# HC3139KT

## 20V P-Channel MOSFET

## General Description

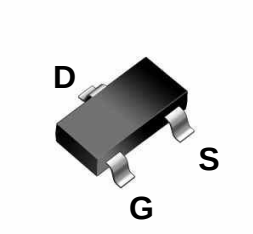
These P-Channel enhancement mode power field effect transistors are using trench DMOS technology. This advanced technology has been especially tailored to minimize on-state resistance, provide superior switching performance, and withstand high energy pulse in the avalanche and commutation mode. These devices are well suited for high efficiency fast switching applications.

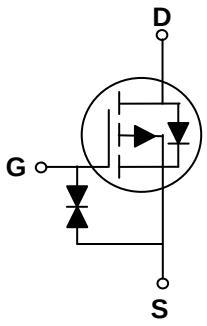
## Features

| | |
|---|---|
| $V_{DS}$ | -20V |
| $I_D$ (at $V_{GS}$=-4.5V) | -0.5A |
| $R_{DS(ON)}$ (at $V_{GS}$=-4.5V) | 580mΩ(Typ) |

ESD Protected Up to 2.0KV (HBM)

SOT723




**Absolute Maximum Ratings $T_A$=25°C unless otherwise noted**

| Parameter | | Symbol | Maximum | Units |
|---|---|---|---|---|
| Drain-Source Voltage | | $V_{DS}$ | -20 | V |
| Gate-Source Voltage | | $V_{GS}$ | ±12 | V |
| Drain Current-Continuous | TC=25°C | $I_D$ | -0.5 | A |
| | TC=100°C | $I_D$ | -0.4 | A |
| Maximum Power Dissipation | | $P_D$ | 0.18 | W |
| Drain Current – Pulsed1 | | $I_{DM}$ | -2.6 | A |
| Junction and Storage Temperature Range | | $T_J$,$T_{STG}$ | -55 To 150 | ℃ |

**Thermal Characteristics**

| Parameter | Symbol | Typ | Max | Unit |
|---|---|---|---|---|
| Thermal Resistance junction-to-solder point | $R_{\theta Jsp}$ | | 40 | ℃ /W |
| Thermal Resistance junction-to-Ambient | $R_{\theta JA}$ | | 500 | ℃ /W |

**Electrical Characteristics (TJ=25℃ unless otherwise noted)**

| Symbol | Parameter | Condition | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| **STATIC PARAMETERS** | | | | | | |
| $BV_{DSS}$ | Drain-Source Breakdown Voltage | $V_{GS}$=0V $I_D$=-250μA | -20 | | | V |
| $I_{DSS}$ | Zero Gate Voltage Drain Current | $V_{DS}$=-20V,$V_{GS}$=0V | | | 1 | μA |
| $I_{GSS}$ | Gate-Body Leakage Current | $V_{GS}$=±10V,$V_{DS}$=0V | | | ±10 | μA |
| $V_{GS(th)}$ | Gate Threshold Voltage | $V_{DS}$=$V_{GS}$,$I_D$=-250μA | -0.3 | -0.6 | -1.2 | V |
| $R_{DS(ON)}$ | Drain-Source On-State Resistance | $V_{GS}$=-4.5V, $I_D$=-0.5A | | 580 | 850 | mΩ |
| | | $V_{GS}$=-2.5V, $I_D$=-0.3A | | 850 | 1200 | mΩ |
| | | $V_{GS}$=-1.8V, $I_D$=-0.2A | | 1350 | 2000 | mΩ |
| $I_S$ | Maximum Body-Diode Continuous Current | | | | -0.5 | A |
| **DYNAMIC PARAMETERS** | | | | | | |
| Ciss | Input Capacitance | $V_{DS}$=-10V,$V_{GS}$=0V, F=1.0MHz | | 71 | | pF |
| $C_{oss}$ | Output Capacitance | | | 20 | | pF |
| $C_{rss}$ | Reverse Transfer Capacitance | | | 15 | | pF |
| **SWITCHING PARAMETERS** | | | | | | |
| $t_{d(on)}$ | Turn-on Delay Time | $V_{DD}$=-10V,$I_D$=-0.2A, $V_{GS}$=-4.5V, $R_G$=10Ω | | 4 | | nS |
| $t_r$ | Turn-on Rise Time | | | 19 | | nS |
| $t_{d(off)}$ | Turn-Off Delay Time | | | 16 | | nS |
| $t_f$ | Turn-Off Fall Time | | | 25 | | nS |
| $Q_g$ | Total Gate Charge | $V_{DS}$=-10V,$I_D$=-0.2A, $V_{GS}$=-4.5V | | 1.2 | | nC |
| $Q_{gs}$ | Gate-Source Charge | | | 0.37 | | nC |
| $Q_{gd}$ | Gate-Drain Charge | | | 0.27 | | nC |
| $V_{SD}$ | Diode Forward Voltage | $V_{GS}$=0V,$I_{SD}$=-1A | | 0.7 | 1.2 | V |

Note：

1. Repetitive Rating : Pulsed width limited by maximum junction temperature.
2. The data tested by pulsed , pulse width ≦ 300us , duty cycle ≦ 2%.
3. Essentially independent of operating temperature.

## TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

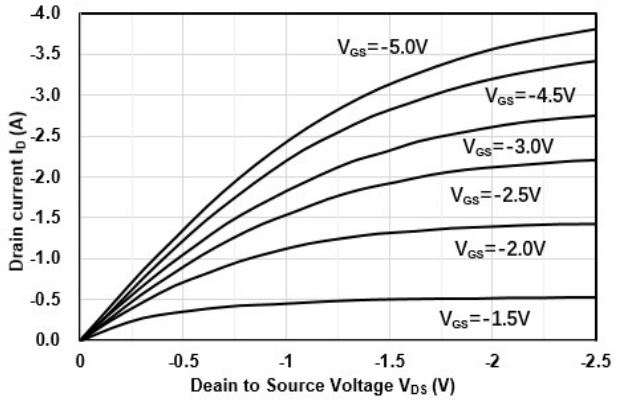



Figure1. Output Characteristics

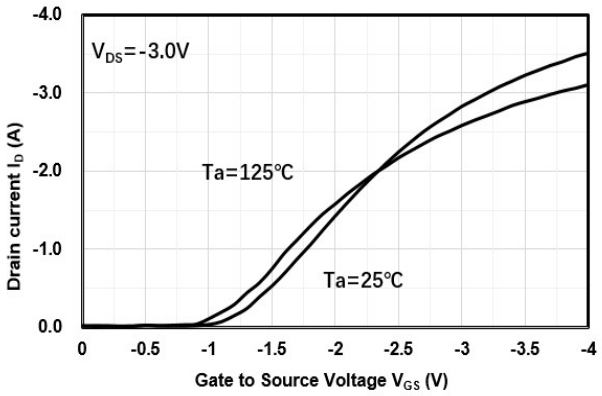



Figure2. Transfer Characteristics

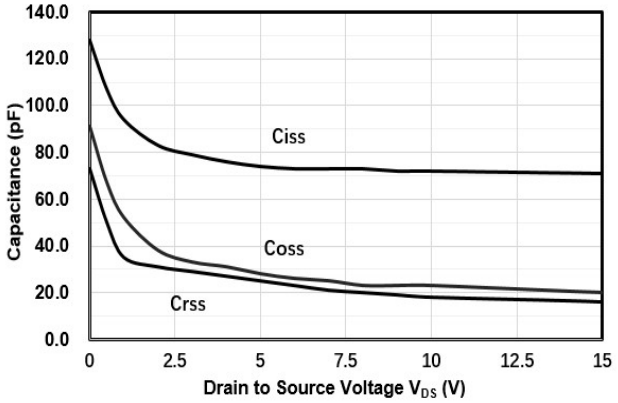



Figure3. Capacitance Characteristics

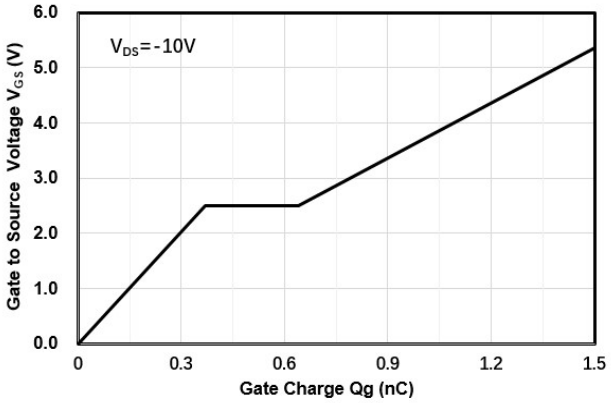



Figure4. Gate Charge

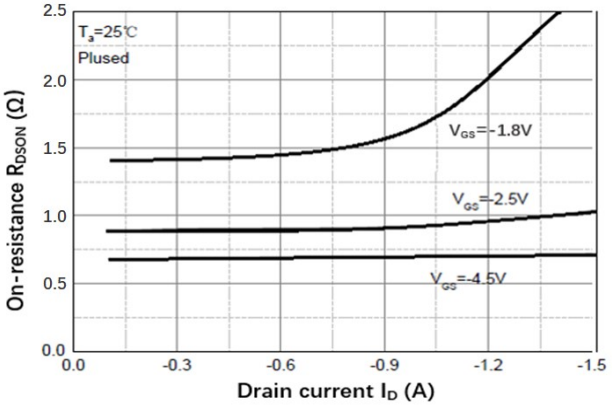



Figure5. Drain-Source on Resistance

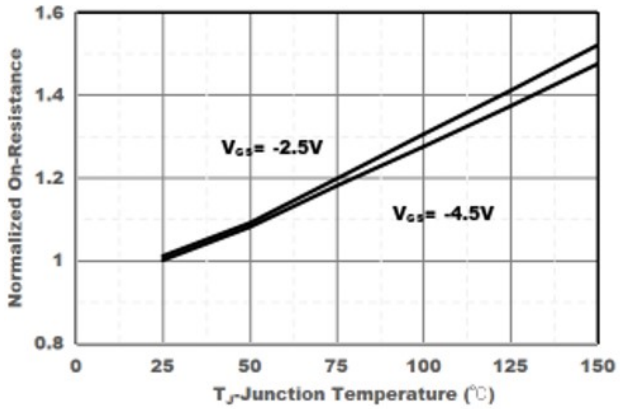



Figure6. Drain-Source on Resistance

## TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

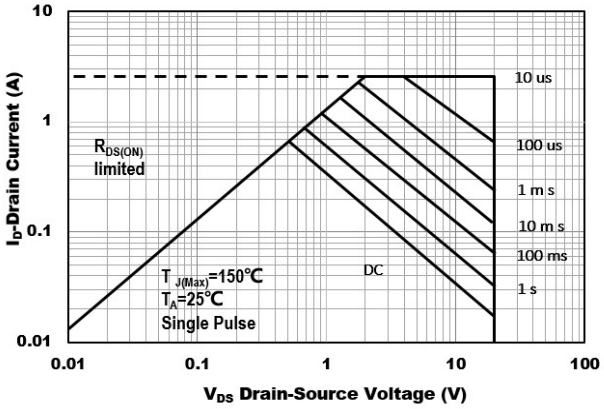



Figure7. Safe Operation Area

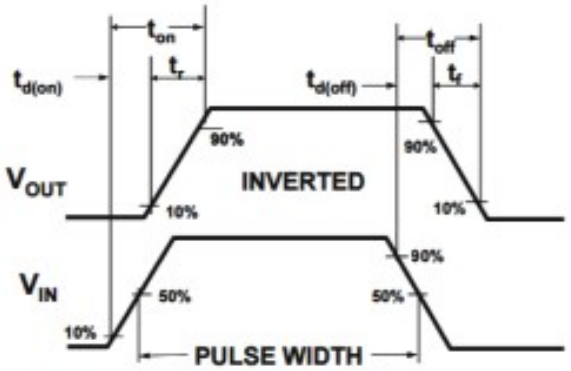
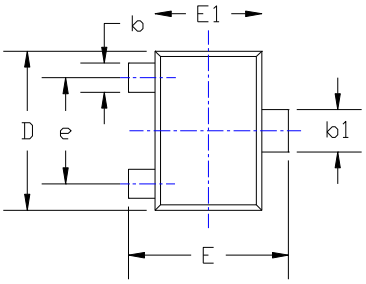
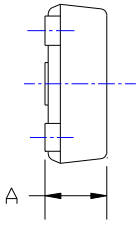



Figure8. Switching wave

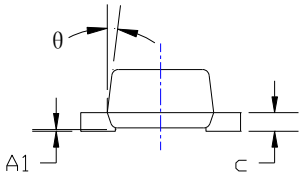
# SOT723 PACKAGE INFORMATION



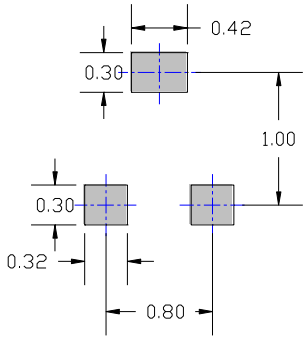

TOP VIEW




SIDE VIEW




SIDE VIEW




SUGGESTED SOLDER PAD LAYOUT

| DIMENSIONS | | | | |
|---|---|---|---|---|
| SYMBOL | INCHES | | Millimeter | |
| | MIN. | MAX. | MIN. | MAX. |
| A | 0.017 | 0.022 | 0.430 | 0.550 |
| A1 | 0.000 | 0.002 | 0.000 | 0.050 |
| b | 0.007 | 0.011 | 0.170 | 0.270 |
| b1 | 0.011 | 0.015 | 0.270 | 0.370 |
| c | 0.003 | 0.008 | 0.080 | 0.200 |
| D | 0.045 | 0.049 | 1.150 | 1.250 |
| E | 0.045 | 0.049 | 1.150 | 1.250 |
| E1 | 0.030 | 0.033 | 0.750 | 0.850 |
| e | 0.031TYP. | | 0.800TYP. | |
| θ | 7°REF. | | 7°REF. | |

NOTE:
1.PACKAGE BODY SIZES EXCLUDE MOLD FLASH AND GATE BURRS.
2.TOLERANCE 0.1mm UNLESS OTHERWISE SPECIFIED.
3.THE PAD LAYOUT IS FOR REFERENCE PURPOSES ONLY.