | mΩ |
| | | $V_{GS}$ = -10V, $I_D$ = -4.5A | P-CH | | 39 | 45 | |
| | | $V_{GS}$ = 4.5V, $I_D$ = 3.5A | N-CH | | 50 | 62 | |
| | | $V_{GS}$ = -4.5V, $I_D$ = -3A | P-CH | | 65 | 80 | |
| Forward Transconductance[1] | $g_{fs}$ | $V_{DS}$ = 5V, $I_D$ = 5.5A | N-CH | | 6 | | S |
| | | $V_{DS}$ = -5V, $I_D$ = -4.5A | P-CH | | 5 | | |
| **DYNAMIC** | | | | | | | |
| | | | | | | | |
| Input Capacitance | $C_{iss}$ | N-CH<br>$V_{GS}$ = 0V, $V_{DS}$ = 15V, f = 1MHz<br>P-CH<br>$V_{GS}$ = 0V, $V_{DS}$ = -15V, f = 1MHz | N-CH | | 323 | | pF |
| | | | P-CH | | 820 | | |
| Output Capacitance | $C_{oss}$ | | N-CH | | 75 | | |
| | | | P-CH | | 122 | | |
| Reverse Transfer Capacitance | $C_{rss}$ | | N-CH | | 53 | | |
| | | | P-CH | | 97 | | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Total Gate Charge[1,2] | $Q_g$ | N-CH<br>$V_{DS}$ = 15V, $V_{GS}$ = 10V,<br>$I_D$ = 6.5A<br>P-CH<br>$V_{DS}$ = -15V, $V_{GS}$ = -10V,<br>$I_D$ = -6A | N-CH | | 7.1 | | nC |
| | | | P-CH | | 9 | | |
| Gate-Source Charge[1,2] | $Q_{gs}$ | | N-CH | | 1.1 | | |
| | | | P-CH | | 2.2 | | |
| Gate-Drain Charge[1,2] | $Q_{gd}$ | | N-CH | | 2.1 | | |
| | | | P-CH | | 2.5 | | |
| Turn-On Delay Time[1,2] | $t_{d(on)}$ | N-CH<br>$V_{DS}$ = 10V,<br>$I_D$ = 1A, $V_{GS}$ = 10V, $R_{GS}$ = 6Ω<br>P-CH<br>$V_{DS}$ = -10V,<br>$I_D$ = -1A, $V_{GS}$ = -10V, $R_{GS}$ = 6Ω | N-CH | | 8 | | nS |
| | | | P-CH | | 12 | | |
| Rise Time[1,2] | $t_r$ | | N-CH | | 12 | | |
| | | | P-CH | | 16 | | |
| Turn-Off Delay Time[1,2] | $t_{d(off)}$ | | N-CH | | 28 | | |
| | | | P-CH | | 34 | | |
| Fall Time[1,2] | $t_f$ | | N-CH | | 15 | | |
| | | | P-CH | | 20 | | |
| **SOURCE-DRAIN DIODE RATINGS AND CHARACTERISTICS ($T_C$ = 25 °C)** | | | | | | | |
| Continuous Current | $I_S$ | | N-CH | | | 1.5 | A |
| | | | P-CH | | | -1.5 | |
| Pulsed Current[3] | $I_{SM}$ | | N-CH | | | 6 | |
| | | | P-CH | | | -6 | |
| Forward Voltage[1] | $V_{SD}$ | $I_F$ = $I_S$, $V_{GS}$ = 0V | N-CH | | | 1.2 | V |
| | | | P-CH | | | -1.2 | |

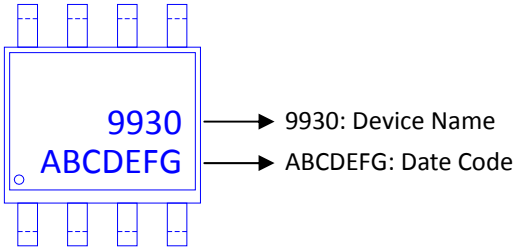
[1]Pulse test : Pulse Width ≤ 300 μsec, Duty Cycle ≤ 2%.

[2]Independent of operating temperature.

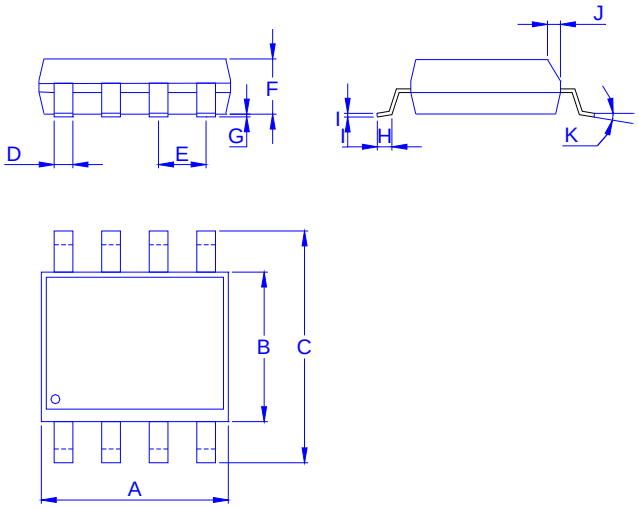
[3]Pulse width limited by maximum junction temperature.

## Ordering & Marking Information:

Device Name: LB9930H for SOP-8



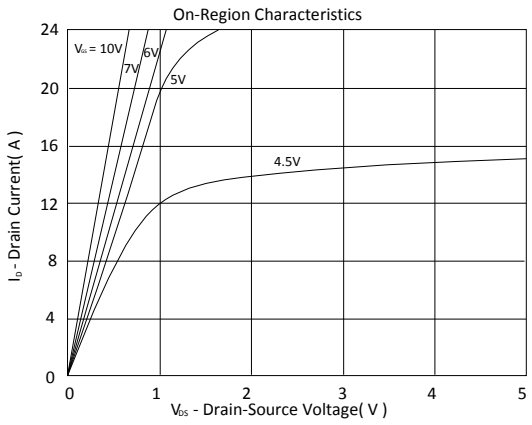

## Outline Drawing

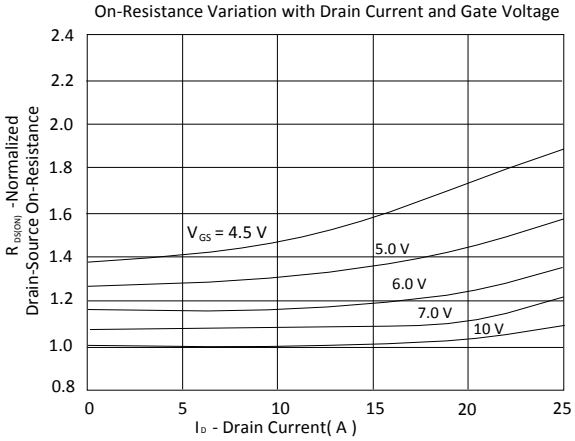


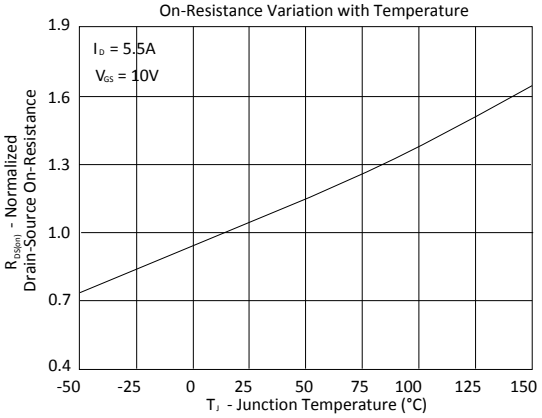

Dimension in mm

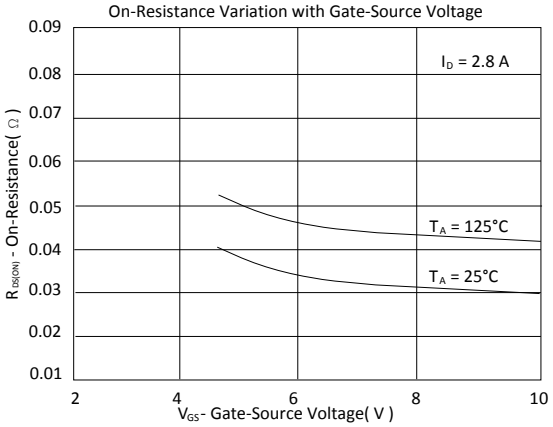
| Dimension | A | B | C | D | E | F | G | H | I | J | K |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Min. | 4.70 | 3.70 | 5.80 | 0.33 | | 1.20 | 0.08 | 0.40 | 0.19 | 0.25 | 0° |
| Typ. | | | | | 1.27 | | | | | | |
| Max. | 5.10 | 4.10 | 6.20 | 0.51 | | 1.62 | 0.28 | 0.83 | 0.26 | 0.50 | 8° |

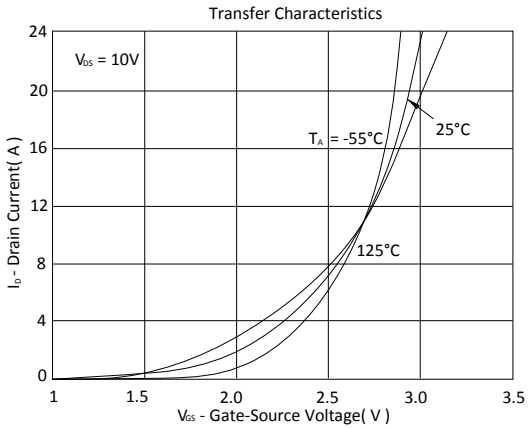
## N-Channel

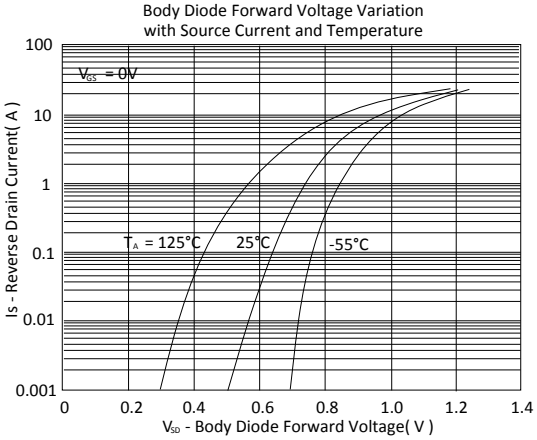

On-Region Characteristics
$V_{GS}$ = 10V
6V
7V
5V
4.5V
$I_D$ - Drain Current( A )
$V_{DS}$ - Drain-Source Voltage( V )


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 )

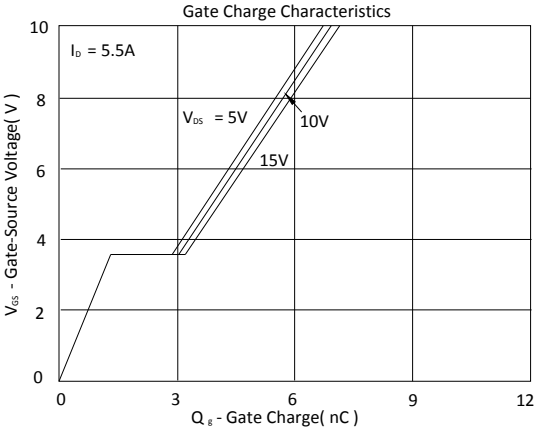

On-Resistance Variation with Temperature
$I_D$ = 5.5A
$V_{GS}$ = 10V
$R_{DS(on)}$ - Normalized
Drain-Source On-Resistance
$T_J$ - Junction Temperature (°C)


On-Resistance Variation with Gate-Source Voltage
$I_D$ = 2.8 A
$T_A$ = 125°C
$T_A$ = 25°C
$R_{DS(ON)}$ - On-Resistance( Ω )
$V_{GS}$- Gate-Source Voltage( V )

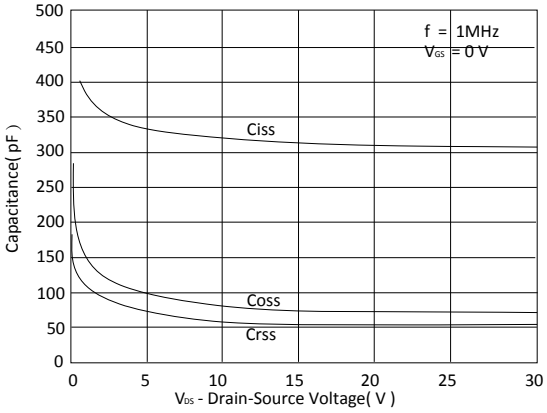

Transfer Characteristics
$V_{DS}$ = 10V
$T_A$ = -55°C
25°C
125°C
$I_D$ - Drain Current( A )
$V_{GS}$ - Gate-Source Voltage( V )


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 )

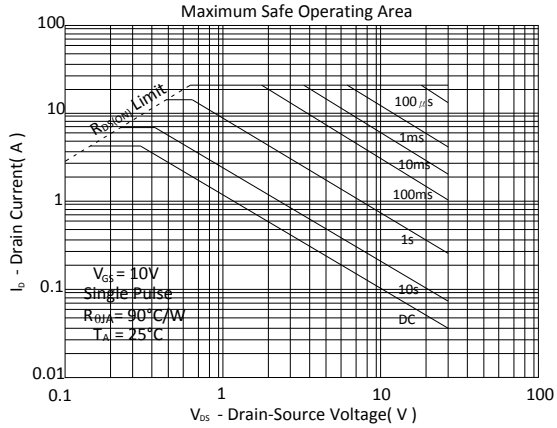
Gate Charge Characteristics



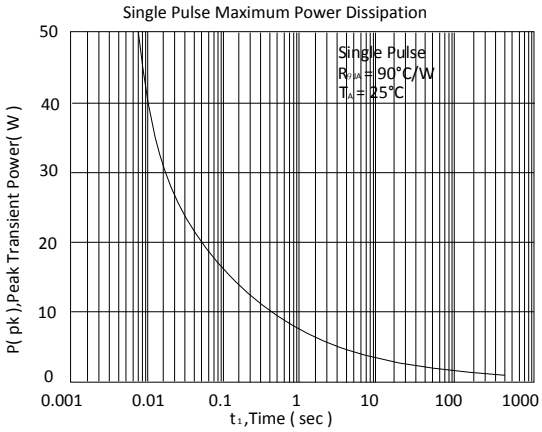

Capacitance Characteristics



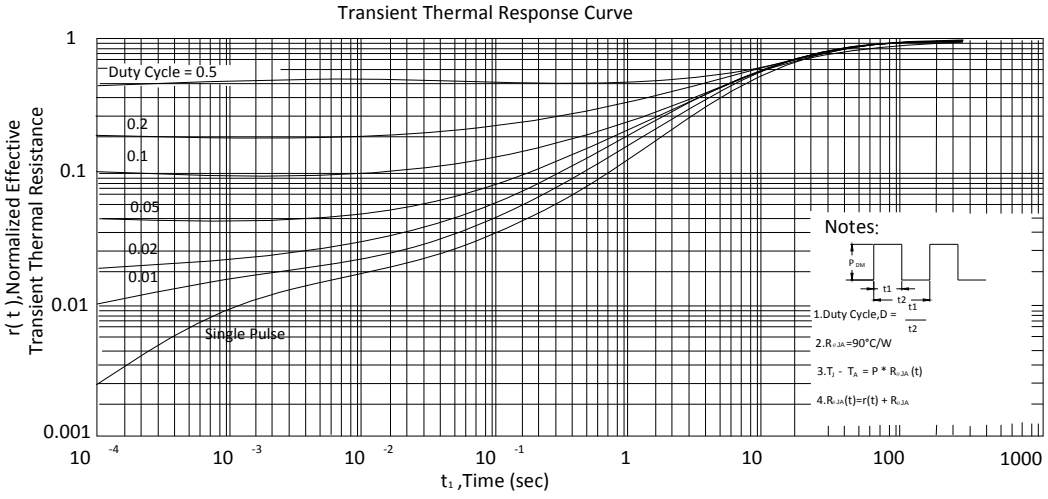

Maximum Safe Operating Area




Single Pulse Maximum Power Dissipation

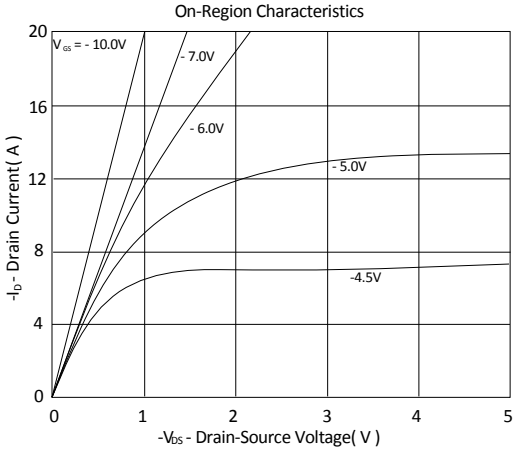



Transient Thermal Response Curve

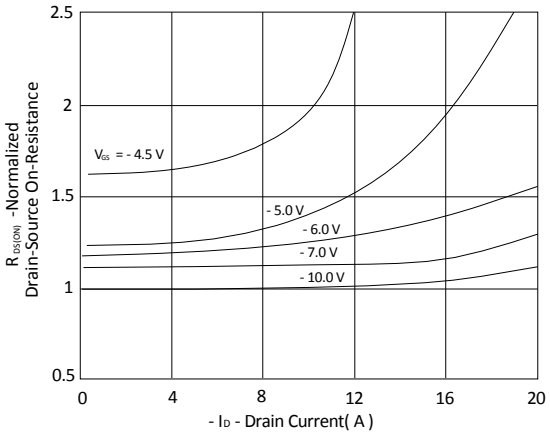


## P-Channel

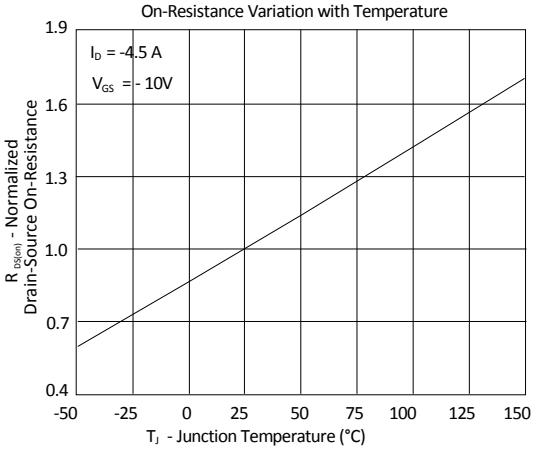
On-Region Characteristics



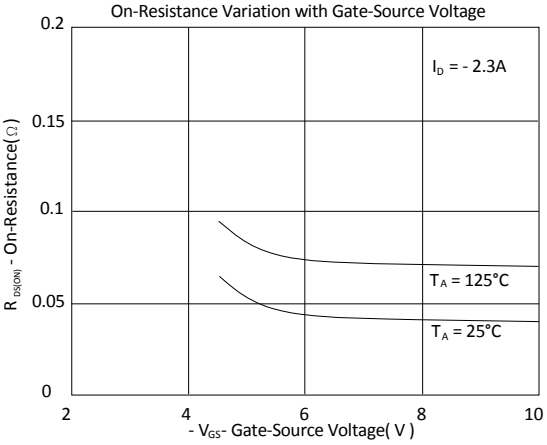

On-Resistance Variation with Drain Current and Gate Voltage



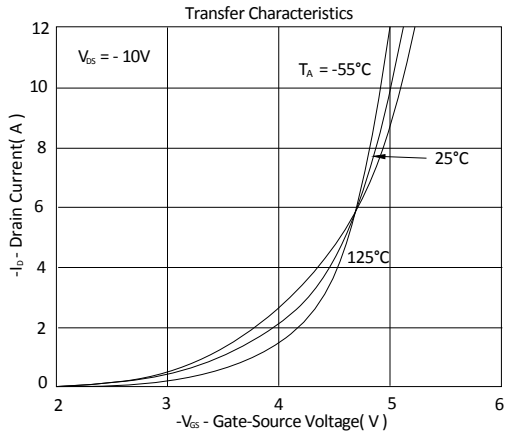

On-Resistance Variation with Temperature



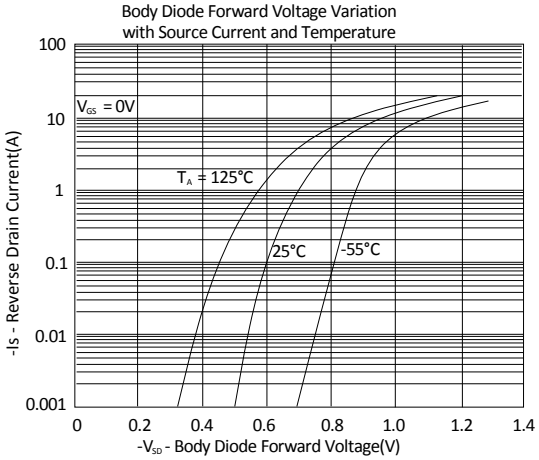

On-Resistance Variation with Gate-Source Voltage



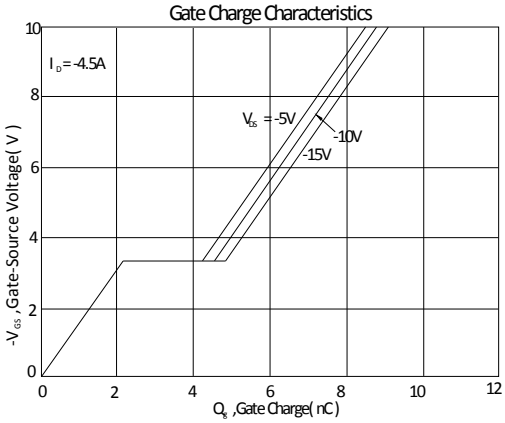

Transfer Characteristics



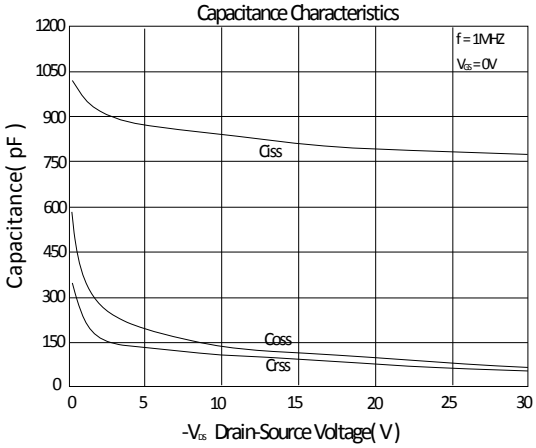

Body Diode Forward Voltage Variation with Source Current and Temperature



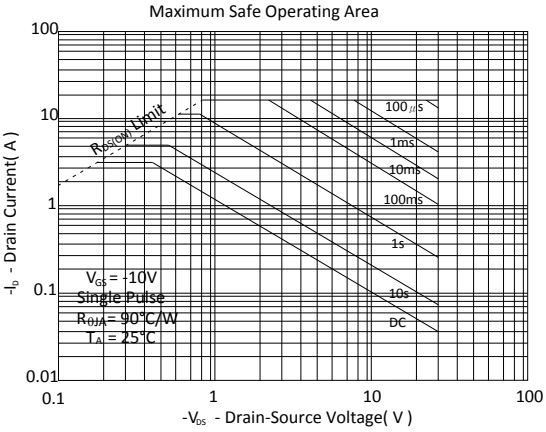
Gate Charge Characteristics



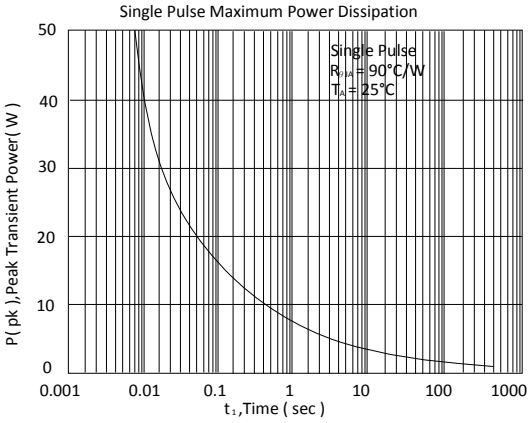

Capacitance Characteristics




Maximum Safe Operating Area




Single Pulse Maximum Power Dissipation




Transient Thermal Response Curve