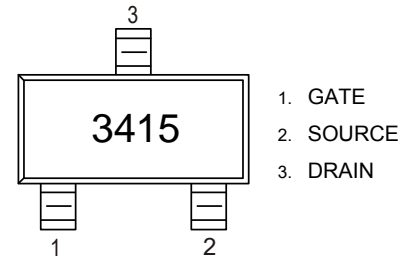


## SOT-23 Plastic-Encapsulate MOSFETS

### Features

- ◆  $V_{DS} = -20V, I_D = -5.5A$
- ◆  $R_{DS(ON)} < 36m\Omega @ V_{GS} = -5V$
- ◆  $R_{DS(ON)} < 39m\Omega @ V_{GS} = -4.5V$
- ◆  $R_{DS(ON)} < 60m\Omega @ V_{GS} = -2.5V$
- ◆ ESD Rating:  $\geq 2000V$  HBM
- ◆ High Power and current handling capability
- ◆ Lead free product is acquired
- ◆ SOT23 Package

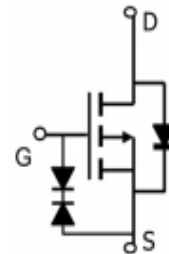
**SOT-23**



### Applications

- ◆ PWM applications
- ◆ Power management
- ◆ Load switch

### Equivalent Circuit



### Absolute Maximum Ratings

Item	Symbol	Rating	Unit
Drain-Source Voltage	$V_{DS}$	-20	V
Gate-Source Voltage	$V_{GS}$	$\pm 12$	V
Drain Current-Continuous	$I_D$	-5.5	A
	$T_A = 70^\circ C$	-4.7	A
Pulsed Drain Current <sup>(3)</sup>	$I_{DM}$	-30	A
Maximum Power Dissipation	$P_D$	1.6	W
Operating junction temperature	$T_J$	-55 to 150	$^\circ C$
Storage temperature	$T_{stg}$	-55 to 150	$^\circ C$

### Thermal Information

Item	Description	Value	Unit
$R_{\theta JA}$	Junction-to-ambient thermal resistance <sup>(4)(5)</sup>	80	$^\circ C/W$

Note (1): Exceeding these ratings may damage the device.

Note (2): The device is not guaranteed to function outside of its operating conditions.

Note (3): Repetitive Rating: Pulse width limited by maximum junction temperature.

Note (4): The package thermal impedance is calculated in accordance to JESD 51-7.

Note (5): Thermal Resistances were simulated on a 4-layer, JEDEC board.

**Electrical Characteristics (1)(2)**
 $T_A=25^{\circ}\text{C}$ , unless otherwise specified.

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
<b>Off Characteristics</b>						
Drain-Source Breakdown Voltage	$B_{VDSS}$	$V_{GS}=0\text{V}, I_D=-250\mu\text{A}$	-20			V
Zero Gate Voltage Drain Current	$I_{DSS}$	$V_{DS}=-20\text{V}, V_{GS}=0\text{V}$			-1	$\mu\text{A}$
Gate-Body Leakage Current	$I_{GSS}$	$V_{GS}=\pm 10\text{V}, V_{DS}=0\text{V}$			$\pm 10$	$\mu\text{A}$
<b>On Characteristics (3)</b>						
Gate Threshold Voltage	$V_{GS(th)}$	$V_{DS}=V_{GS}, I_D=-250\mu\text{A}$	-0.45	-0.8	-1.2	V
Drain-Source On-State Resistance	$R_{DS(on)}$	$V_{GS}=-5\text{V}, I_D=-1\text{A}$		30	36	$\text{m}\Omega$
		$V_{GS}=-4.5\text{V}, I_D=-2\text{A}$		32	39	$\text{m}\Omega$
		$V_{GS}=-2.5\text{V}, I_D=-1\text{A}$		48	60	$\text{m}\Omega$
Forward Transconductance	$g_{FS}$	$V_{DS}=-5\text{V}, I_D=-2\text{A}$		25		S
<b>Dynamic Characteristics (4)</b>						
Input Capacitance	$C_{iss}$	$V_{DS}=-10\text{V}, V_{GS}=0\text{V},$ $F=1\text{KHz}$		310		pF
Output Capacitance	$C_{oss}$			81		pF
Reverse Transfer Capacitance (4)	$C_{rss}$			28		pF
Gate Resistance	$R_g$	$V_{DS}=0\text{V}, V_{GS}=0\text{V},$ $F=500\text{KHz}$		2.3		$\text{k}\Omega$
<b>Switching Characteristics</b>						
Turn-on Delay Time	$t_{d(on)}$	$V_{DD}=-10\text{V}, R_L=1\Omega,$		13		ns
Turn-on Rise Time	$t_r$			11		ns
Turn-Off Delay Time	$t_{d(off)}$	$V_{GS}=-4.5\text{V}, R_G=3\Omega$		20		ns
Turn-Off Fall Time	$t_f$			31		ns
Total Gate Charge	$Q_g$	$V_{DS}=-10\text{V}, I_D=-4\text{A},$ $V_{GS}=-4.5\text{V}$		10		nC
Gate-Source Charge	$Q_{gs}$			1.1		nC
Gate-Drain Charge	$Q_{gd}$			2.4		nC
<b>Drain-Source Diode Characteristics</b>						
Diode Forward Voltage (3)	$V_{SD}$	$V_{GS}=0\text{V}, I_S=-1\text{A}$			-1.2	V
Diode Forward Current (5)	$I_S$				-5.5	A

Note (1): MOSFET on-resistance specifications are guaranteed by correlation to wafer level measurements.

Note (2): Thermal shutdown specifications are guaranteed by correlation to the design and characteristics analysis.

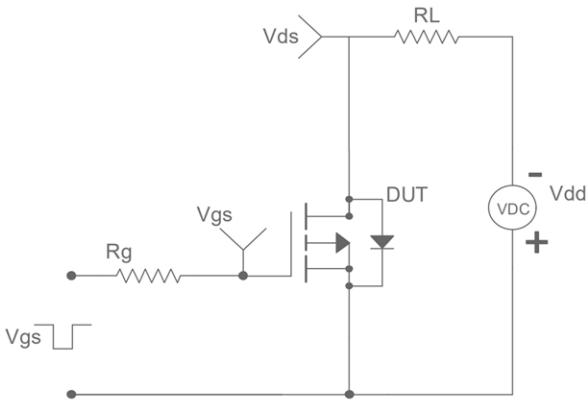
Note (3): Pulse Test: Pulse Width  $\leq 300\mu\text{s}$ , Duty Cycle  $\leq 2\%$ .

Note (4): Guaranteed by design, not subject to product.

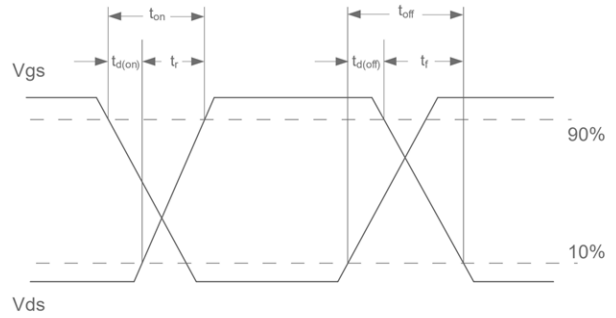
Note (5): Surface Mounted on 4-layer, JEDEC board,  $t \leq 10$  sec.

### Typical Performance Characteristics

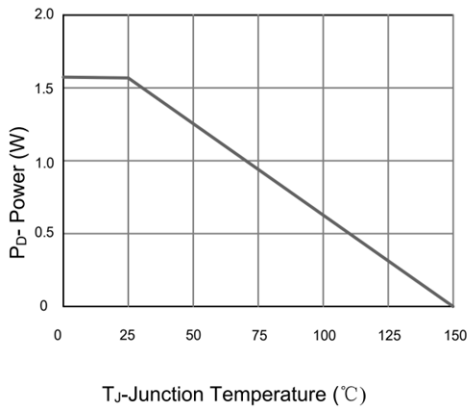
**Switching Test Circuit**



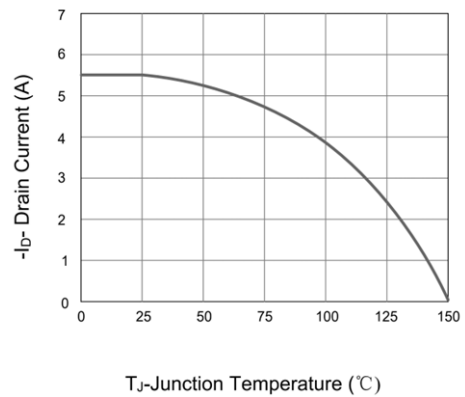
**Switching Waveform**



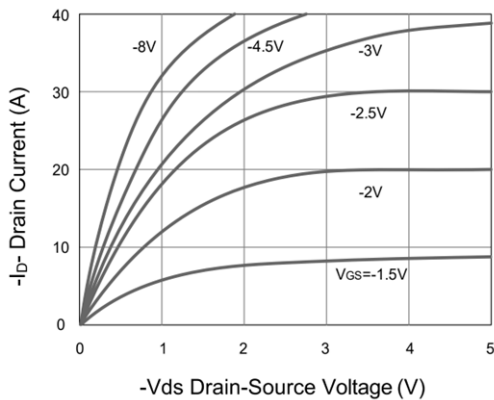
**Power De-rating**



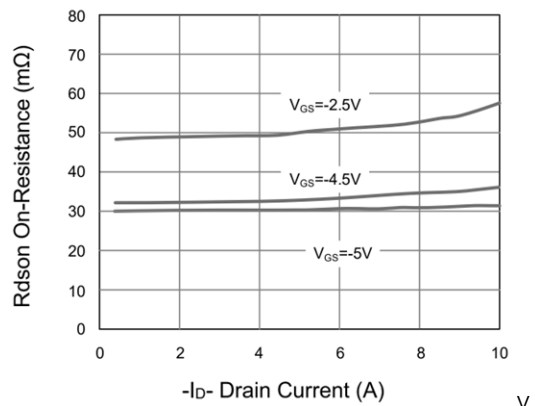
**Drain Current**



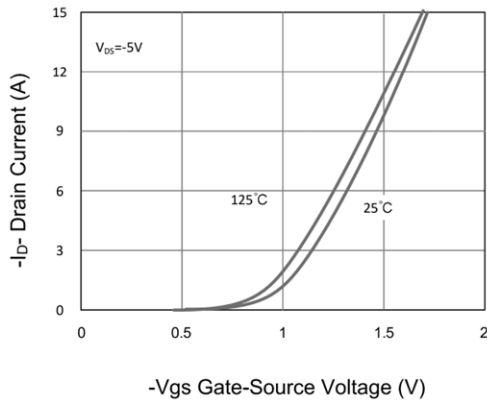
**Output Characteristics**



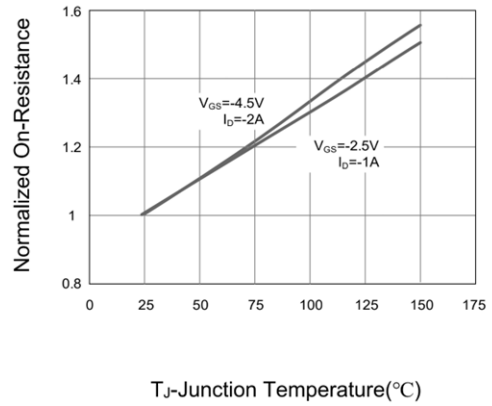
**RDS(ON) vs Drain Current**



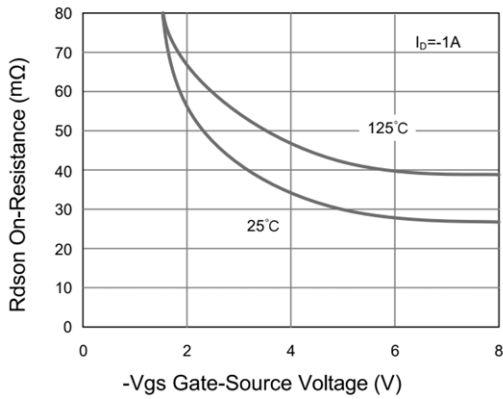
### Transfer Characteristics



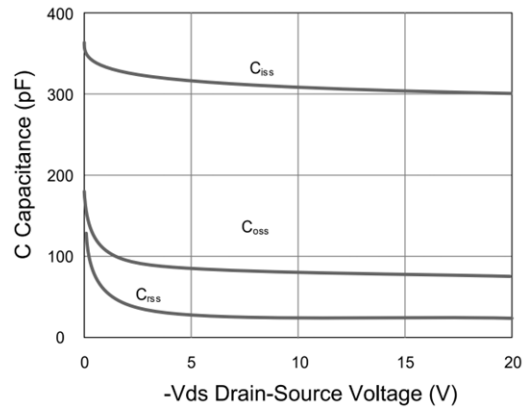
### $R_{DS(ON)}$ vs Junction Temperature



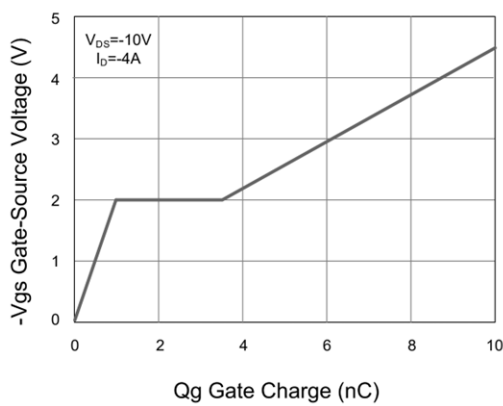
### $R_{DS(ON)}$ vs $V_{GS}$



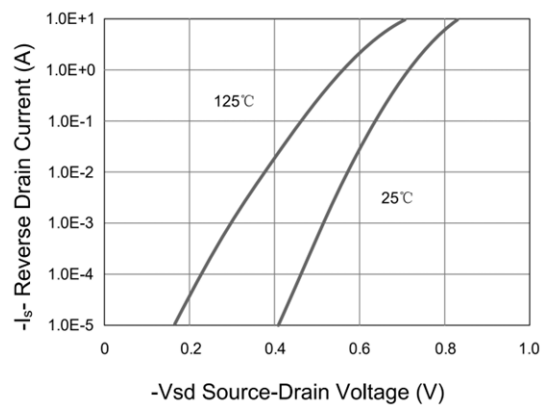
### Capacitance vs $V_{DS}$



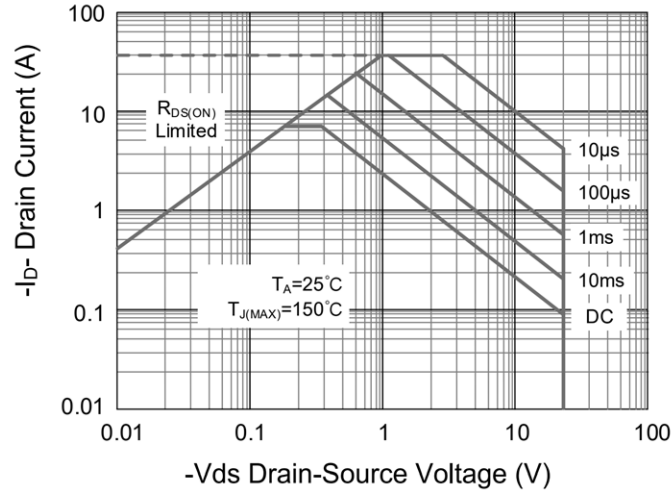
### Gate Charge



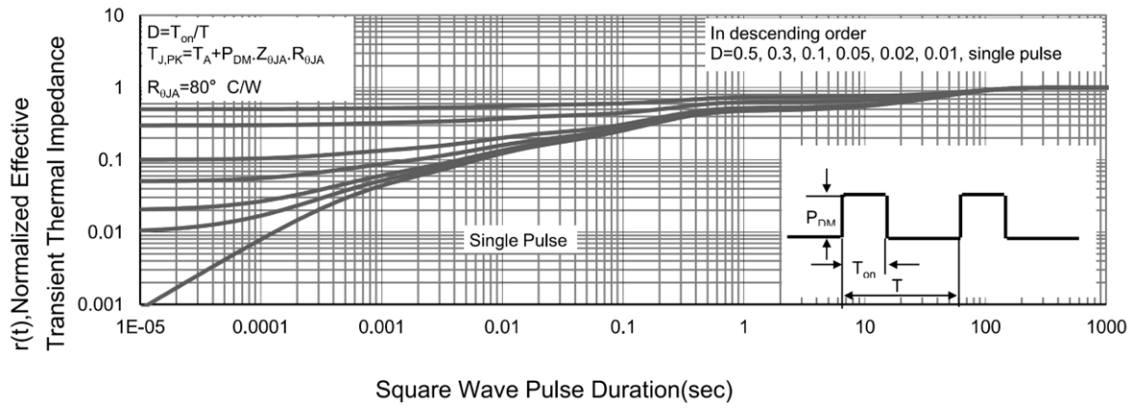
### Source- Drain Diode Forward



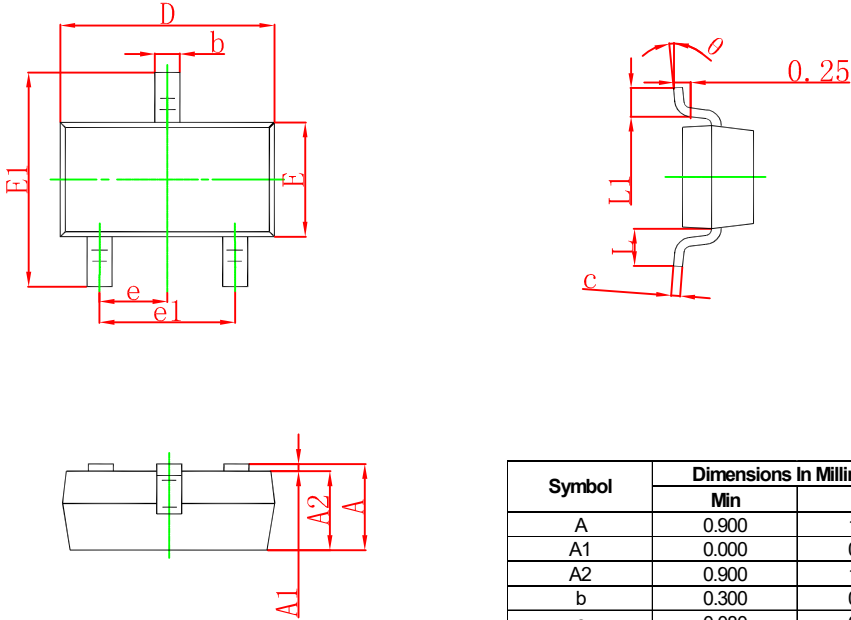
### Safe Operation Area



### Normalized Maximum Transient Thermal Impedance

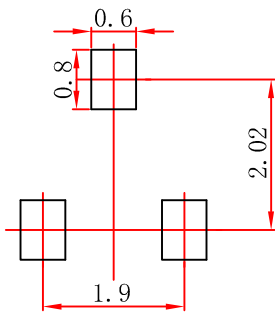


SOT-23 Package Outline Dimensions



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	0.900	1.400	0.035	0.055
A1	0.000	0.100	0.000	0.004
A2	0.900	1.050	0.035	0.041
b	0.300	0.500	0.012	0.020
c	0.080	0.150	0.003	0.006
D	2.800	3.000	0.110	0.118
E	1.200	1.400	0.047	0.055
E1	2.250	2.550	0.089	0.100
e	0.950 TYP		0.037 TYP	
e1	1.800	2.000	0.071	0.079
L	0.550 REF		0.022 REF	
L1	0.300	0.500	0.012	0.020
θ	0°	8°	0°	8°

SOT-23 Suggested Pad Layout



Note:

1. Controlling dimension: in/millimeters.
2. General tolerance: ±0.05mm.
3. The pad layout is for reference purposes only.