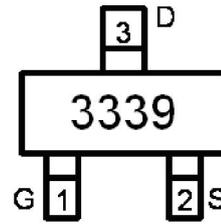


## Main Product Characteristics

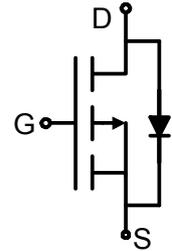
$V_{DSS}$	-30V
$R_{DS(on)}$	37m $\Omega$ (typ.)
$I_D$	-4.1A ①



SOT-23



Marking and Pin Assignment



Schematic Diagram

## Features and Benefits

- Advanced MOSFET process technology
- Special designed for PWM, load switching and general purpose applications
- Ultra low on-resistance with low gate charge
- Fast switching and reverse body recovery
- 150°C operating temperature
- Lead free product



## Description

It utilizes the latest processing techniques to achieve the high cell density and reduces the on-resistance with high repetitive avalanche rating. These features combine to make this design an extremely efficient and reliable device for use in power switching application and a wide variety of other applications.

## Absolute Max Rating: @ $T_A=25^\circ\text{C}$ unless otherwise specified

Symbol	Parameter	Max.	Units
$I_D @ TC = 25^\circ\text{C}$	Continuous Drain Current, $V_{GS} @ 10\text{V}$	-4.1 ①	A
$I_D @ TC = 70^\circ\text{C}$	Continuous Drain Current, $V_{GS} @ 10\text{V}$	-3.5 ①	
$I_{DM}$	Pulsed Drain Current ②	-20	
$P_D @ TC = 25^\circ\text{C}$	Power Dissipation ③	1.4	W
$V_{DS}$	Drain-Source Voltage	-30	V
$V_{GS}$	Gate-to-Source Voltage	$\pm 20$	V
$T_J$ $T_{STG}$	Operating Junction and Storage Temperature Range	-55 to +150	$^\circ\text{C}$

## Thermal Resistance

Symbol	Characteristics	Typ.	Max.	Units
$R_{\theta JA}$	Junction-to-ambient ( $t \leq 10\text{s}$ ) ④	—	90	$^\circ\text{C}/\text{W}$

### Electrical Characteristics @ $T_A=25^{\circ}\text{C}$ unless otherwise specified

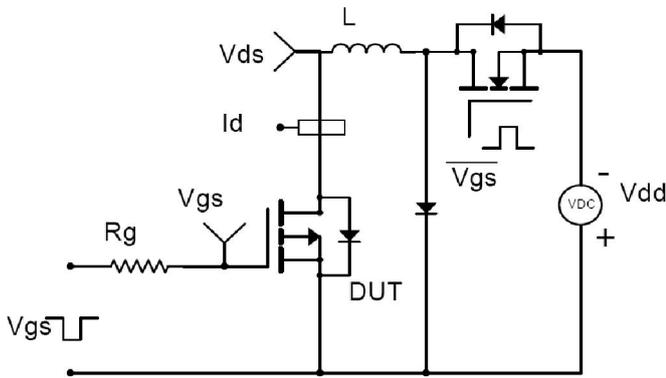
Symbol	Parameter	Min.	Typ.	Max.	Units	Conditions
$V_{(BR)DSS}$	Drain-to-Source breakdown voltage	-30	—	—	V	$V_{GS} = 0V, I_D = -250\mu A$
$R_{DS(on)}$	Static Drain-to-Source on-resistance	—	37	52	m $\Omega$	$V_{GS}=-10V, I_D = -4.1A$
		—	54	87		$V_{GS}=-4.5V, I_D = -3A$
$V_{GS(th)}$	Gate threshold voltage	-1	—	-3	V	$V_{DS} = V_{GS}, I_D = -250\mu A$
		—	-1.4	—		$T_J = 125^{\circ}\text{C}$
$I_{DSS}$	Drain-to-Source leakage current	—	—	-1	$\mu A$	$V_{DS} = -24V, V_{GS} = 0V$
		—	—	-50		$T_J = 125^{\circ}\text{C}$
$I_{GSS}$	Gate-to-Source forward leakage	—	—	100	nA	$V_{DS} = 20V$
		—	—	-100		$V_{GS} = -20V$
$Q_g$	Total gate charge	—	17	—	nC	$I_D = -6A,$ $V_{DS}=-25V,$ $V_{GS} = -10V$
$Q_{gs}$	Gate-to-Source charge	—	2.5	—		
$Q_{gd}$	Gate-to-Drain("Miller") charge	—	5.0	—		
$t_{d(on)}$	Turn-on delay time	—	7.2	—	ns	$V_{GS}=-10V, V_{DS}=-25V,$ $R_{GEN}=3\Omega,$
$t_r$	Rise time	—	4.8	—		
$t_{d(off)}$	Turn-Off delay time	—	24	—		
$t_f$	Fall time	—	11	—		
$C_{iss}$	Input capacitance	—	665	—	pF	$V_{GS} = 0V,$ $V_{DS} = -15V,$ $f = 1\text{MHz}$
$C_{oss}$	Output capacitance	—	108	—		
$C_{rss}$	Reverse transfer capacitance	—	83	—		

### Source-Drain Ratings and Characteristics

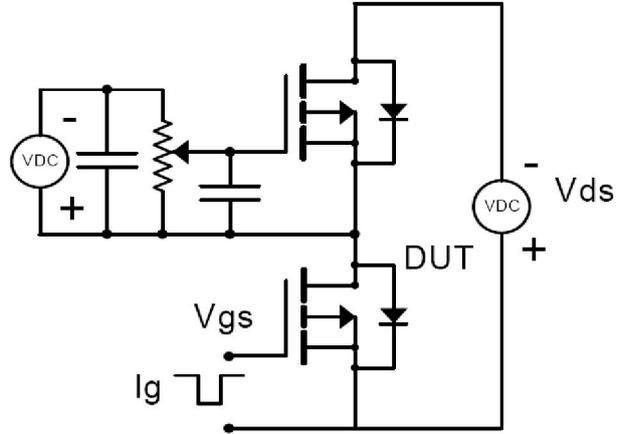
Symbol	Parameter	Min.	Typ.	Max.	Units	Conditions
$I_S$	Continuous Source Current (Body Diode)	—	—	-4.1 ①	A	MOSFET symbol showing the integral reverse p-n junction diode.
$I_{SM}$	Pulsed Source Current (Body Diode)	—	—	-20	A	
$V_{SD}$	Diode Forward Voltage	—	-0.79	-1.0	V	$I_S=1A, V_{GS}=0V$
$t_{rr}$	Reverse Recovery Time	—	9.7	—	ns	$T_J = 25^{\circ}\text{C}, I_F = -6A,$
$Q_{rr}$	Reverse Recovery Charge	—	3.8	—	nC	$di/dt = 100A/\mu s$

## Test Circuits and Waveforms

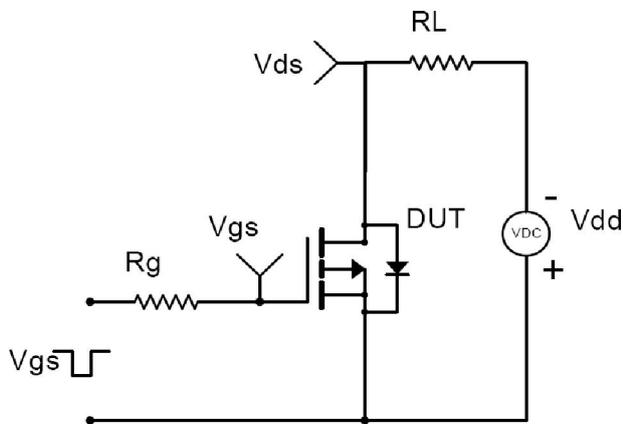
EAS test circuit:



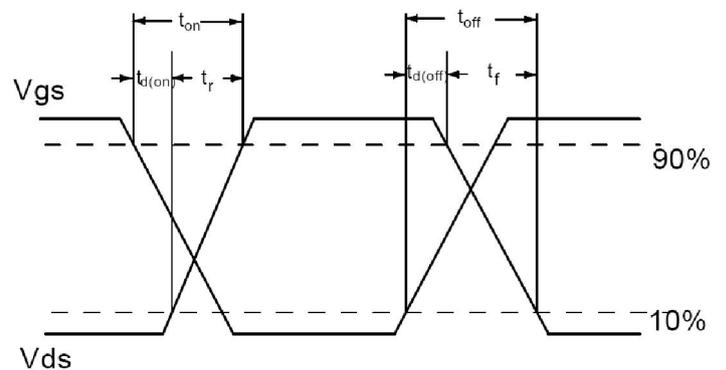
Gate charge test circuit:



Switching time test circuit:



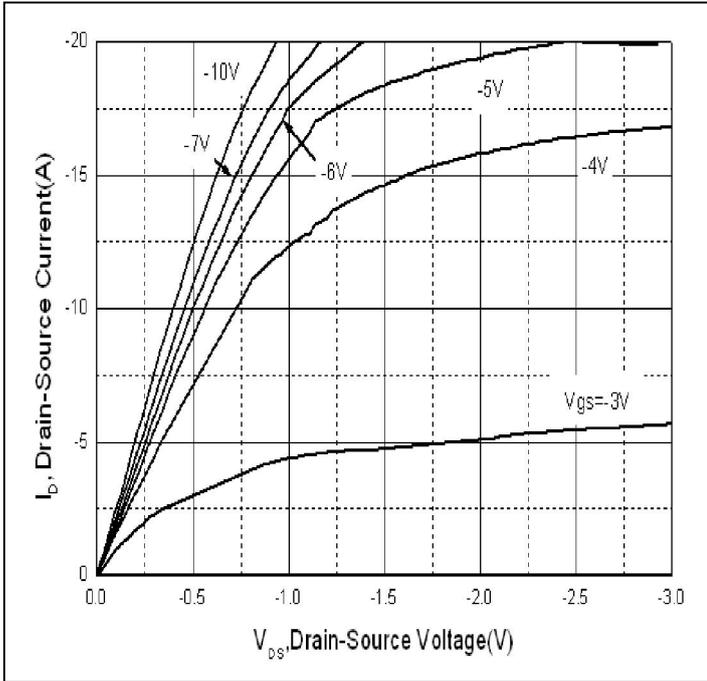
Switch Waveforms:



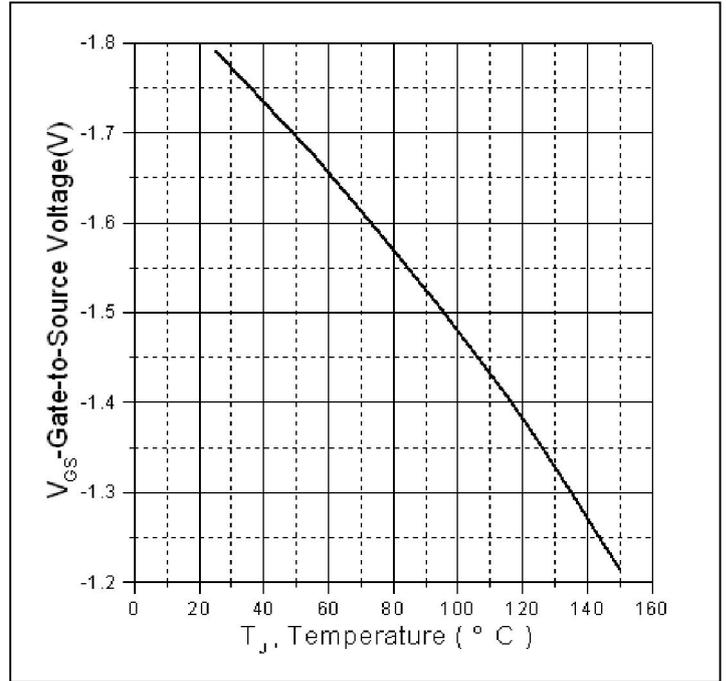
## Notes:

- ① Calculated continuous current based on maximum allowable junction temperature.
- ② Repetitive rating; pulse width limited by max. junction temperature.
- ③ The power dissipation PD is based on max. junction temperature, using junction-to-case thermal resistance.
- ④ The value of  $R_{\theta JA}$  is measured with the device mounted on 1 in 2 FR-4 board with 2oz. Copper, in a still air environment with  $T_A = 25^\circ\text{C}$

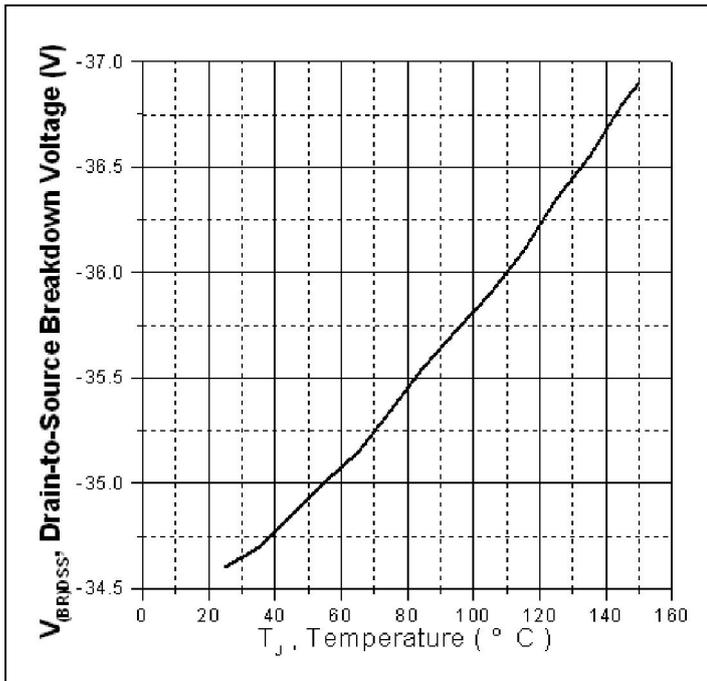
**Typical Electrical and Thermal Characteristics**



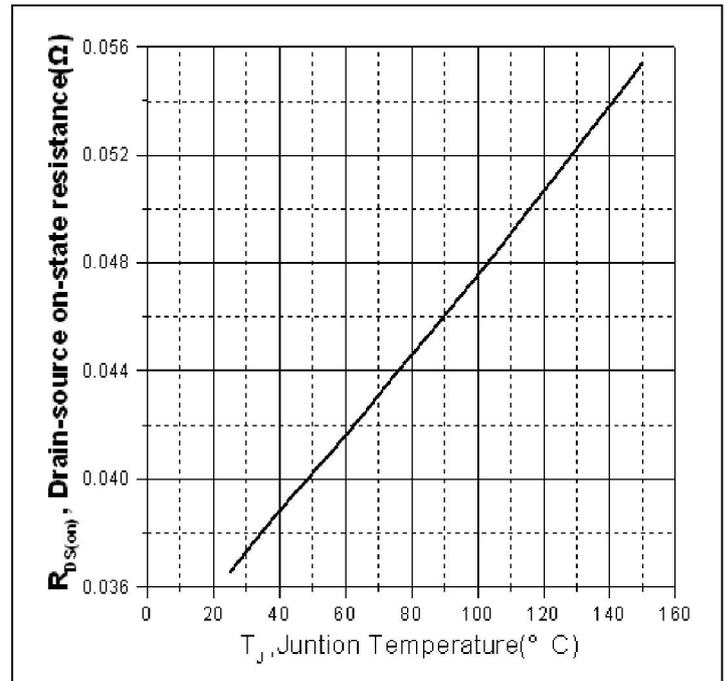
**Figure 1: Typical Output Characteristics**



**Figure 2. Gate to source cut-off voltage**

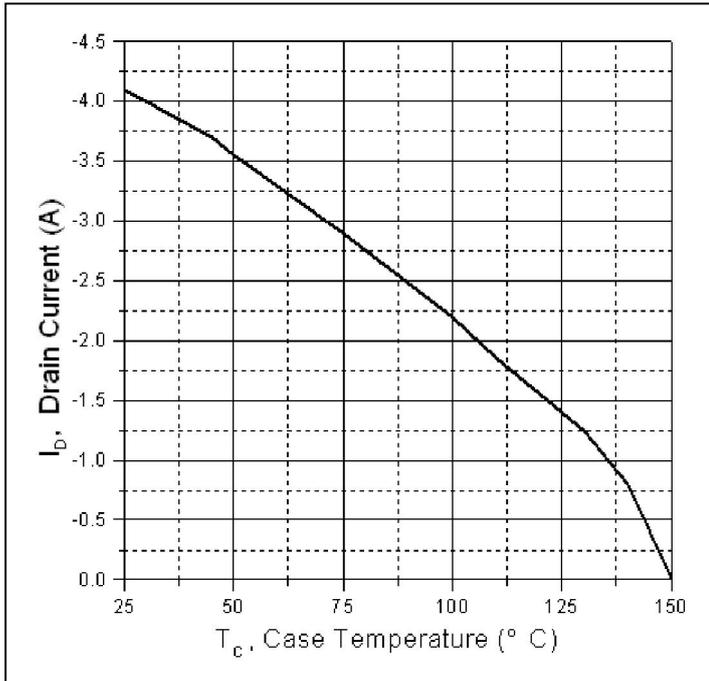


**Figure 3. Drain-to-Source Breakdown Voltage Vs. Case Temperature**

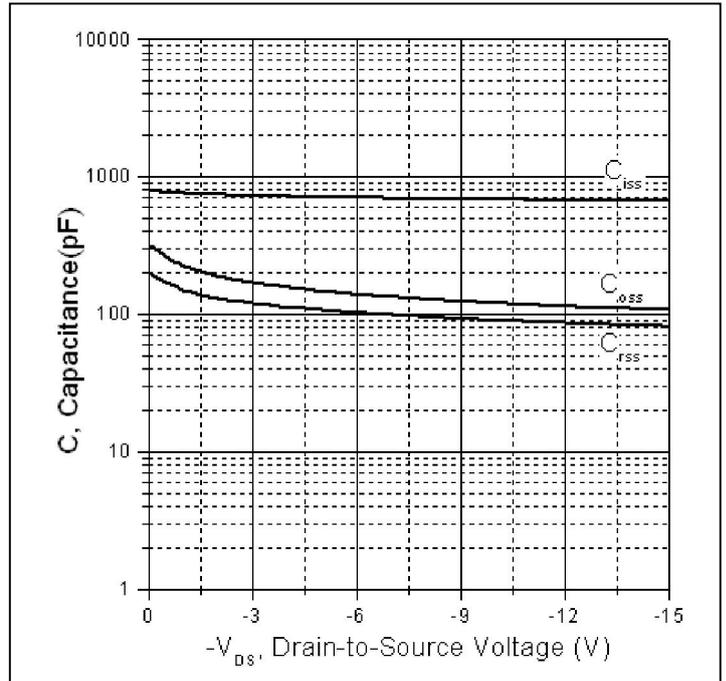


**Figure 4: Normalized On-Resistance Vs. Case Temperature**

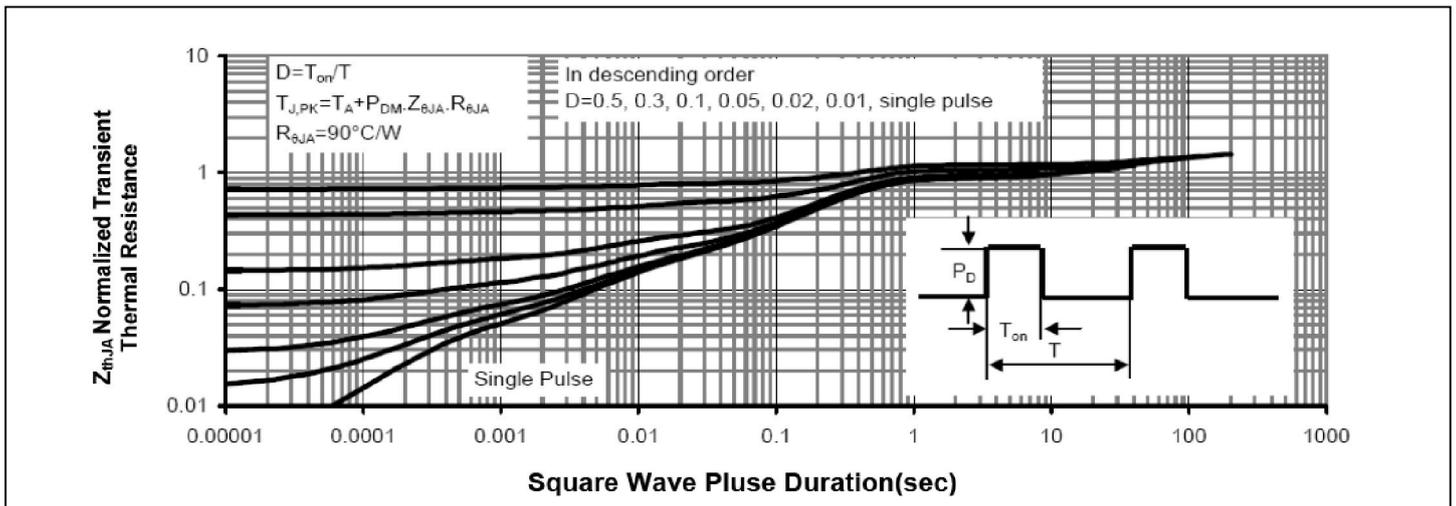
**Typical Electrical and Thermal Characteristics**



**Figure 5. Maximum Drain Current Vs. Case Temperature**



**Figure 6. Typical Capacitance Vs. Drain-to-Source Voltage**



**Figure7. Maximum Effective Transient Thermal Impedance Junction-to-Case**





## Ordering and Marking Information

**Device Marking: 3339**

**Package (Available)**  
**SOT-23**  
**Operating Temperature Range**  
**C : -55 to 150 °C**

## Devices per Unit

<b>Package Type</b>	<b>Units/Tape</b>	<b>Tapes/Inner Box</b>	<b>Units/Inner Box</b>	<b>Inner Boxes/ Carton Box</b>	<b>Units/ Carton Box</b>
SOT23	3000	10	30000	4	120000

## Reliability Test Program

<b>Test Item</b>	<b>Conditions</b>	<b>Duration</b>	<b>Sample Size</b>
<b>High Temperature Reverse Bias(HTRB)</b>	<b>T<sub>j</sub>=125°C to 150°C @ 80% of Max V<sub>DSS</sub>/V<sub>CES</sub>/V<sub>R</sub></b>	<b>168 hours 500 hours 1000 hours</b>	<b>3 lots x 77 devices</b>
<b>High Temperature Gate Bias(HTGB)</b>	<b>T<sub>j</sub>=150°C @ 100% of Max V<sub>GSS</sub></b>	<b>168 hours 500 hours 1000 hours</b>	<b>3 lots x 77 devices</b>