

Features

- N-Channel
30V/50A,
 $R_{DS(ON)} = 5m\Omega$ (Typ.) @ $V_{GS} = 10V$
 $R_{DS(ON)} = 7m\Omega$ (Typ.) @ $V_{GS} = 4.5V$
- P-Channel
-30V/-40A,
 $R_{DS(ON)} = 9m\Omega$ (Typ.) @ $V_{GS} = -10V$
 $R_{DS(ON)} = 12m\Omega$ (Typ.) @ $V_{GS} = -4.5V$
- Very low on-resistance
- Fast Switching

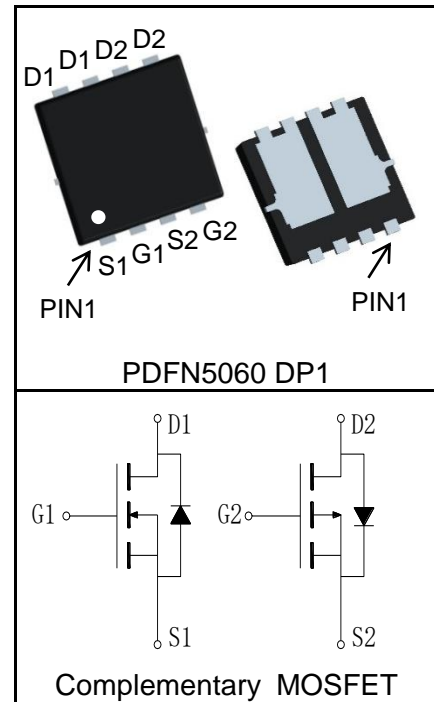
Applications

- Motor Drive Applications



Halogen-Free

Pin Description



Absolute Maximum Ratings

| Symbol | Parameter | | N-Channel | P-Channel | Unit |
|--|--|---------------------------|------------|------------|---------------------------|
| Common Ratings ($T_A = 25^\circ\text{C}$ Unless Otherwise Noted) | | | | | |
| V_{DSS} | Drain-Source Voltage | | 30 | -30 | V |
| V_{GSS} | Gate-Source Voltage | | ± 20 | ± 20 | |
| T_J | Maximum Junction Temperature | | 150 | 150 | $^\circ\text{C}$ |
| T_{STG} | Storage Temperature Range | | -55 to 150 | -55 to 150 | $^\circ\text{C}$ |
| I_S | Diode Continuous Forward Current | $T_C = 25^\circ\text{C}$ | 50 | -40 | A |
| Mounted on Large Heat Sink | | | | | |
| $I_{DP}^{(1)}$ | 300 μs Pulse Drain Current Tested | $T_C = 25^\circ\text{C}$ | 200 | -160 | A |
| $I_D^{(2)}$ | Continuous Drain Current @ T_C ($V_{GS} = \pm 10V$) | $T_C = 25^\circ\text{C}$ | 50 | -40 | A |
| | | $T_C = 100^\circ\text{C}$ | 32 | -25 | |
| | Continuous Drain Current @ T_A ($V_{GS} = \pm 10V$) ⁽³⁾ | $T_A = 25^\circ\text{C}$ | 16 | -13 | |
| | | $T_A = 70^\circ\text{C}$ | 13 | -10 | |
| P_D | Maximum Power Dissipation @ T_C | $T_C = 25^\circ\text{C}$ | 29 | 29 | W |
| | | $T_C = 100^\circ\text{C}$ | 12 | 12 | |
| | Maximum Power Dissipation @ T_A ⁽³⁾ | $T_A = 25^\circ\text{C}$ | 3.1 | 3.1 | |
| | | $T_A = 70^\circ\text{C}$ | 2 | 2 | |
| $R_{\theta JC}$ | Thermal Resistance-Junction to Case | | 4.3 | 4.3 | $^\circ\text{C}/\text{W}$ |
| $R_{\theta JA}^{(3)}$ | Thermal Resistance-Junction to Ambient | | 40 | 40 | $^\circ\text{C}/\text{W}$ |
| Drain-Source Avalanche Ratings | | | | | |
| $E_{AS}^{(4)}$ | Avalanche Energy, Single Pulsed | | 25 | 25 | mJ |

Electrical Characteristics ($T_A=25^\circ\text{C}$ Unless Otherwise Noted)

| Symbol | Parameter | Test Condition | KS3608NA | | | Unit | |
|--|----------------------------------|--|----------|------|-------|-----------|------------|
| | | | Min. | Typ. | Max. | | |
| Static Characteristics | | | | | | | |
| BV_{DSS} | Drain-Source Breakdown Voltage | $V_{GS}=0V, I_{DS}=250\mu A$ | N | 30 | | V | |
| | | $V_{GS}=0V, I_{DS}=-250\mu A$ | P | -30 | | | |
| I_{DSS} | Zero Gate Voltage Drain Current | $V_{DS}=30V, V_{GS}=0V$ | N | | 1 | μA | |
| | | $T_J=125^\circ C$ | | | 30 | | |
| | | $V_{DS}=-30V, V_{GS}=0V$ | P | | -1 | | |
| | | $T_J=125^\circ C$ | | | -30 | | |
| $V_{GS(th)}$ | Gate Threshold Voltage | $V_{DS}=V_{GS}, I_{DS}=250\mu A$ | N | 1.1 | 1.5 | 2.3 | V |
| | | $V_{DS}=V_{GS}, I_{DS}=-250\mu A$ | P | -1.1 | -1.5 | -2.3 | |
| I_{GSS} | Gate Leakage Current | $V_{GS}=\pm 20V, V_{DS}=0V$ | N | | | ± 100 | nA |
| | | $V_{GS}=\pm 20V, V_{DS}=0V$ | P | | | ± 100 | |
| $R_{DS(ON)}^{(5)}$ | Drain-Source On-state Resistance | $V_{GS}=10V, I_{DS}=20A$ | N | | 5 | 6.5 | m Ω |
| | | $V_{GS}=-10V, I_{DS}=-20A$ | P | | 9 | 11 | |
| | | $V_{GS}=4.5V, I_{DS}=16A$ | N | | 7 | 9 | |
| | | $V_{GS}=-4.5V, I_{DS}=-16A$ | P | | 12 | 15 | |
| Diode Characteristics | | | | | | | |
| $V_{SD}^{(5)}$ | Diode Forward Voltage | $I_{SD}=20A, V_{GS}=0V$ | N | | 0.85 | 1.2 | V |
| | | $I_{SD}=-20A, V_{GS}=0V$ | P | | -0.89 | -1.2 | |
| t_{rr} | Reverse Recovery Time | N-Channel $I_{SD}=20A, dI_{SD}/dt=100A/\mu s$ | N | | 29 | | ns |
| | | | P | | 39 | | |
| Q_{rr} | Reverse Recovery Charge | P-Channel $I_{SD}=-20A, dI_{SD}/dt=100A/\mu s$ | N | | 55 | | nC |
| | | | P | | 21 | | |
| Dynamic Characteristics⁽⁶⁾ | | | | | | | |
| R_G | Gate Resistance | $V_{GS}=0V, V_{DS}=0V, F=1MHz$ | N | | 0.9 | | Ω |
| | | | P | | 3.1 | | |
| C_{iss} | Input Capacitance | N-Channel $V_{GS}=0V, V_{DS}=15V,$ Frequency=1.0MHz | N | | 2600 | | pF |
| | | | P | | 4210 | | |
| C_{oss} | Output Capacitance | P-Channel $V_{GS}=0V, V_{DS}=-15V,$ Frequency=1.0MHz | N | | 420 | | |
| | | | P | | 505 | | |
| C_{rss} | Reverse Transfer Capacitance | N-Channel $V_{GS}=0V, V_{DS}=-15V,$ Frequency=1.0MHz | N | | 285 | | |
| | | | P | | 430 | | |

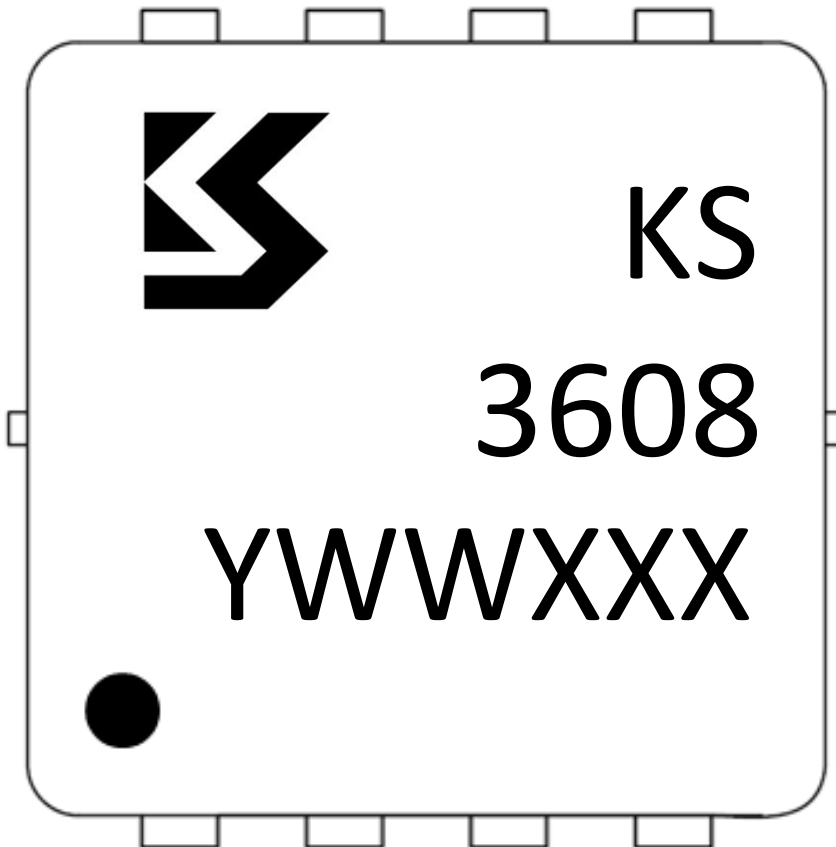
Electrical Characteristics ($T_A=25^{\circ}\text{C}$ Unless Otherwise Noted)

| Symbol | Parameter | Test Condition | KS3608NA | | | Unit | |
|---|---------------------|---|----------|------|------|------|----|
| | | | Min. | Typ. | Max. | | |
| Dynamic Characteristics ^⑥ | | | | | | | |
| $t_{d(ON)}$ | Turn-on Delay Time | N-Channel $V_{DD}=15\text{V}$, $I_{DS}=20\text{A}$, $V_{GEN}=10\text{V}$, $R_G=3\Omega$ P-Channel $V_{DD}=-15\text{V}$, $I_{DS}=-20\text{A}$, $V_{GEN}=-10\text{V}$, $R_G=3\Omega$ | N | | 18 | | ns |
| | | | P | | 21 | | |
| t_r | Turn-on Rise Time | | N | | 15 | | |
| | | | P | | 53 | | |
| $t_{d(OFF)}$ | Turn-off Delay Time | | N | | 39 | | |
| | | | P | | 42 | | |
| t_f | Turn-off Fall Time | | N | | 16 | | |
| | | | P | | 17 | | |
| Gate Charge Characteristics ^⑥ | | | | | | | |
| Q_g | Total Gate Charge | N-Channel $V_{DS}=15\text{V}$, $V_{GS}=10\text{V}$, $I_{DS}=20\text{A}$ P-Channel $V_{DS}=-15\text{V}$, $V_{GS}=-10\text{V}$, $I_{DS}=-20\text{A}$ | N | | 42 | | nC |
| | | | P | | 75 | | |
| Q_{gs} | Gate-Source Charge | | N | | 5 | | |
| | | | P | | 12 | | |
| Q_{gd} | Gate-Drain Charge | | N | | 8 | | |
| | | | P | | 15 | | |

- Notes:
- ① Pulse width limited by safe operating area.
 - ② Calculated continuous current based on maximum allowable junction temperature.
 - ③ When mounted on 1 inch square copper board, $t \leq 10\text{sec}$. The value in any given application depends on the user's specific board design.
 - ④ Limited by T_{Jmax} . Starting $T_J = 25^{\circ}\text{C}$, N Channel: $L = 0.5\text{mH}$, $R_G = 25\Omega$, $I_{AS} = 10\text{A}$, $V_{GS} = 10\text{V}$, P-Channel: $L = 0.5\text{mH}$, $R_G = 25\Omega$, $I_{AS} = -10\text{A}$, $V_{GS} = -10\text{V}$, Part not recommended for use above this value.
 - ⑤ Pulse test; Pulse width $\leq 300\mu\text{s}$, duty cycle $\leq 2\%$.
 - ⑥ Guaranteed by design, not subject to production testing.

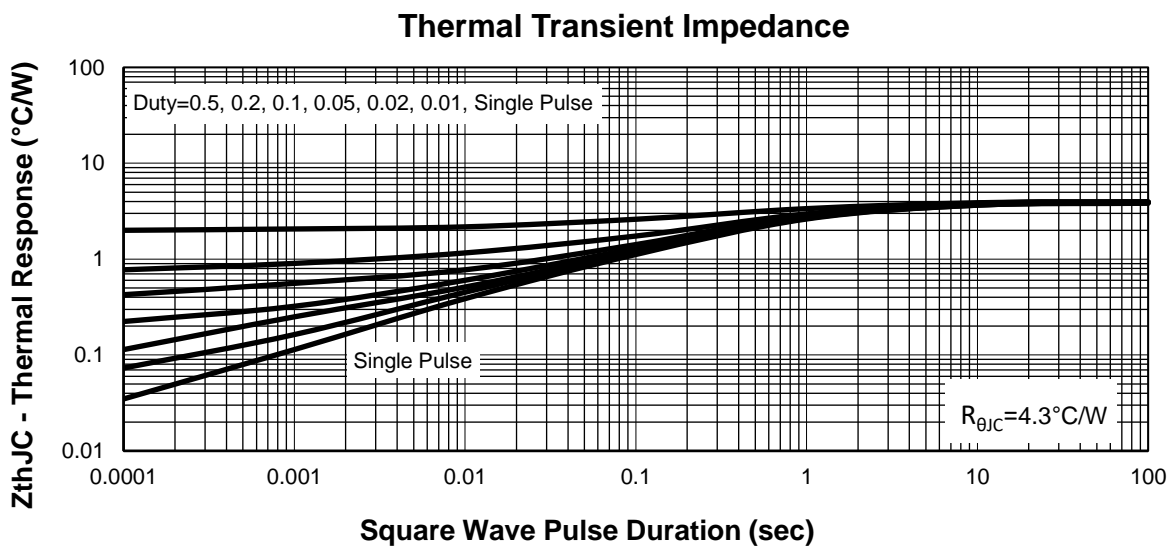
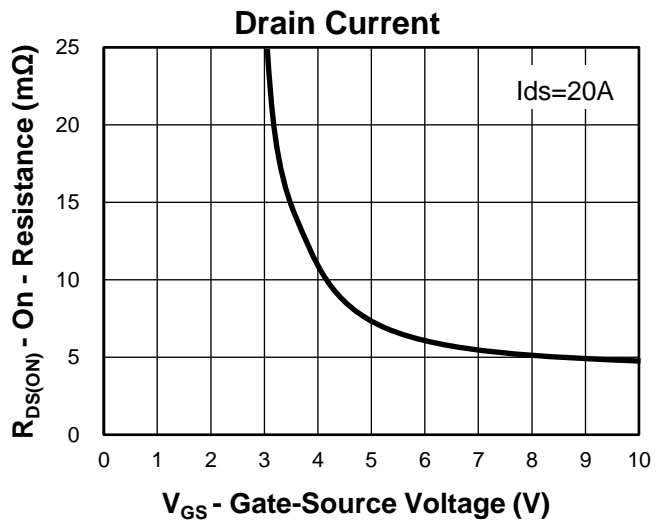
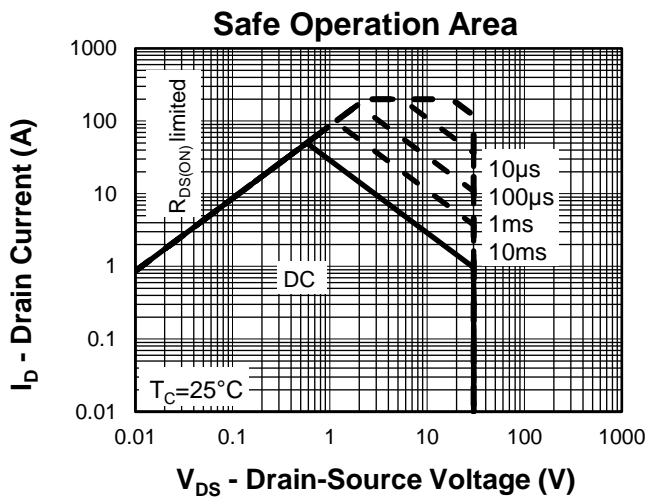
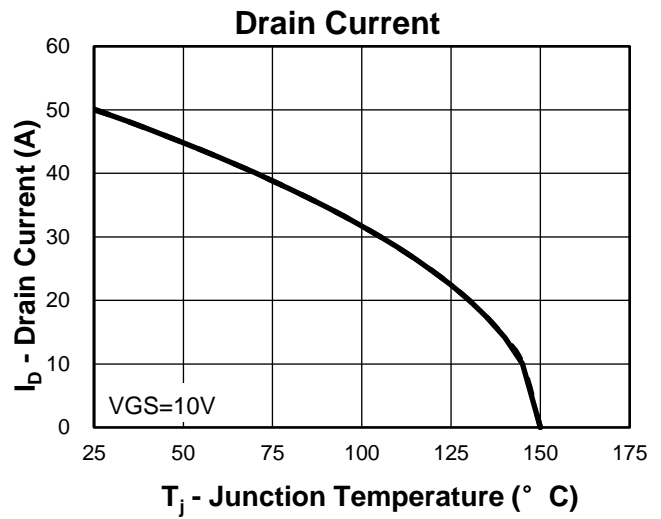
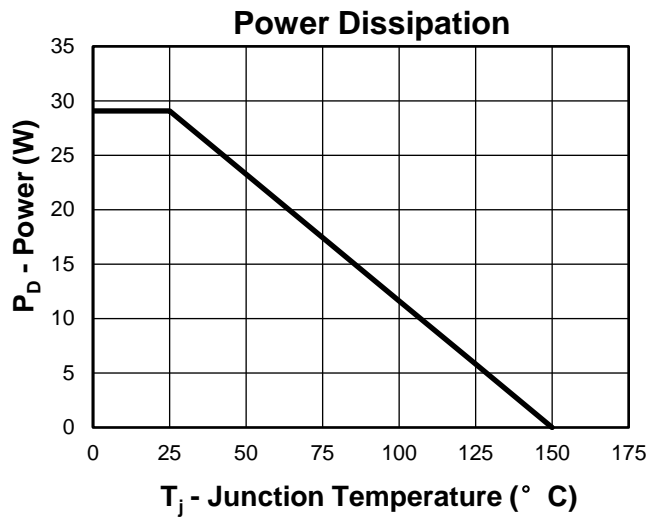
Ordering and Marking Information

| Device | Package | Packaging | Quantity | Reel Size | Tape width |
|----------|--------------|-----------|----------|-----------|------------|
| KS3608NA | PDFN5060 DP1 | Tape&Reel | 5000 | 13" | 12mm |

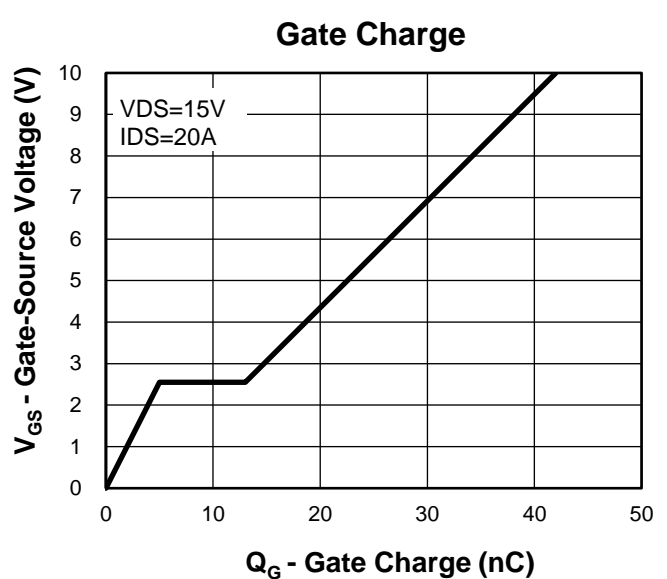
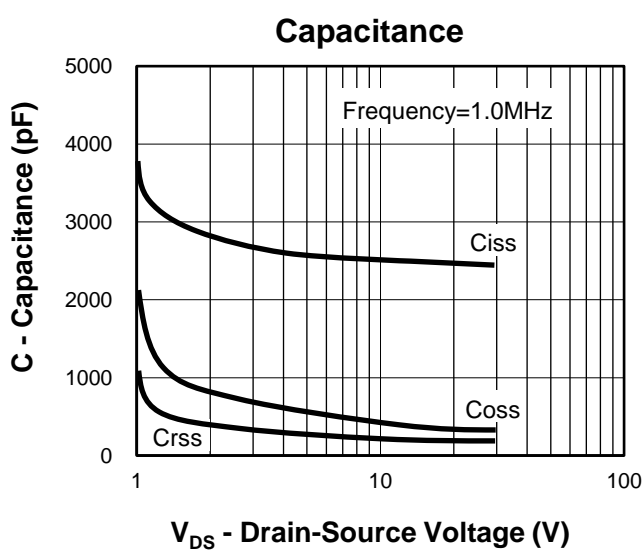
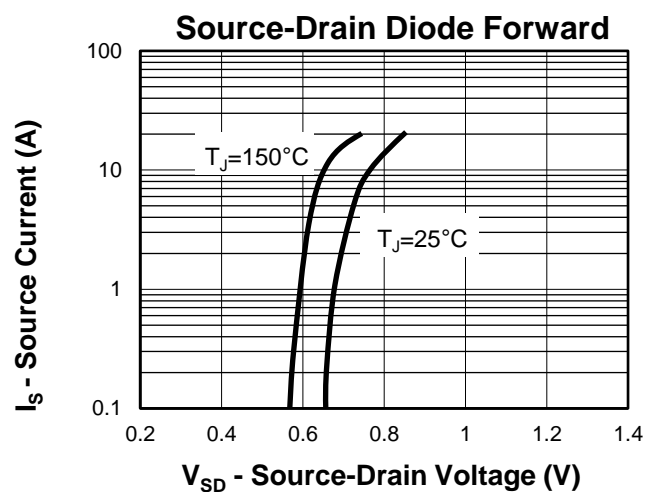
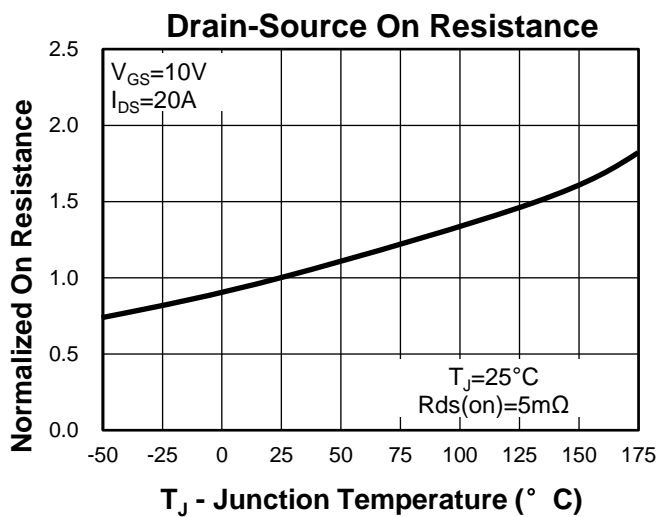
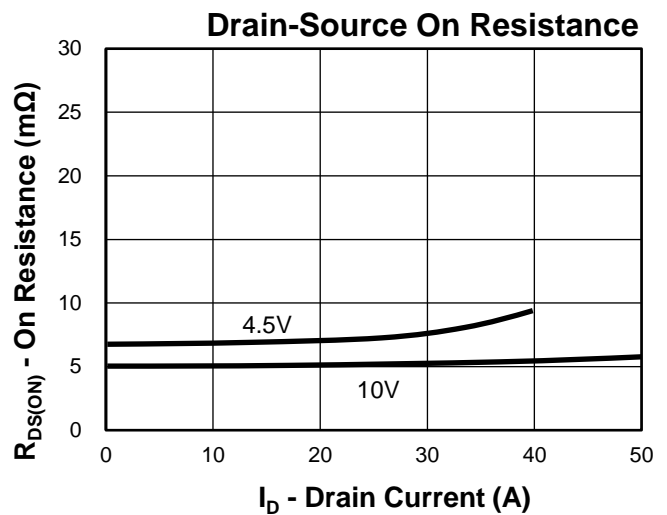
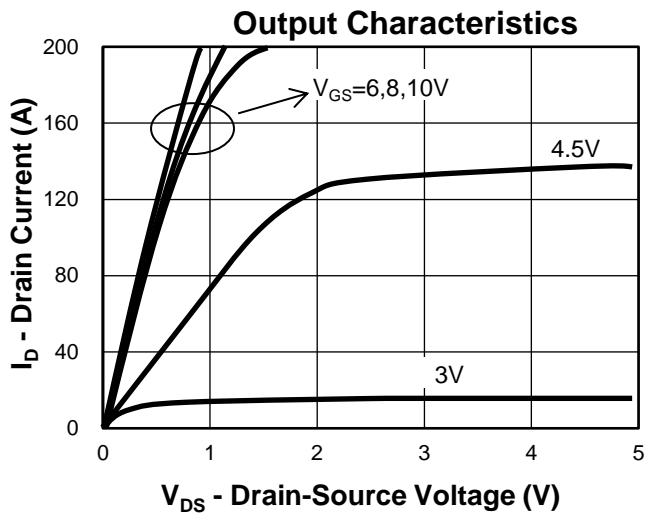


Y =Year,2017-A,2018-B,etc.
WW =Week.
XXX =Lot number.

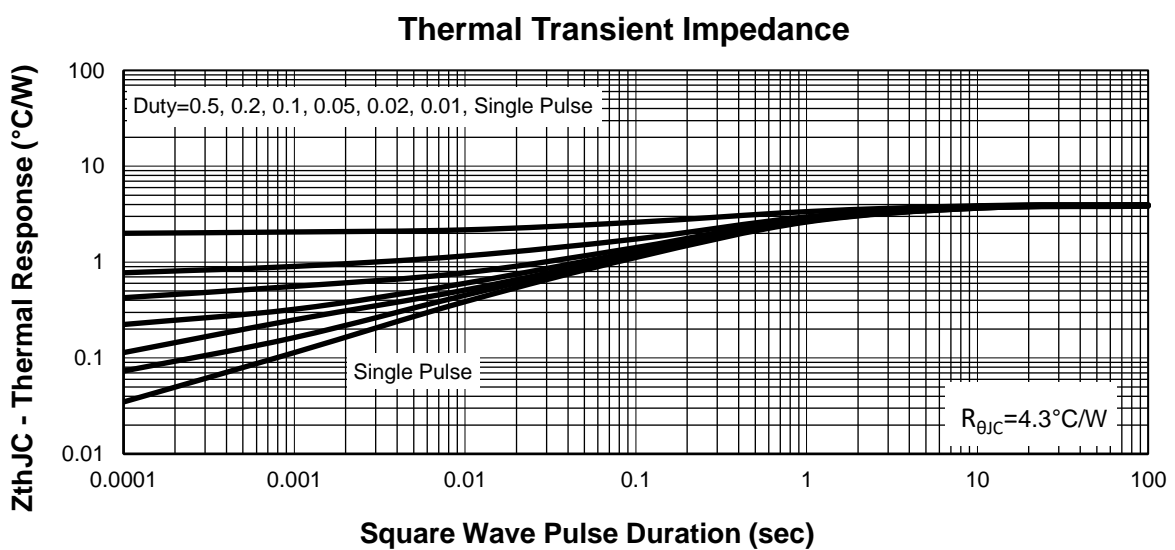
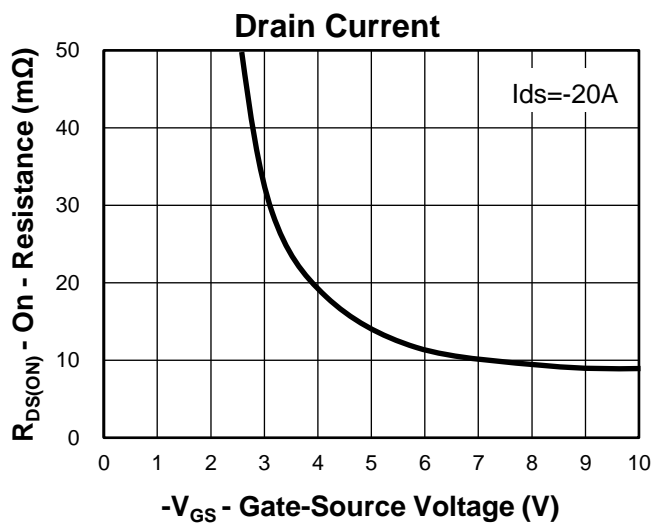
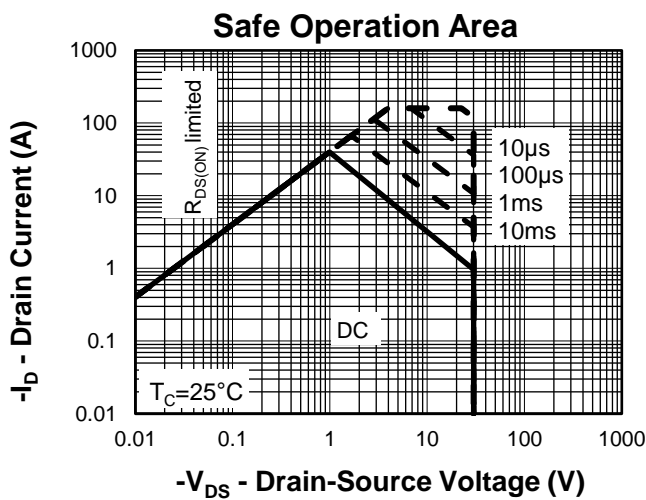
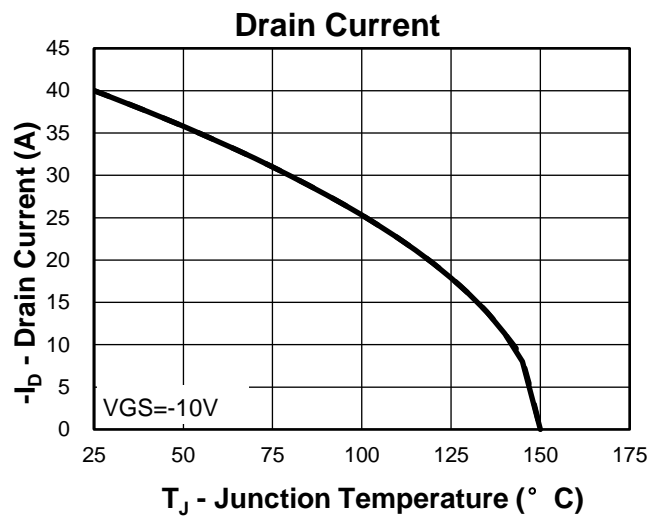
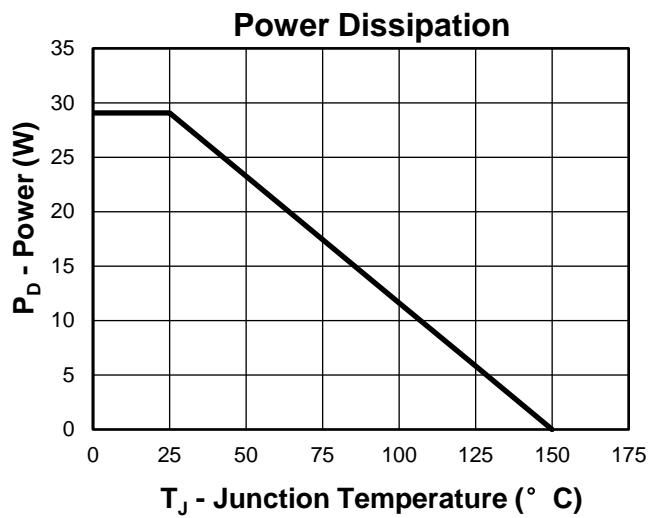
Typical Characteristics(N-Channel)



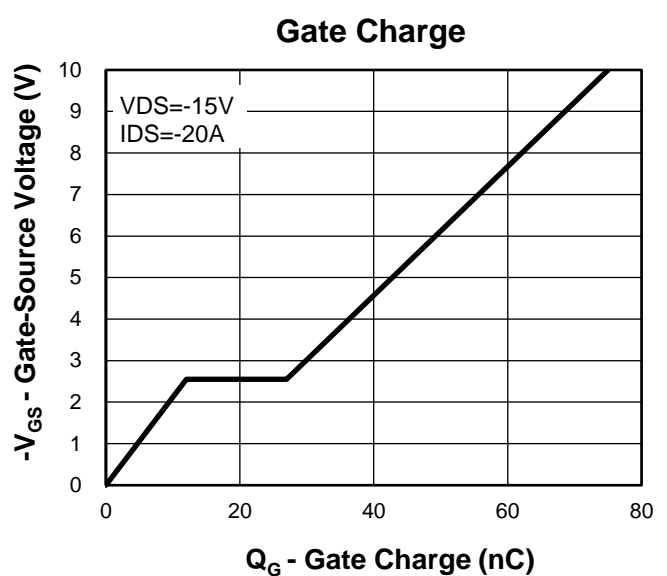
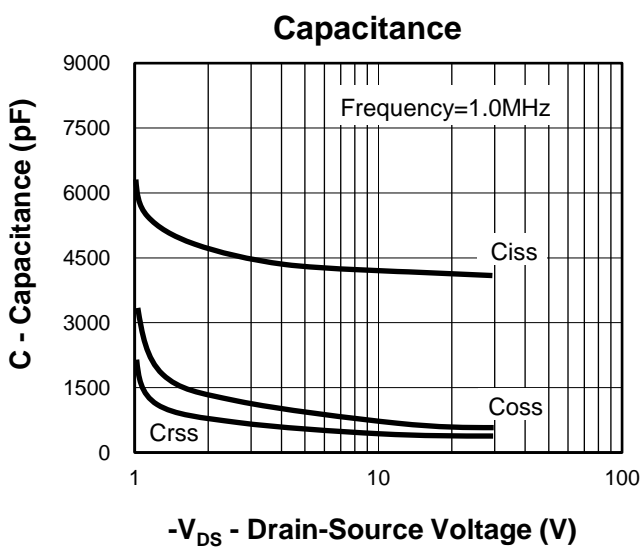
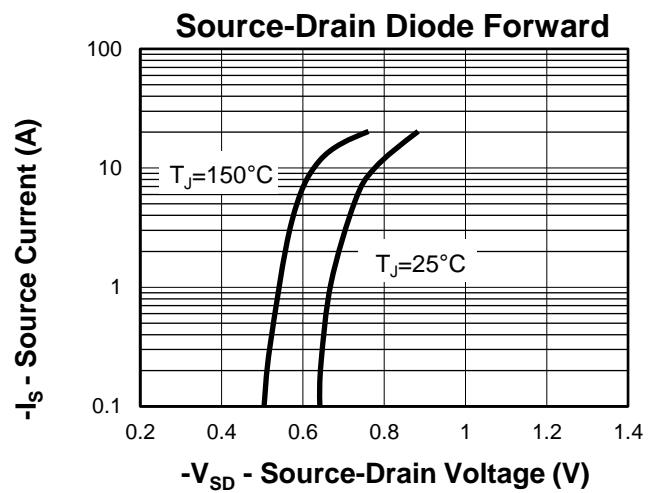
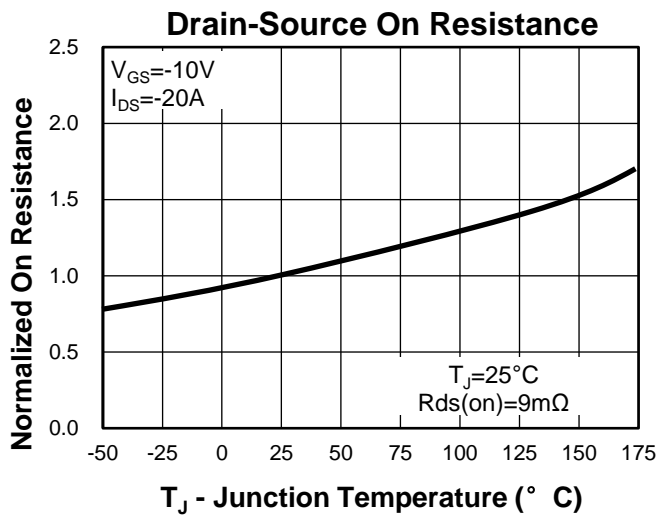
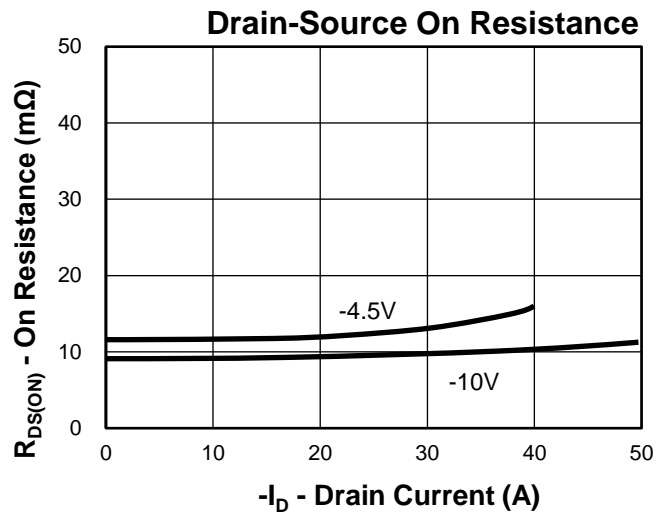
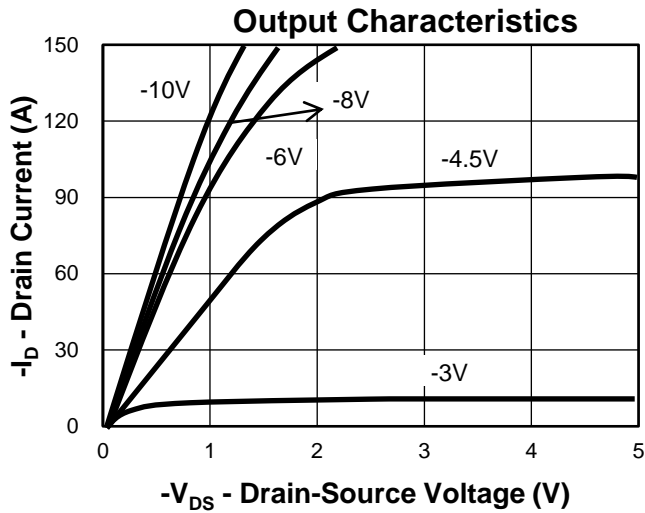
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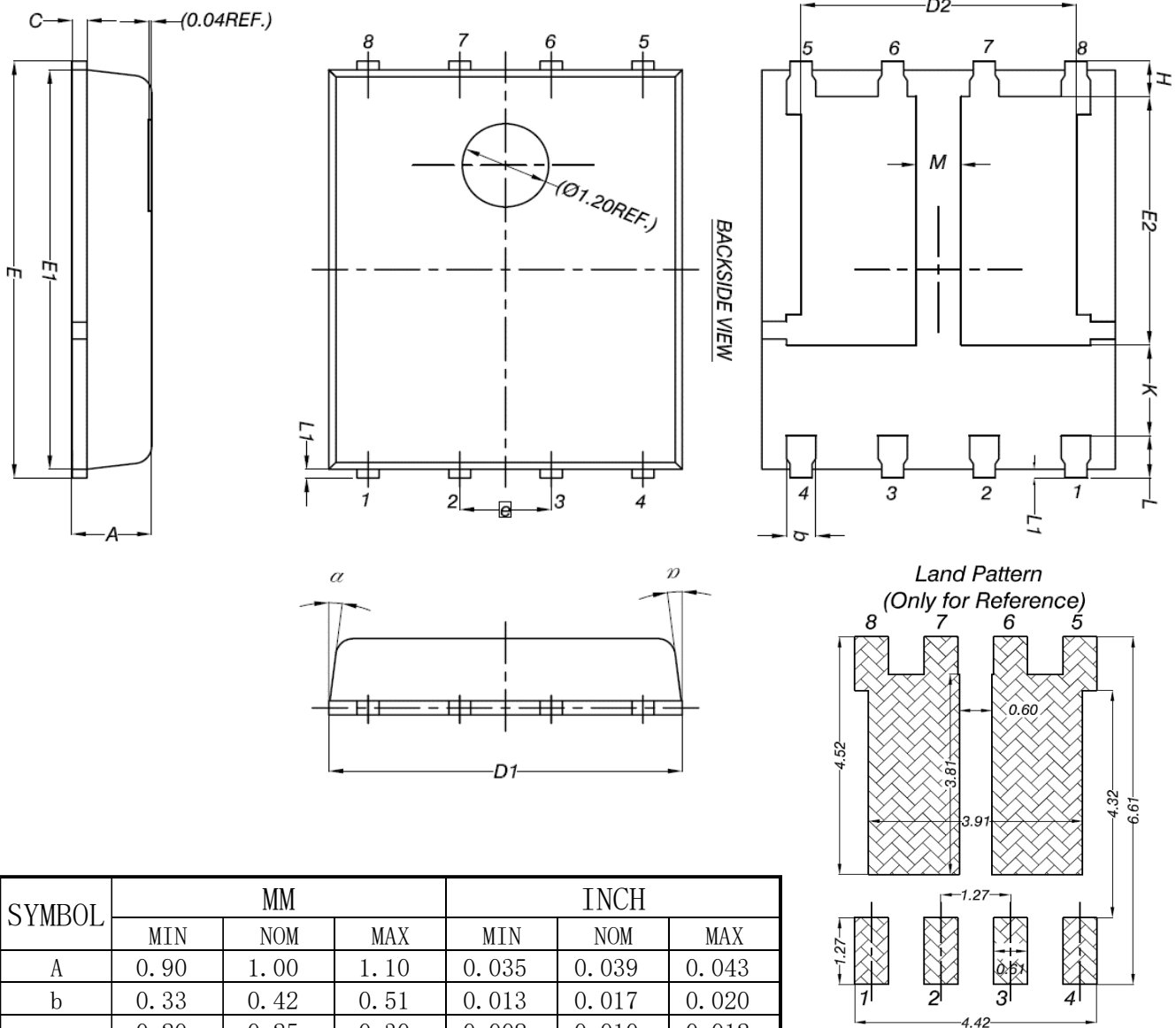


Typical Characteristics(P-Channel)



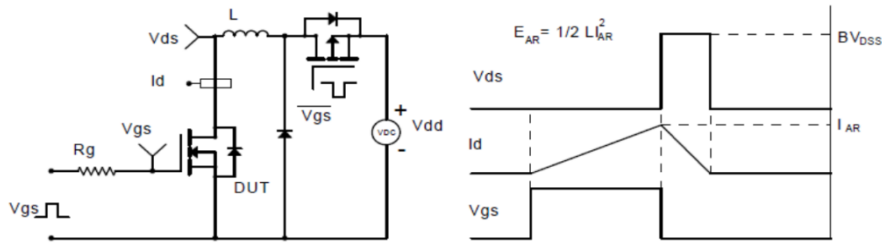
Typical Characteristics(P-Channel)



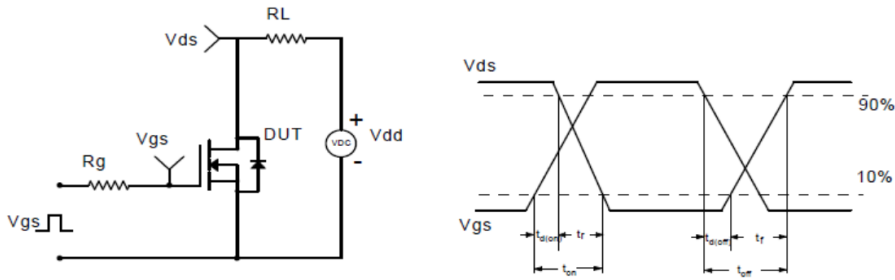
Package Information
PDFN5060 DP1


| SYMBOL | MM | | | INCH | | |
|--------|----------|------|------|-----------|-------|-------|
| | MIN | NOM | MAX | MIN | NOM | MAX |
| A | 0.90 | 1.00 | 1.10 | 0.035 | 0.039 | 0.043 |
| b | 0.33 | 0.42 | 0.51 | 0.013 | 0.017 | 0.020 |
| c | 0.20 | 0.25 | 0.30 | 0.008 | 0.010 | 0.012 |
| D1 | 4.80 | 4.90 | 5.00 | 0.189 | 0.193 | 0.197 |
| D2 | 3.61 | 3.79 | 3.96 | 0.142 | 0.149 | 0.156 |
| E | 5.90 | 6.00 | 6.10 | 0.232 | 0.236 | 0.240 |
| E1 | 5.65 | 5.75 | 5.85 | 0.222 | 0.226 | 0.230 |
| E2 | 3.38 | 3.58 | 3.78 | 0.133 | 0.141 | 0.149 |
| e | 1.27 BSC | | | 0.050 BSC | | |
| H | 0.41 | 0.51 | 0.61 | 0.016 | 0.020 | 0.024 |
| k | 1.10 | | | 0.043 | | |
| L | 0.51 | 0.61 | 0.71 | 0.020 | 0.024 | 0.028 |
| L1 | 0.06 | 0.13 | 0.20 | 0.002 | 0.005 | 0.008 |
| M | 0.50 | | | 0.020 | | |
| a | 0° | | 12° | 0° | | 12° |

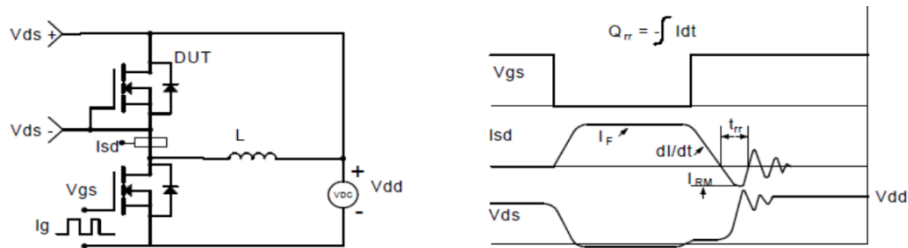
Avalanche Test Circuit and Waveforms(N-Channel)



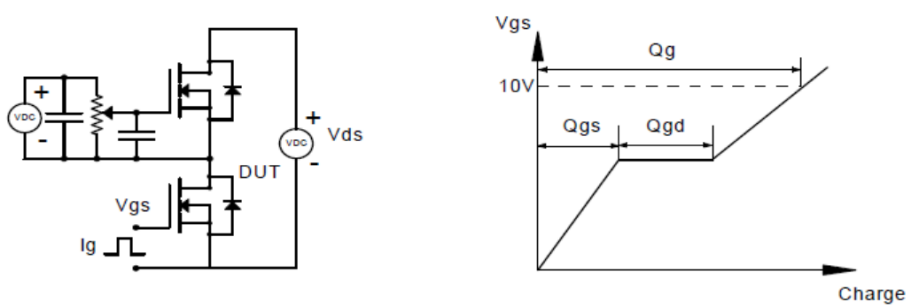
Switching Time Test Circuit and Waveforms(N-Channel)

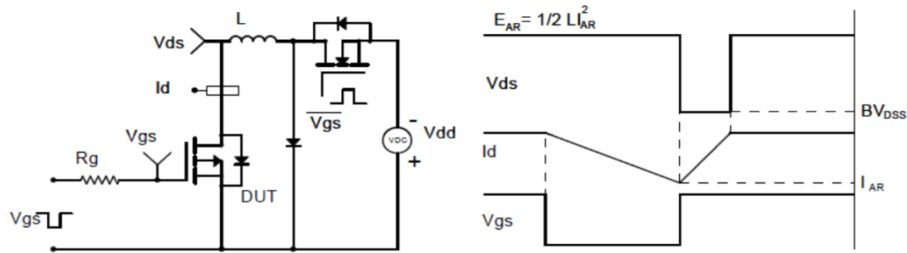
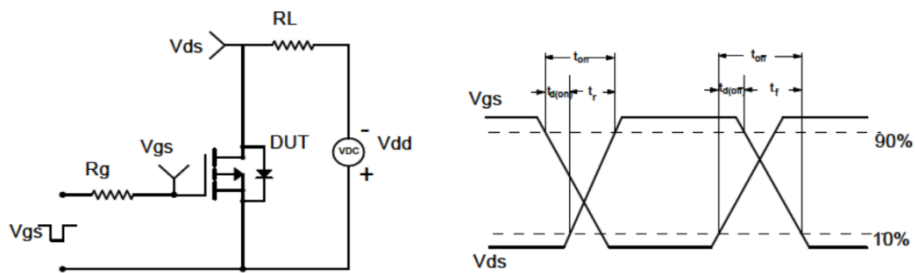
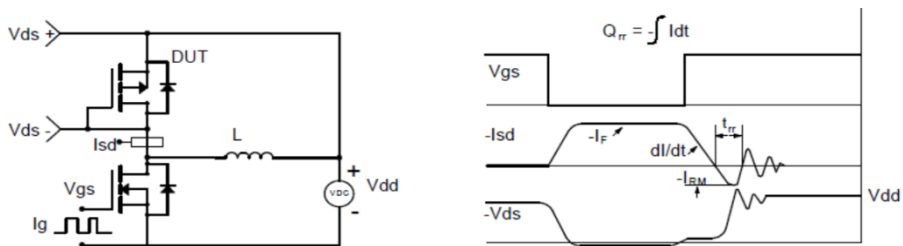
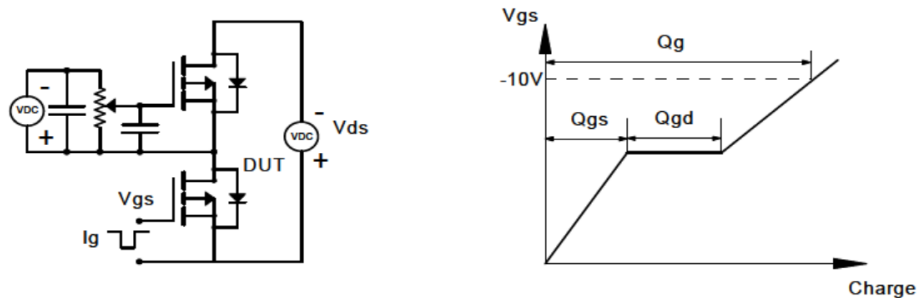


Diode Recovery Test Circuit and Waveforms(N-Channel)



Gate Charge Test Circuit and Waveform(N-Channel)



Avalanche Test Circuit and Waveforms(P-Channel)

Switching Time Test Circuit and Waveforms(P-Channel)

Diode Recovery Test Circuit and Waveforms(P-Channel)

Gate Charge Test Circuit and Waveform(P-Channel)

Customer Service

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