

Features

- 7.6A, 200V, $R_{DS(on)} = 0.36\Omega @ V_{GS} = 10V$
- Low gate charge (typical 13.5 nC)
- Low Crss (typical 13 pF)
- Fast switching
- 100% avalanche tested
- Improved dv/dt capability

General Description

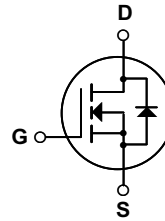
These N-Channel enhancement mode power field effect transistors are produced using Kersemi proprietary, planar stripe, DMOS technology.

This advanced technology has been especially tailored to minimize on-state resistance, provide superior switching performance, and withstand high energy pulse in the avalanche and commutation mode. These devices are well suited for high efficiency switching DC/DC converters, switch mode power supply, DC-AC converters for uninterrupted power supply, motor control.

TO-252



TO-251


Absolute Maximum Ratings $T_C = 25^\circ\text{C}$ unless otherwise noted

| Symbol | Parameter | KSMD10N20 / KSMU10N20 | Units |
|----------------|---|-----------------------|---------------------|
| V_{DSS} | Drain-Source Voltage | 200 | V |
| I_D | Drain Current - Continuous ($T_C = 25^\circ\text{C}$) | 7.6 | A |
| | - Continuous ($T_C = 100^\circ\text{C}$) | 4.8 | A |
| I_{DM} | Drain Current - Pulsed (Note 1) | 30.4 | A |
| V_{GSS} | Gate-Source Voltage | ± 30 | V |
| E_{AS} | Single Pulsed Avalanche Energy (Note 2) | 180 | mJ |
| I_{AR} | Avalanche Current (Note 1) | 7.6 | A |
| E_{AR} | Repetitive Avalanche Energy (Note 1) | 5.1 | mJ |
| dv/dt | Peak Diode Recovery dv/dt (Note 3) | 5.5 | V/ns |
| P_D | Power Dissipation ($T_A = 25^\circ\text{C}$) * | 2.5 | W |
| | Power Dissipation ($T_C = 25^\circ\text{C}$) | 51 | W |
| | - Derate above 25°C | 0.41 | W/ $^\circ\text{C}$ |
| T_J, T_{STG} | Operating and Storage Temperature Range | -55 to +150 | $^\circ\text{C}$ |
| T_L | Maximum lead temperature for soldering purposes, 1/8" from case for 5 seconds | 300 | $^\circ\text{C}$ |

Thermal Characteristics

| Symbol | Parameter | Typ | Max | Units |
|-----------------|---|-----|------|---------------------------|
| $R_{\theta JC}$ | Thermal Resistance, Junction-to-Case | -- | 2.48 | $^\circ\text{C}/\text{W}$ |
| $R_{\theta JA}$ | Thermal Resistance, Junction-to-Ambient * | -- | 50 | $^\circ\text{C}/\text{W}$ |
| $R_{\theta JA}$ | Thermal Resistance, Junction-to-Ambient | -- | 110 | $^\circ\text{C}/\text{W}$ |

* When mounted on the minimum pad size recommended (PCB Mount)

Electrical Characteristics
 $T_C = 25^\circ\text{C}$ unless otherwise noted

| Symbol | Parameter | Test Conditions | Min | Typ | Max | Units |
|--------------------------------|---|---|-----|------|------|---------------------------|
| Off Characteristics | | | | | | |
| BV_{DSS} | Drain-Source Breakdown Voltage | $V_{GS} = 0\text{ V}, I_D = 250\ \mu\text{A}$ | 200 | -- | -- | V |
| $\Delta BV_{DSS} / \Delta T_J$ | Breakdown Voltage Temperature Coefficient | $I_D = 250\ \mu\text{A}$, Referenced to 25°C | -- | 0.19 | -- | $\text{V}/^\circ\text{C}$ |
| I_{DSS} | Zero Gate Voltage Drain Current | $V_{DS} = 200\text{ V}, V_{GS} = 0\text{ V}$ | -- | -- | 1 | μA |
| | | $V_{DS} = 160\text{ V}, T_C = 125^\circ\text{C}$ | -- | -- | 10 | μA |
| I_{GSSF} | Gate-Body Leakage Current, Forward | $V_{GS} = 30\text{ V}, V_{DS} = 0\text{ V}$ | -- | -- | 100 | nA |
| I_{GSSR} | Gate-Body Leakage Current, Reverse | $V_{GS} = -30\text{ V}, V_{DS} = 0\text{ V}$ | -- | -- | -100 | nA |

On Characteristics

| | | | | | | |
|--------------|-----------------------------------|---|-----|------|------|----------|
| $V_{GS(th)}$ | Gate Threshold Voltage | $V_{DS} = V_{GS}, I_D = 250\ \mu\text{A}$ | 3.0 | -- | 5.0 | V |
| $R_{DS(on)}$ | Static Drain-Source On-Resistance | $V_{GS} = 10\text{ V}, I_D = 3.8\text{ A}$ | -- | 0.28 | 0.36 | Ω |
| g_{FS} | Forward Transconductance | $V_{DS} = 40\text{ V}, I_D = 3.8\text{ A}$ (Note 4) | -- | 6 | -- | S |

Dynamic Characteristics

| | | | | | | |
|-----------|------------------------------|--|----|-----|-----|----|
| C_{iss} | Input Capacitance | $V_{DS} = 25\text{ V}, V_{GS} = 0\text{ V},$ $f = 1.0\text{ MHz}$ | -- | 510 | 670 | pF |
| C_{oss} | Output Capacitance | | -- | 95 | 130 | pF |
| C_{rss} | Reverse Transfer Capacitance | | -- | 13 | 17 | pF |

Switching Characteristics

| | | | | | | |
|--------------|---------------------|---|-------------|------|-----|-----|
| $t_{d(on)}$ | Turn-On Delay Time | $V_{DD} = 100\text{ V}, I_D = 10\text{ A},$ $R_G = 25\ \Omega$ | -- | 13 | 40 | ns |
| t_r | Turn-On Rise Time | | -- | 90 | 190 | ns |
| $t_{d(off)}$ | Turn-Off Delay Time | | -- | 26 | 70 | ns |
| t_f | Turn-Off Fall Time | | (Note 4, 5) | -- | 50 | 110 |
| Q_g | Total Gate Charge | $V_{DS} = 160\text{ V}, I_D = 10\text{ A},$ $V_{GS} = 10\text{ V}$ | -- | 13.5 | 18 | nC |
| Q_{gs} | Gate-Source Charge | | -- | 3.8 | -- | nC |
| Q_{gd} | Gate-Drain Charge | | (Note 4, 5) | -- | 5.5 | -- |

Drain-Source Diode Characteristics and Maximum Ratings

| | | | | | | |
|----------|---|---|----|------|-----|---------------|
| I_S | Maximum Continuous Drain-Source Diode Forward Current | -- | -- | 7.6 | A | |
| I_{SM} | Maximum Pulsed Drain-Source Diode Forward Current | -- | -- | 30.4 | A | |
| V_{SD} | Drain-Source Diode Forward Voltage | $V_{GS} = 0\text{ V}, I_S = 7.6\text{ A}$ | -- | -- | 1.5 | V |
| t_{rr} | Reverse Recovery Time | $V_{GS} = 0\text{ V}, I_S = 10\text{ A},$ | -- | 130 | -- | ns |
| Q_{rr} | Reverse Recovery Charge | $di_F / dt = 100\text{ A}/\mu\text{s}$ (Note 4) | -- | 0.6 | -- | μC |

Notes:

1. Repetitive Rating : Pulse width limited by maximum junction temperature
2. $L = 4.7\text{ mH}, I_{AS} = 7.6\text{ A}, V_{DD} = 50\text{ V}, R_G = 25\ \Omega$, Starting $T_J = 25^\circ\text{C}$
3. $I_{SD} \leq 10\text{ A}, di/dt \leq 300\text{ A}/\mu\text{s}, V_{DD} \leq BV_{DSS}$, Starting $T_J = 25^\circ\text{C}$
4. Pulse Test : Pulse width $\leq 300\ \mu\text{s}$, Duty cycle $\leq 2\%$
5. Essentially independent of operating temperature

Typical Characteristics

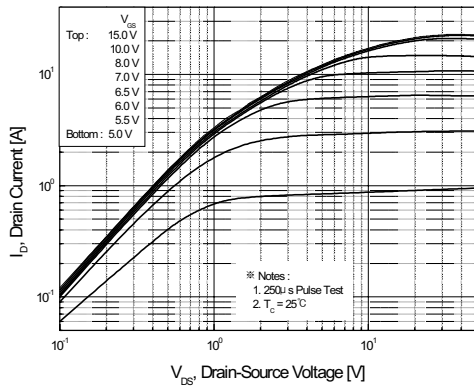


Figure 1. On-Region Characteristics

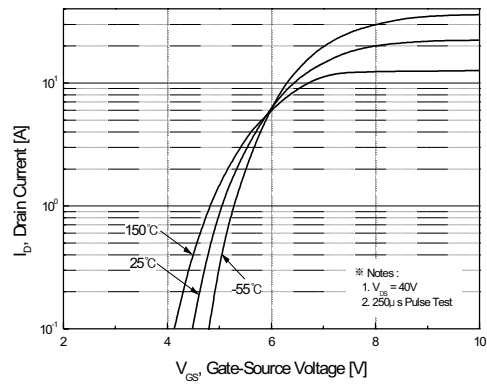


Figure 2. Transfer Characteristics

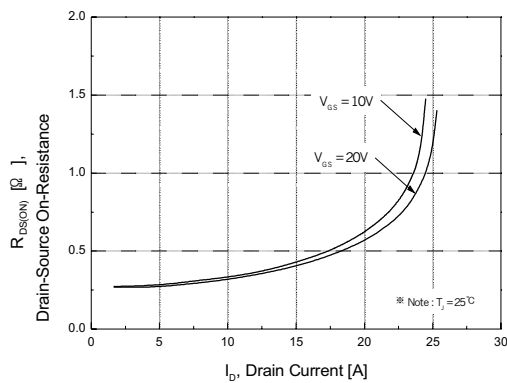


Figure 3. On-Resistance Variation vs. Drain Current and Gate Voltage

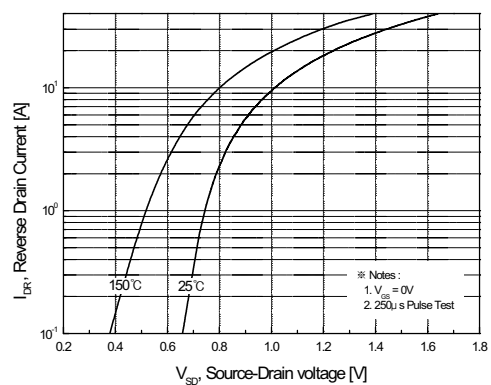


Figure 4. Body Diode Forward Voltage Variation vs. Source Current and Temperature

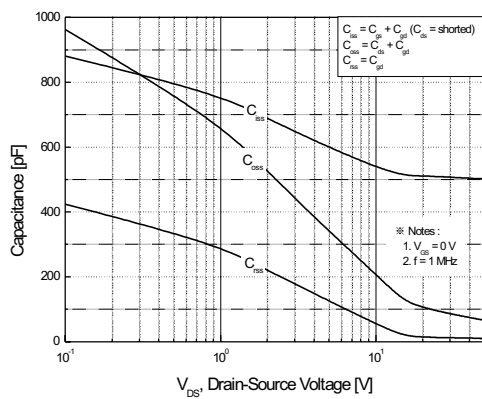


Figure 5. Capacitance Characteristics

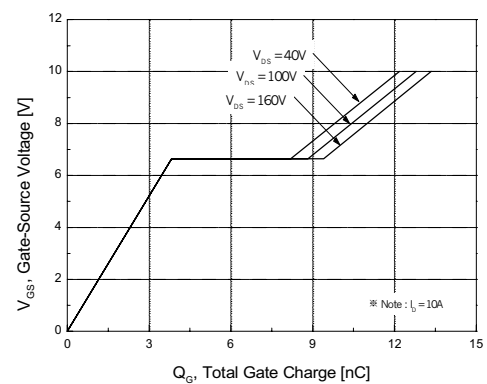
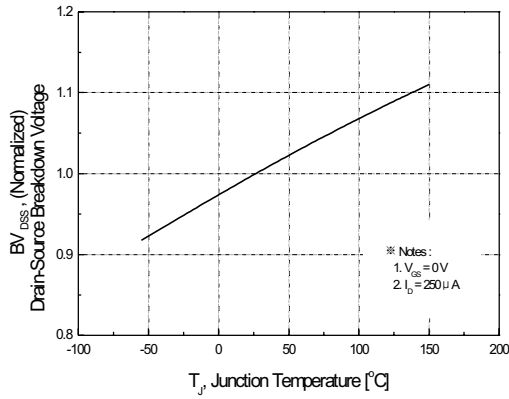
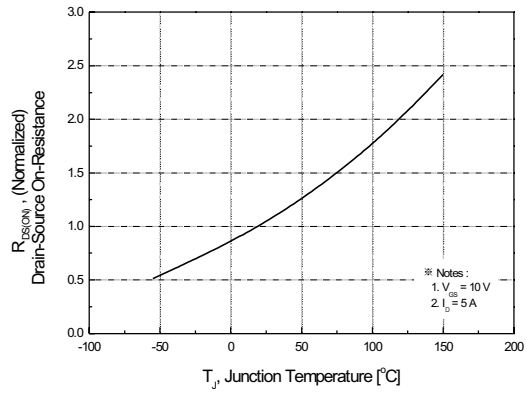
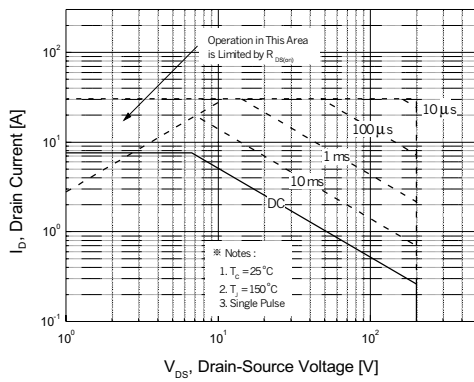
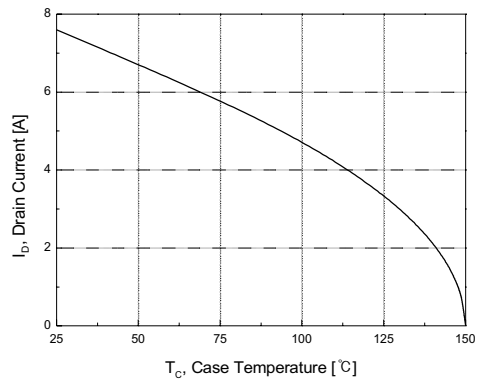
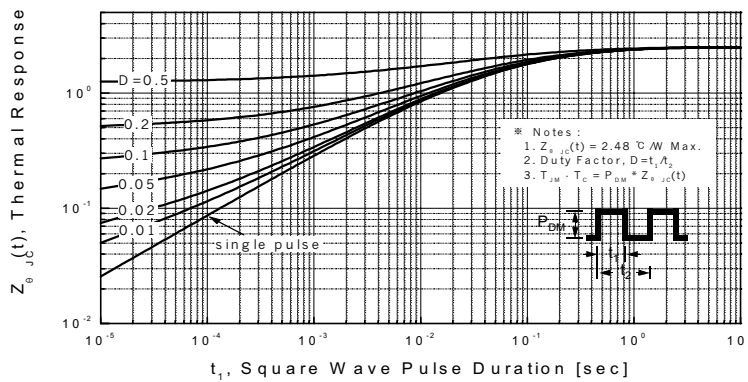
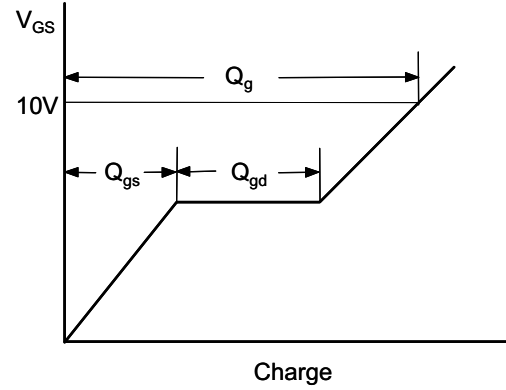
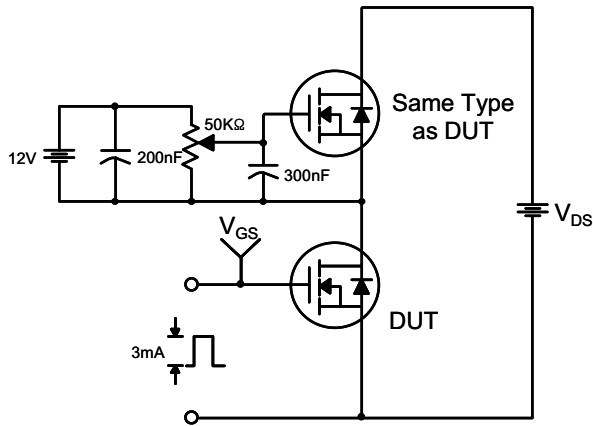
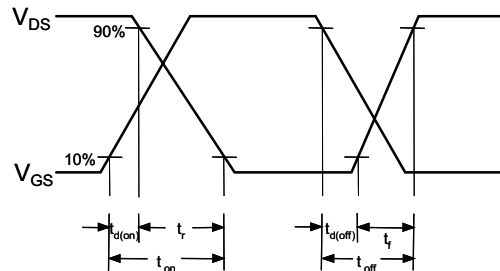
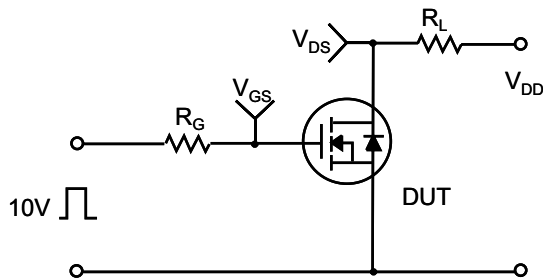
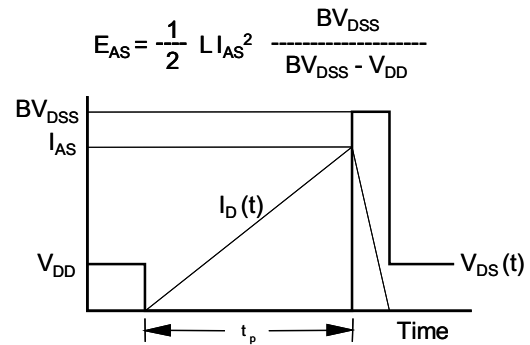
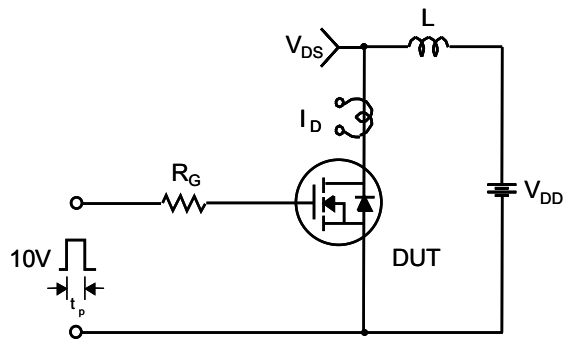
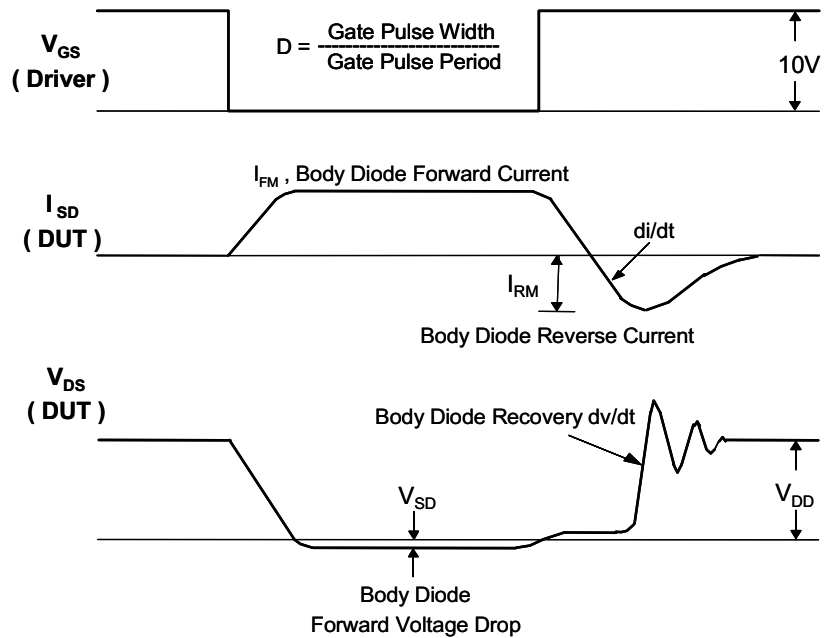
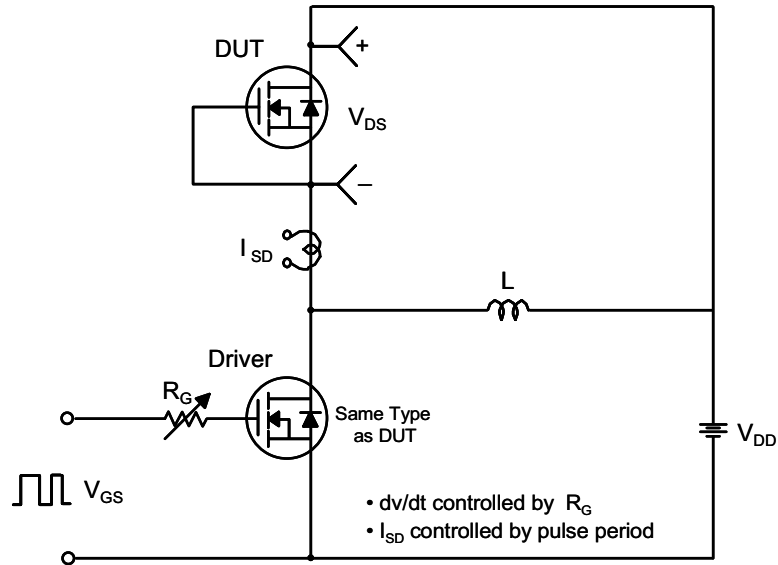


Figure 6. Gate Charge Characteristics

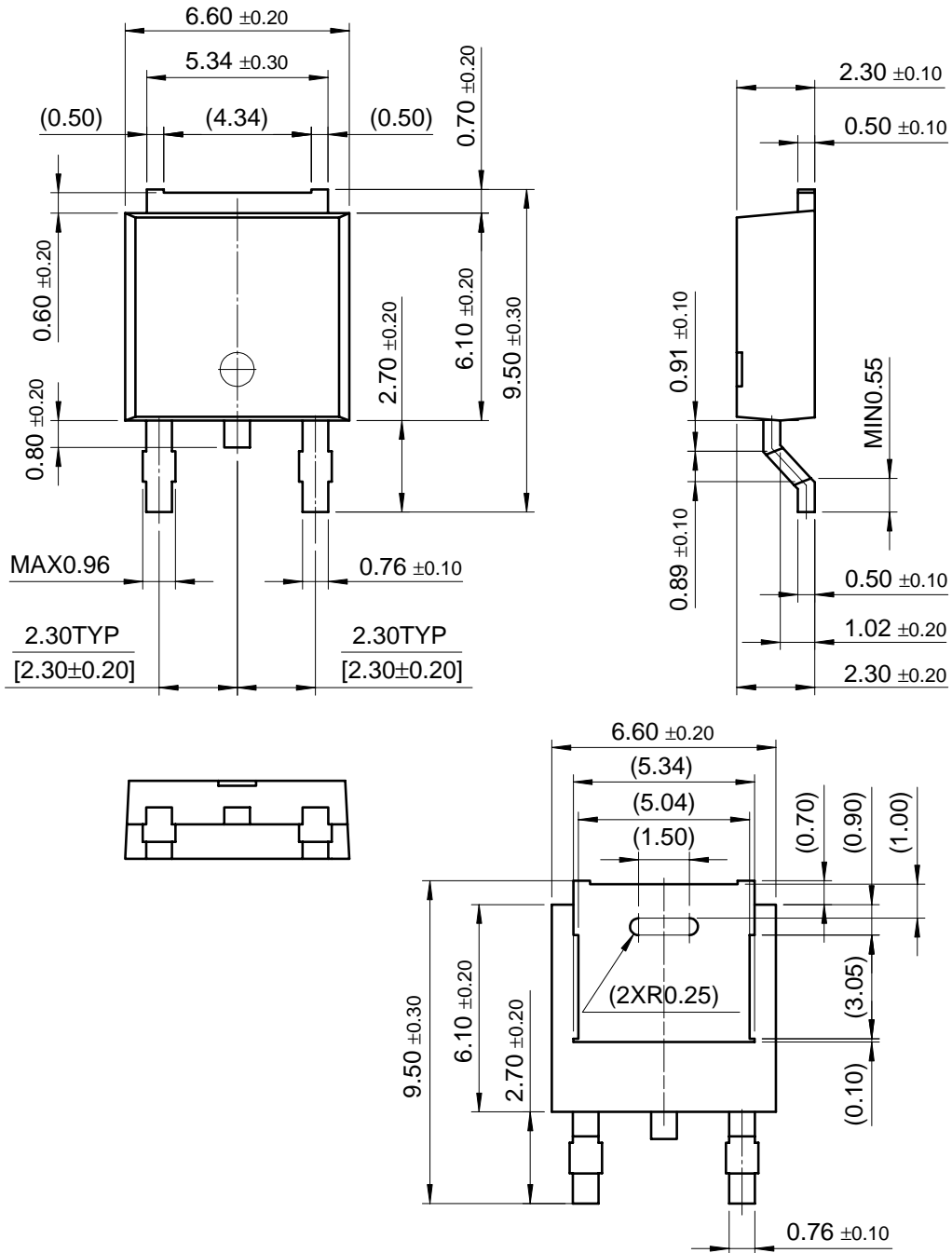
Typical Characteristics (Continued)

Figure 7. Breakdown Voltage Variation vs. Temperature

Figure 8. On-Resistance Variation vs. Temperature

Figure 9. Maximum Safe Operating Area

Figure 10. Maximum Drain Current vs. Case Temperature

Figure 11. Transient Thermal Response Curve

Gate Charge Test Circuit & Waveform

Resistive Switching Test Circuit & Waveforms

Unclamped Inductive Switching Test Circuit & Waveforms


Peak Diode Recovery dv/dt Test Circuit & Waveforms


Package Dimensions

DPAK



Package Dimensions (Continued)

IPAK

