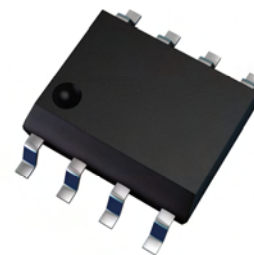


ZXMHC6A07N8

60V SO8 Complementary enhancement mode MOSFET H-Bridge

Summary

| Device | $V_{(BR)DSS}$ | Q_G | $R_{DS(on)}$ | I_D $T_A = 25^\circ C$ |
|--------|---------------|-------|--------------------------|-----------------------------|
| N-CH | 60V | 3.2nC | 0.25Ω @ $V_{GS} = 10V$ | 1.8A |
| | | | 0.35Ω @ $V_{GS} = 4.5V$ | 1.5A |
| P-CH | -60V | 5.1nC | 0.40Ω @ $V_{GS} = -10V$ | -1.4A |
| | | | 0.60Ω @ $V_{GS} = -4.5V$ | -1.2A |



Description

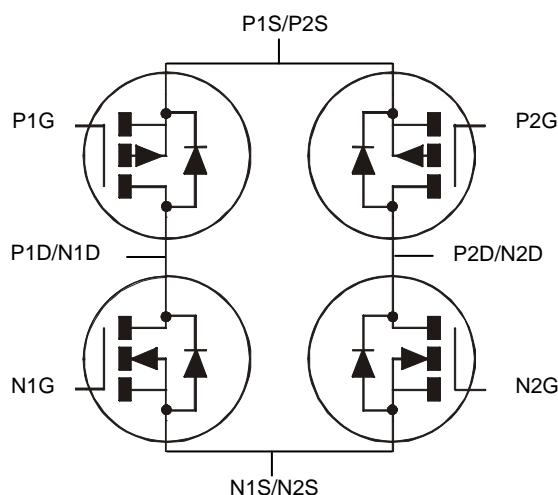
This new generation complementary MOSFET H-Bridge features low on-resistance achievable with low gate drive.

Features

- 2 x N + 2 x P channels in a SOIC package

Applications

- DC Motor control
- DC-AC Inverters

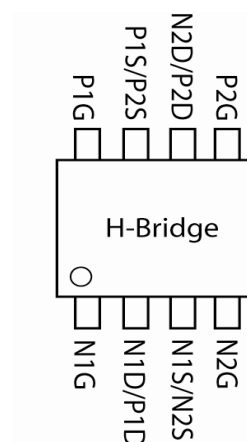


Ordering information

| Device | Reel size (inches) | Tape width (mm) | Quantity per reel |
|---------------|--------------------|-----------------|-------------------|
| ZXMHC6A07N8TC | 13 | 12 | 2,500 |

Device marking

ZXMHC
6A07



Absolute maximum ratings

| Parameter | Symbol | N-channel | P-channel | Unit |
|---|----------------|------------------------------|----------------------------------|---------------------|
| Drain-Source voltage | V_{DSS} | 60 | -60 | V |
| Gate-Source voltage | V_{GS} | ± 20 | ± 20 | V |
| Continuous Drain current @ $V_{GS}=10V$; $T_A=25^\circ C$ ^(b) @ $V_{GS}=10V$; $T_A=70^\circ C$ ^(b) @ $V_{GS}=10V$; $T_A=25^\circ C$ ^(a) @ $V_{GS}=10V$; $T_L=25^\circ C$ ^(f) | I_D | 1.80 1.40 1.39 1.42 | -1.42 -1.28 -1.28 -1.33 | A |
| Pulsed Drain current @ $V_{GS}=10V$; $T_A=25^\circ C$ ^(c) | I_{DM} | 7.10 | -6.03 | A |
| Continuous Source current (Body diode) at $T_A=25^\circ C$ ^(b) | I_S | 1.00 | -1.00 | A |
| Pulsed Source current (Body diode) at $T_A=25^\circ C$ ^(c) | I_{SM} | 7.10 | -6.03 | A |
| Power dissipation at $T_A=25^\circ C$ ^(a) Linear derating factor | P_D | 0.87 6.94 | | W mW/ $^\circ C$ |
| Power dissipation at $T_A=25^\circ C$ ^(b) Linear derating factor | P_D | 1.36 10.9 | | W mW/ $^\circ C$ |
| Power dissipation at $T_L=25^\circ C$ ^(f) Linear derating factor | P_D | 0.90 7.19 | | W mW/ $^\circ C$ |
| Operating and storage temperature range | T_j, T_{stg} | -55 to 150 | | $^\circ C$ |

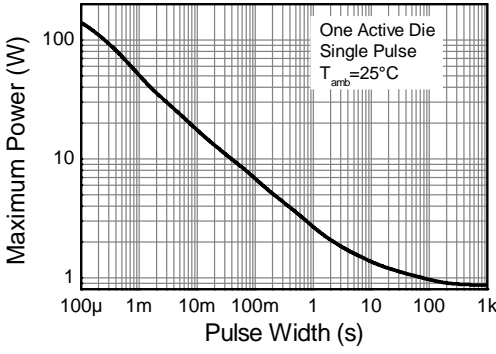
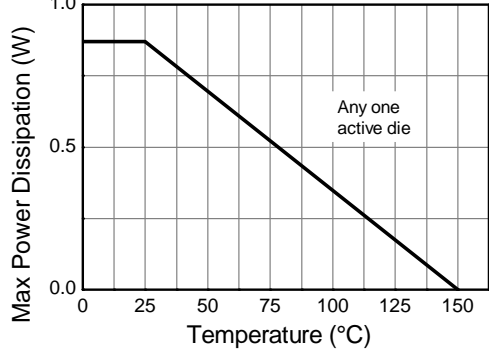
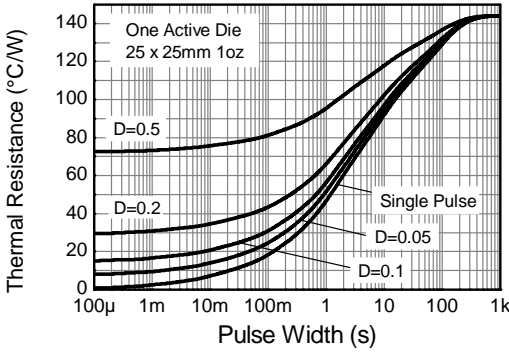
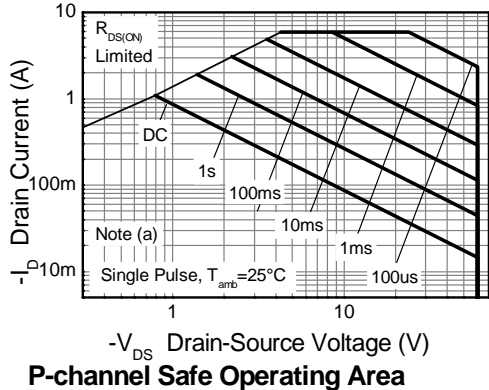
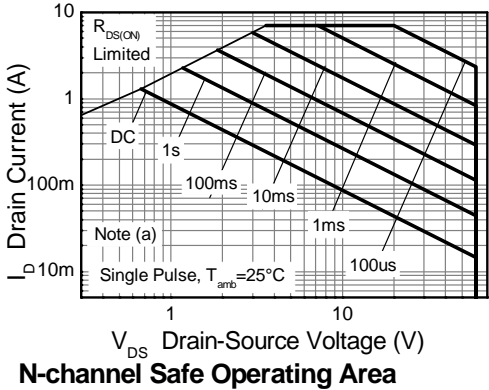
Thermal resistance

| Parameter | Symbol | Value | Unit |
|------------------------------------|-----------------|-------|--------------|
| Junction to ambient ^(a) | $R_{\theta JA}$ | 144 | $^\circ C/W$ |
| Junction to ambient ^(b) | $R_{\theta JA}$ | 92 | $^\circ C/W$ |
| Junction to ambient ^(d) | $R_{\theta JA}$ | 106 | $^\circ C/W$ |
| Junction to ambient ^(e) | $R_{\theta JA}$ | 254 | $^\circ C/W$ |
| Junction to lead ^(f) | $R_{\theta JL}$ | 139 | $^\circ C/W$ |

NOTES:

- For a device surface mounted on 25mm x 25mm x 1.6mm FR4 PCB with high coverage of single sided 1oz copper, in still air conditions with the heat-sink split into two equal areas (one for each drain connection); the device is measured when operating in a steady-state condition with one active die.
- Same as note (a), except the device is measured at $t \leq 10$ sec.
- Same as note (a), except the device is pulsed with $D=0.02$ and pulse width 300 μs . The pulse current is limited by the maximum junction temperature.
- For a device surface mounted on 50mm x 50mm x 1.6mm FR4 PCB with high coverage of single sided 2oz copper, in still air conditions with the heat-sink split into two equal areas (one for each drain connection); the device is measured when operating in a steady-state condition with one active die.
- For a device surface mounted on minimum copper 1.6mm FR4 PCB, in still air conditions; the device is measured when operating in a steady-state condition with one active die.
- Thermal resistance from junction to solder-point (at the end of the drain lead); the device is operating in a steady-state condition with one active die.

Thermal characteristics



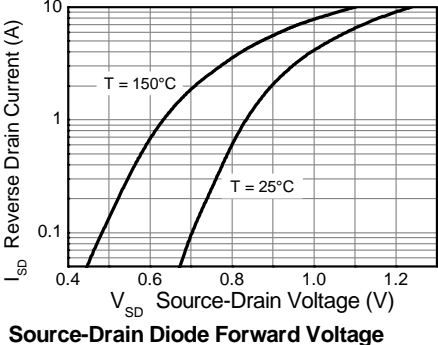
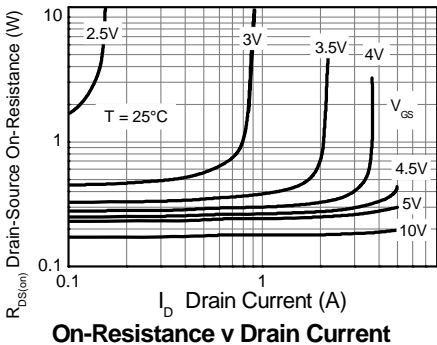
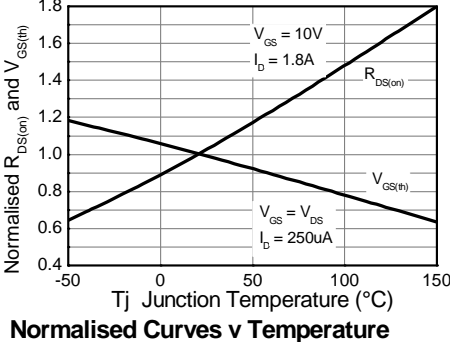
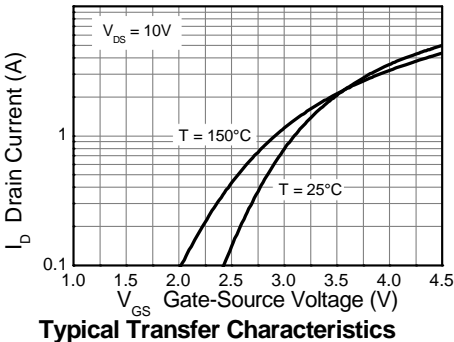
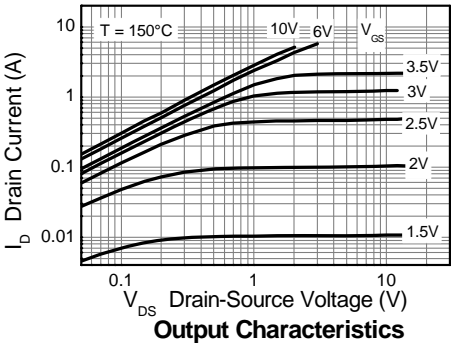
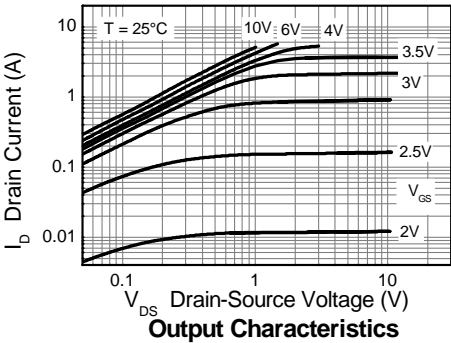
N-channel electrical characteristics (at $T_{amb} = 25^{\circ}\text{C}$ unless otherwise stated)

| Parameter | Symbol | Min. | Typ. | Max. | Unit | Conditions |
|--|---------------|------|------|--------------|---------------|---|
| Static | | | | | | |
| Drain-Source breakdown voltage | $V_{(BR)DSS}$ | 60 | | | V | $I_D = 250\mu\text{A}$, $V_{GS} = 0\text{V}$ |
| Zero Gate voltage Drain current | I_{DSS} | | | 0.5 | μA | $V_{DS} = 60\text{V}$, $V_{GS} = 0\text{V}$ |
| Gate-Body leakage | I_{GSS} | | | ± 100 | nA | $V_{GS} = \pm 20\text{V}$, $V_{DS} = 0\text{V}$ |
| Gate-Source threshold voltage | $V_{GS(th)}$ | 1.0 | | 3.0 | V | $I_D = 250\mu\text{A}$, $V_{DS} = V_{GS}$ |
| Static Drain-Source on-state resistance ^(a) | $R_{DS(on)}$ | | | 0.25 0.35 | Ω | $V_{GS} = 10\text{V}$, $I_D = 1.8\text{A}$ $V_{GS} = 4.5\text{V}$, $I_D = 1.3\text{A}$ |
| Forward Transconductance ^{(a) (c)} | g_{fs} | | 2.3 | | S | $V_{DS} = 15\text{V}$, $I_D = 1.8\text{A}$ |
| Dynamic | | | | | | |
| Capacitance ^(c) | | | | | | |
| Input capacitance | C_{iss} | | 166 | | pF | $V_{DS} = 40\text{V}$, $V_{GS} = 0\text{V}$ $f = 1\text{MHz}$ |
| Output capacitance | C_{oss} | | 19.5 | | pF | |
| Reverse transfer capacitance | C_{rss} | | 8.7 | | pF | |
| Switching ^{(b) (c)} | | | | | | |
| Turn-on-delay time | $t_{d(on)}$ | | 1.8 | | ns | $V_{DD} = 30\text{V}$, $V_{GS} = 10\text{V}$ $I_D = 1.8\text{A}$ $R_G \cong 6.0\Omega$, |
| Rise time | t_r | | 1.4 | | ns | |
| Turn-off delay time | $t_{d(off)}$ | | 4.9 | | ns | |
| Fall time | t_f | | 2.0 | | ns | |
| Gate charge ^(c) | | | | | | |
| Total Gate charge | Q_g | | 3.2 | | nC | $V_{DS} = 30\text{V}$, $V_{GS} = 10\text{V}$ $I_D = 1.8\text{A}$ |
| Gate-Source charge | Q_{gs} | | 0.67 | | nC | |
| Gate-Drain charge | Q_{gd} | | 0.82 | | nC | |
| Source-Drain diode | | | | | | |
| Diode forward voltage ^(a) | V_{SD} | | 0.80 | 0.95 | V | $I_S = 0.45\text{A}$, $V_{GS} = 0\text{V}$ |
| Reverse recovery time ^(c) | t_{rr} | | 20.5 | | ns | $I_S = 1.8\text{A}$, $di/dt = 100\text{A}/\mu\text{s}$ |
| Reverse recovery charge ^(c) | Q_{rr} | | 21.3 | | nC | |

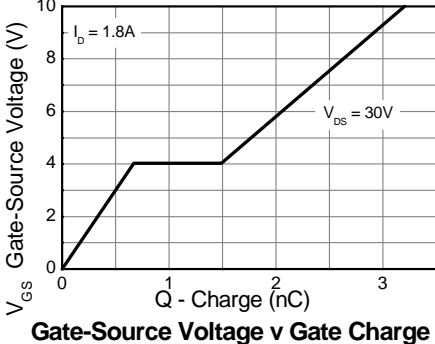
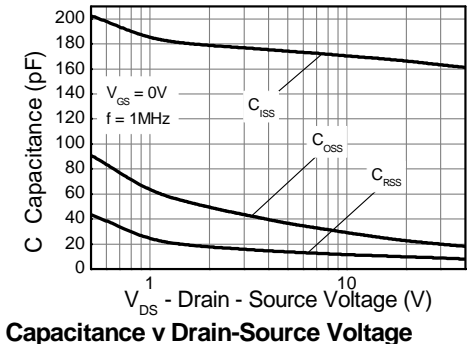
NOTES:

- (a) Measured under pulsed conditions. Pulse width $\leq 300\mu\text{s}$; duty cycle $\leq 2\%$.
 (b) Switching characteristics are independent of operating junction temperature.
 (c) For design aid only, not subject to production testing

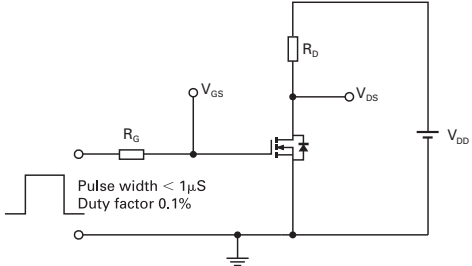
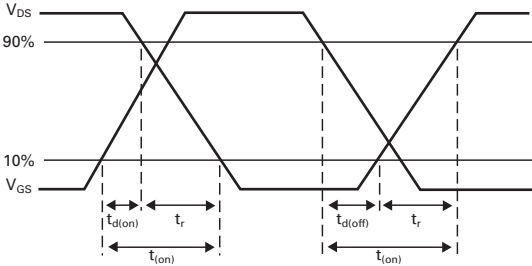
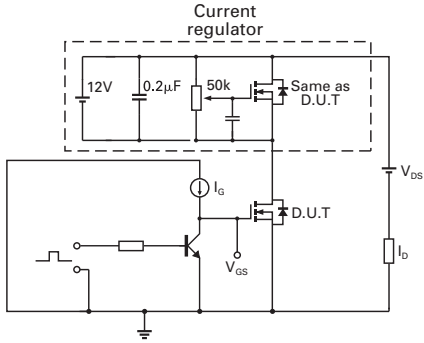
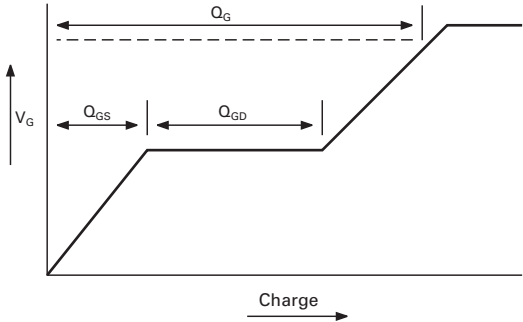
N-channel typical characteristics



N-channel typical characteristics –continued



Test circuits



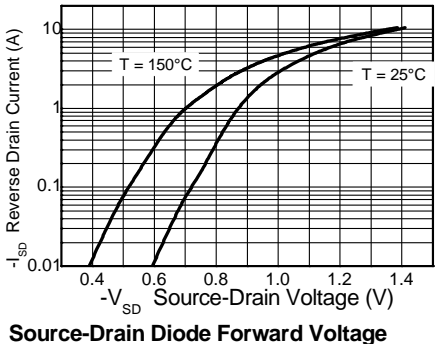
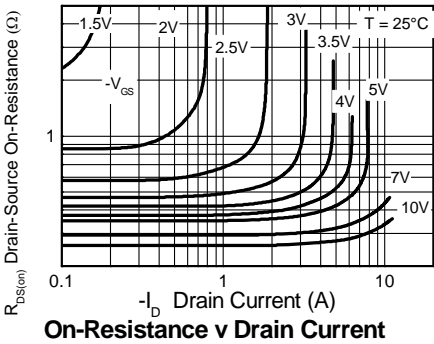
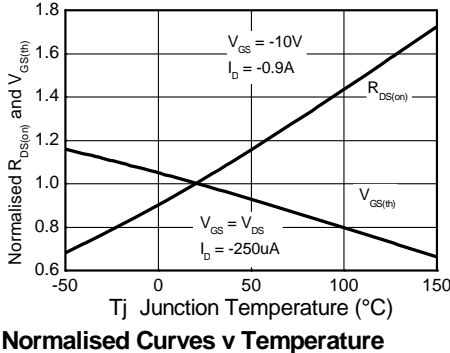
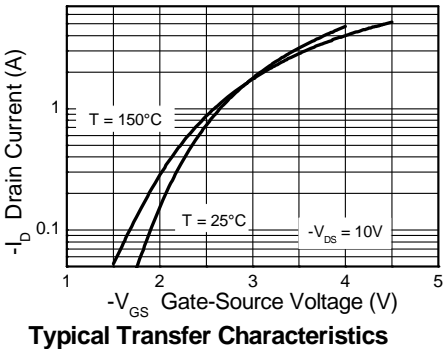
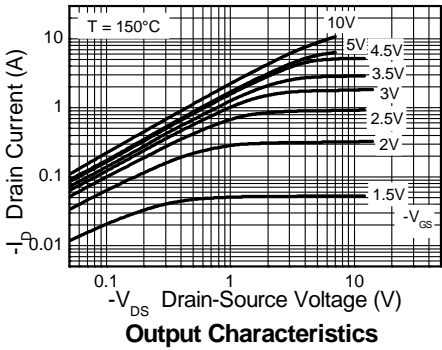
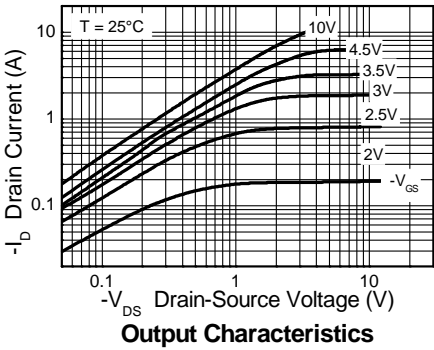
P-channel electrical characteristics (at $T_{amb} = 25^{\circ}\text{C}$ unless otherwise stated)

| Parameter | Symbol | Min. | Typ. | Max. | Unit | Conditions |
|--|---------------|------|-------|--------------|---------------|--|
| Static | | | | | | |
| Drain-Source breakdown voltage | $V_{(BR)DSS}$ | -60 | | | V | $I_D = -250\mu\text{A}$, $V_{GS} = 0\text{V}$ |
| Zero Gate voltage Drain current | I_{DSS} | | | -0.5 | μA | $V_{DS} = -60\text{V}$, $V_{GS} = 0\text{V}$ |
| Gate-Body leakage | I_{GSS} | | | ± 100 | nA | $V_{GS} = \pm 20\text{V}$, $V_{DS} = 0\text{V}$ |
| Gate-Source threshold voltage | $V_{GS(th)}$ | -1.0 | | -3.0 | V | $I_D = -250\mu\text{A}$, $V_{DS} = V_{GS}$ |
| Static Drain-Source on-state resistance ^(a) | $R_{DS(on)}$ | | | 0.40 0.60 | Ω | $V_{GS} = -10\text{V}$, $I_D = -0.9\text{A}$ $V_{GS} = -4.5\text{V}$, $I_D = -0.8\text{A}$ |
| Forward Transconductance ^{(a) (c)} | g_{fs} | | 1.8 | | S | $V_{DS} = -15\text{V}$, $I_D = -0.9\text{A}$ |
| Dynamic | | | | | | |
| Capacitance ^(c) | | | | | | |
| Input capacitance | C_{iss} | | 141 | | pF | $V_{DS} = -50\text{V}$, $V_{GS} = 0\text{V}$ $f = 1\text{MHz}$ |
| Output capacitance | C_{oss} | | 13.1 | | pF | |
| Reverse transfer capacitance | C_{rss} | | 10.8 | | pF | |
| Switching ^{(b) (c)} | | | | | | |
| Turn-on-delay time | $t_{d(on)}$ | | 1.6 | | ns | $V_{DD} = -30\text{V}$, $V_{GS} = -10\text{V}$ $I_D = -1.0\text{A}$ $R_G \cong 6.0\Omega$ |
| Rise time | t_r | | 2.3 | | ns | |
| Turn-off delay time | $t_{d(off)}$ | | 13 | | ns | |
| Fall time | t_f | | 5.8 | | ns | |
| Gate charge ^(c) | | | | | | |
| Total Gate charge | Q_g | | 5.1 | | nC | $V_{DS} = -30\text{V}$, $V_{GS} = -10\text{V}$ $I_D = -0.9\text{A}$ |
| Gate-Source charge | Q_{gs} | | 0.7 | | nC | |
| Gate-Drain charge | Q_{gd} | | 0.7 | | nC | |
| Source-Drain diode | | | | | | |
| Diode forward voltage ^(a) | V_{SD} | | -0.85 | -0.95 | V | $I_S = -0.8\text{A}$, $V_{GS} = 0\text{V}$ |
| Reverse recovery time ^(c) | t_{rr} | | 22.6 | | ns | $I_S = -0.9\text{A}$, $di/dt = 100\text{A}/\mu\text{s}$ |
| Reverse recovery charge ^(c) | Q_{rr} | | 23.2 | | nC | |

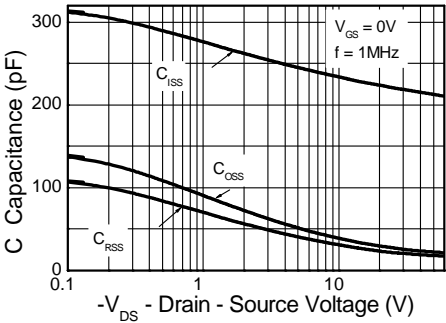
NOTES:

- (a) Measured under pulsed conditions. Pulse width $\leq 300\mu\text{s}$; duty cycle $\leq 2\%$.
 (b) Switching characteristics are independent of operating junction temperature.
 (c) For design aid only, not subject to production testing

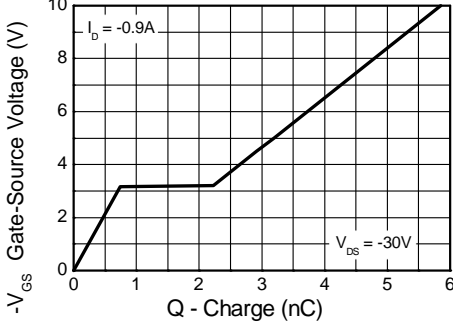
P-channel typical characteristics



P-channel typical characteristics –continued

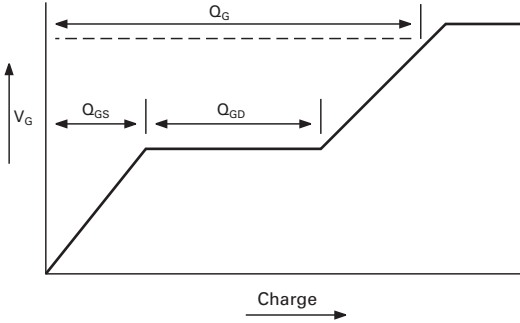


Capacitance v Drain-Source Voltage

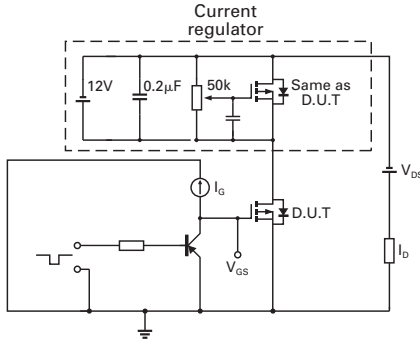


Gate-Source Voltage v Gate Charge

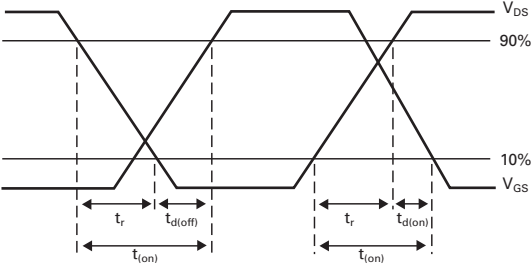
Test circuits



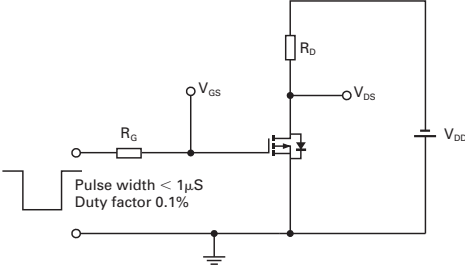
Basic gate charge waveform



Gate charge test circuit

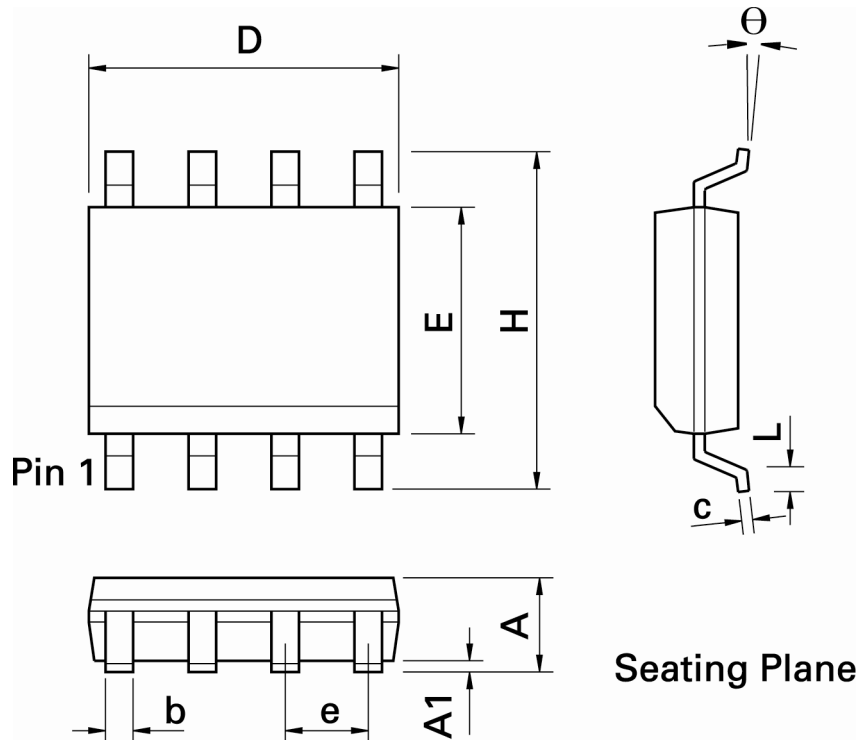


Switching time waveforms



Switching time test circuit

Packaging details - SO8



| DIM | Inches | | Millimeters | | DIM | Inches | | Millimeters | |
|-----|--------|-------|-------------|------|-----|-----------|-------|-------------|------|
| | Min. | Max. | Min. | Max. | | Min. | Max. | Min. | Max. |
| A | 0.053 | 0.069 | 1.35 | 1.75 | e | 0.050 BSC | | 1.27 BSC | |
| A1 | 0.004 | 0.010 | 0.10 | 0.25 | b | 0.013 | 0.020 | 0.33 | 0.51 |
| D | 0.189 | 0.197 | 4.80 | 5.00 | c | 0.008 | 0.010 | 0.19 | 0.25 |
| H | 0.228 | 0.244 | 5.80 | 6.20 | θ | 0° | 8° | 0° | 8° |
| E | 0.150 | 0.157 | 3.80 | 4.00 | - | - | - | - | - |
| L | 0.016 | 0.050 | 0.40 | 1.27 | - | - | - | - | - |

Note: Controlling dimensions are in inches. Approximate dimensions are provided in millimeters

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