

P-Channel MOSFET

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

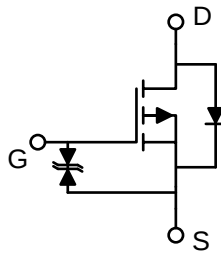
Applications

- PWM applications
- Power management
- Load switch

General Description

The RY3415t3 features advanced channel technology with excellent $R_{DS(ON)}$ performance and low gate charge. It can be used in a variety of applications.

Typical Application Circuit

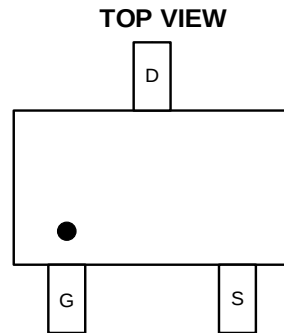


Basic Application Circuit

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Pin Description

Pin Configuration



Order Information ⁽¹⁾

Marking	Part No.	Model	Description	Package	T/R Qty.
3415	70903001	RY3415t3	RY3415t3 P-Channel MOSFET, V_{DS} -20V, I_D -5.5A, SOT23	SOT23	3000PCS

Note (1): All RYCHIP parts are Pb-Free and adhere to the RoHS directive.

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Specifications

Absolute Maximum Ratings ^{(1) (2)}

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

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.

Thermal Information

Item	Description	Value	Unit
$R_{\theta JA}$	Junction-to-ambient thermal resistance ⁽¹⁾⁽²⁾	80	$^{\circ}\text{C}/\text{W}$

Note (1): The package thermal impedance is calculated in accordance to JESD 51-7.

Note (2): Thermal Resistances were simulated on a 4-layer, JEDEC board.

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Electrical Characteristics ⁽¹⁾⁽²⁾

T_A=25°C, unless otherwise specified.

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Off Characteristics						
Drain-Source Breakdown Voltage	B _V DSS	V _{GS} =0V, I _D =-250μA	-20			V
Zero Gate Voltage Drain Current	I _D SS	V _{DS} =-20V, V _{GS} =0V			-1	μA
Gate-Body Leakage Current	I _G SS	V _{GS} =±10V, V _{DS} =0V			±10	μA
On Characteristics ⁽³⁾						
Gate Threshold Voltage	V _{GS(th)}	V _{DS} =V _{GS} , I _D =-250μA	-0.45	-0.8	-1.2	V
Drain-Source On-State Resistance	R _{DS(ON)}	V _{GS} =-5V, I _D =-1A		30	36	mΩ
		V _{GS} =-4.5V, I _D =-2A		32	39	mΩ
		V _{GS} =-2.5V, I _D =-1A		48	60	mΩ
Forward Transconductance	g _{FS}	V _{DS} =-5V, I _D =-2A		25		S
Dynamic Characteristics ⁽⁴⁾						
Input Capacitance	C _{iss}	V _{DS} =-10V, V _{GS} =0V, F=1KHz		310		pF
Output Capacitance	C _{oss}			81		pF
Reverse Transfer Capacitance ⁽⁴⁾	C _{rss}			28		pF
Gate Resistance	R _g	V _{DS} =0V, V _{GS} =0V, F=500KHz		2.3		kΩ
Switching Characteristics						
Turn-on Delay Time	t _{d(on)}	V _{DD} =-10V, R _L =1Ω, V _{GS} =-4.5V, R _G =3Ω		13		ns
Turn-on Rise Time	t _r			11		ns
Turn-Off Delay Time	t _{d(off)}			20		ns
Turn-Off Fall Time	t _f			31		ns
Total Gate Charge	Q _g	V _{DS} =-10V, I _D =-4A, V _{GS} =-4.5V		10		nC
Gate-Source Charge	Q _{gs}			1.1		nC
Gate-Drain Charge	Q _{gd}			2.4		nC
Drain-Source Diode Characteristics						
Diode Forward Voltage ⁽³⁾	V _{SD}	V _{GS} =0V, I _S =-1A			-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 ≤ 300μs, Duty Cycle ≤ 2%.

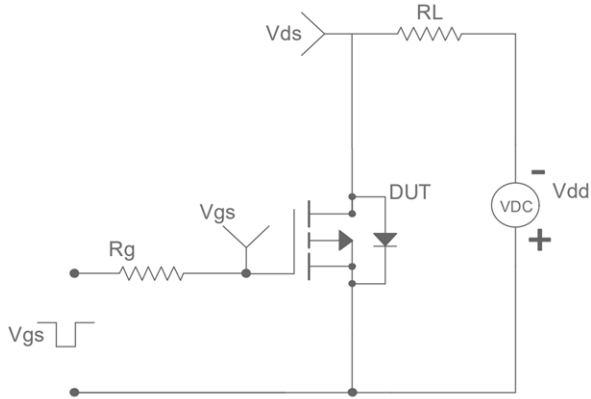
Note (4): Guaranteed by design, not subject to product.

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

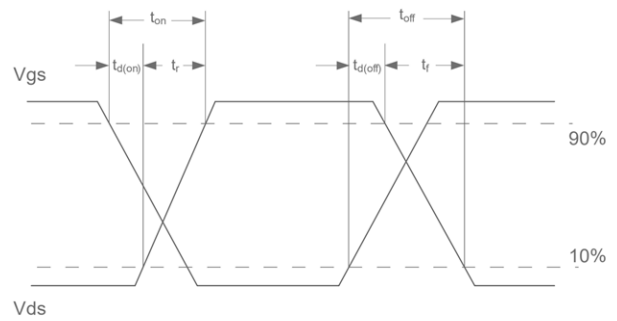
P-Channel MOSFET

Typical Performance Characteristics

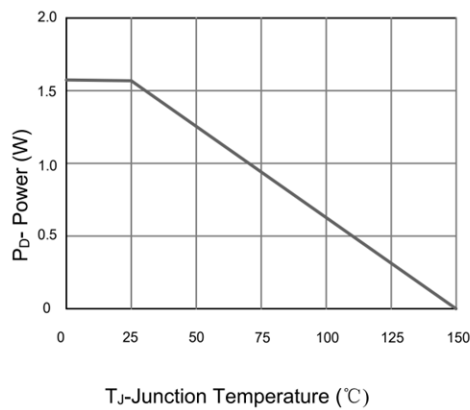
Switching Test Circuit



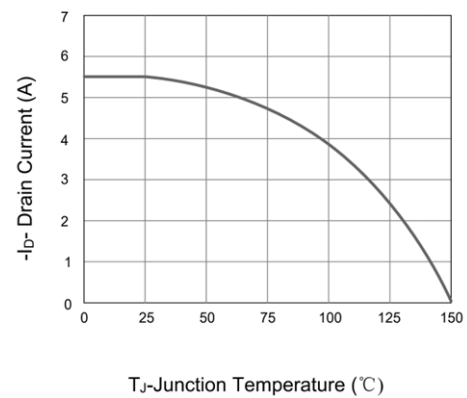
Switching Waveform



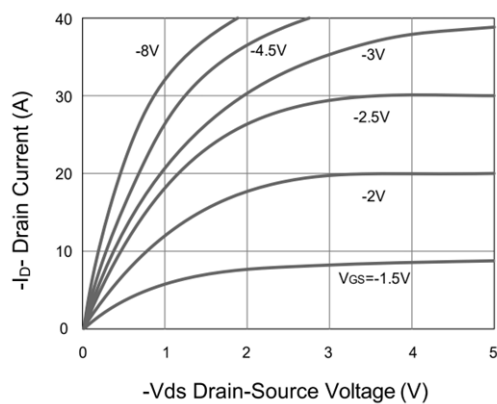
Power De-rating



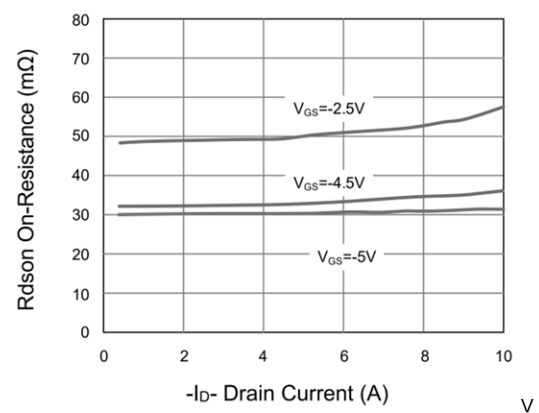
Drain Current



Output Characteristics

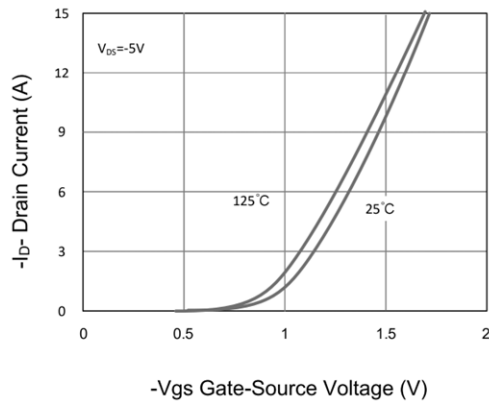


$R_{DS(ON)}$ vs Drain Current

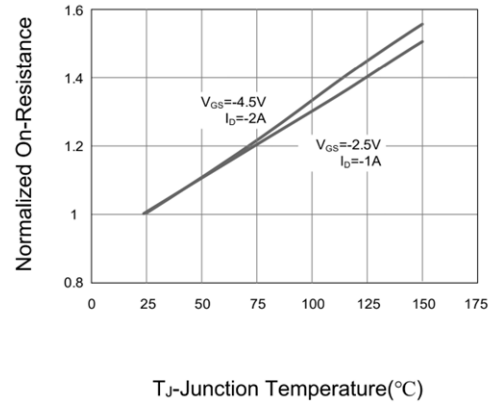


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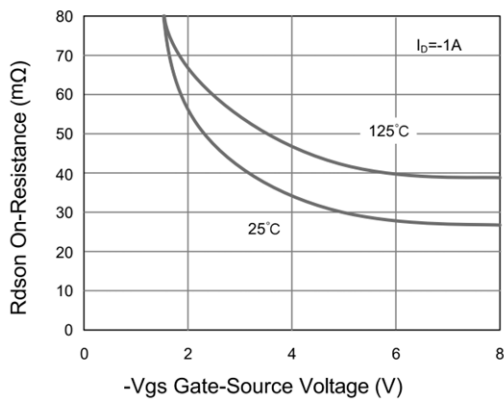
Transfer Characteristics



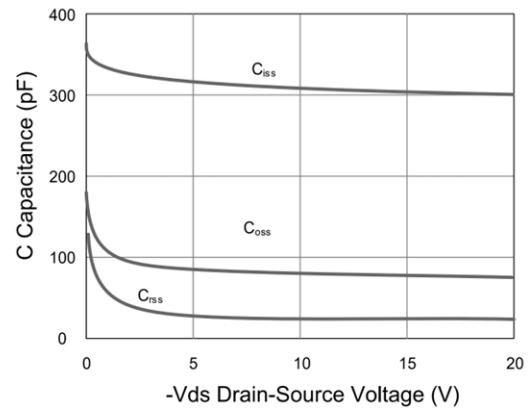
$R_{DS(ON)}$ vs Junction Temperature



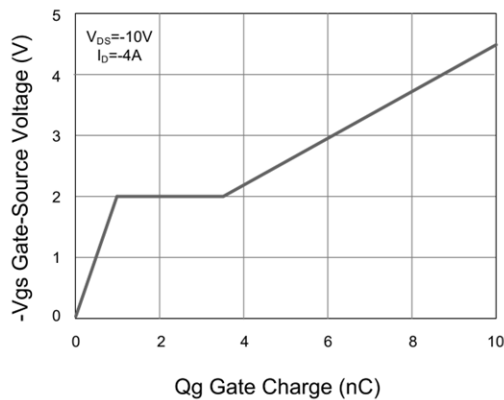
$R_{DS(ON)}$ vs V_{GS}



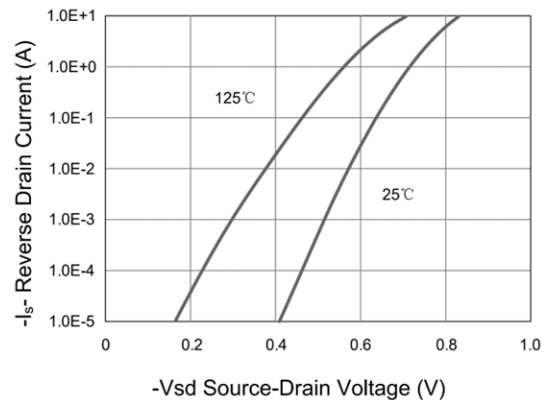
Capacitance vs V_{DS}



Gate Charge

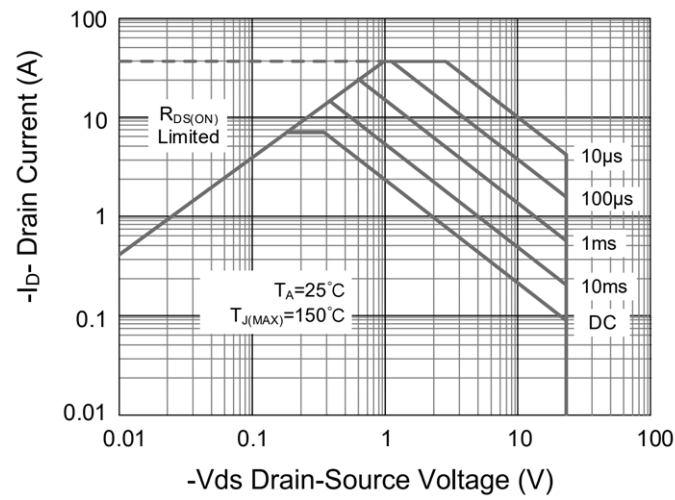


Source- Drain Diode Forward

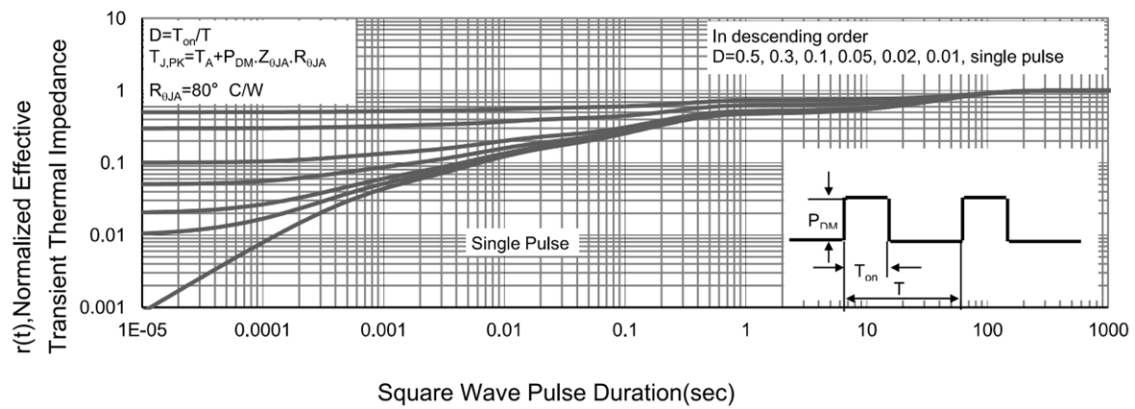


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Safe Operation Area



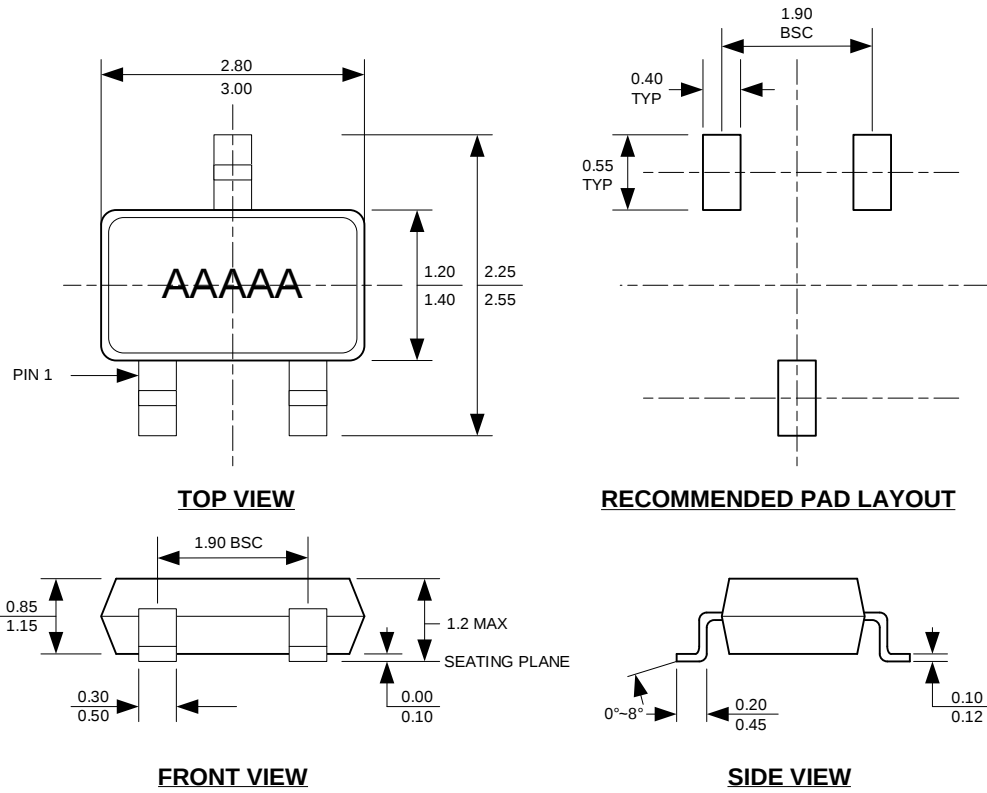
Normalized Maximum Transient Thermal Impedance



P-Channel MOSFET

Package Description

SOT23



NOTE:

1. CONTROL DIMENSION IS IN INCHES. DIMENSION IN BRACKET IS IN MILLIMETERS.
2. PACKAGE LENGTH DOES NOT INCLUDE MOLD FLASH, PROTRUSIONS OR GATE BURRS.
3. PACKAGE WIDTH DOES NOT INCLUDE INTERLEAD FLASH OR PROTRUSIONS.
4. LEAD COPLANARITY (BOTTOM OF LEADS AFTER FORMING) SHALL BE 0.004" INCHES MAX.
5. DRAWING CONFORMS TO JEDEC MS-012, VARIATION BA.
6. DRAWING IS NOT TO SCALE.