

### N-CHANNEL MOSFET

#### PRODUCT CHARACTERISTICS

VDSS	650V
$R_{DS(on)max}(@V_{GS} = 10V)$	1.2Ω
Qg@type	29nC
ID	7A

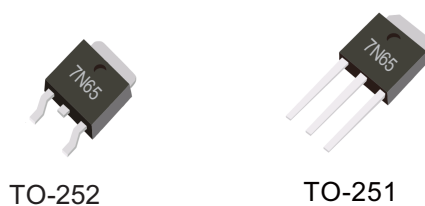
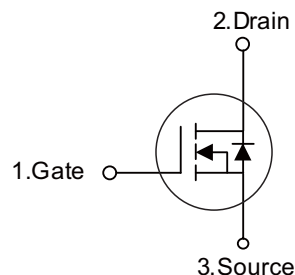
#### APPLICATIONS

- High efficiency switch mode power supplies
- Electronic lamp ballasts based on half bridge
- LED power supplies

#### FEATURES

- \*  $R_{DS(ON)} = 1.2\Omega @ V_{GS} = 10V$
- \* Ultra low gate charge
- \* Low reverse transfer Capacitance
- \* Fast switching capability
- \* Avalanche energy tested
- \* Improved dv/dt capability, high ruggedness

#### Symbol



#### ORDER INFORMATION

Order codes		Package	Packing
Halogen-Free	Halogen		
N/A	7N65	TO-252	2500 pieces /Real
N/A	7N65	TO-251	70 pieces/Tube

#### ABSOLUTE MAXIMUM RATINGS ( $T_C = 25^\circ\text{C}$ , unless otherwise specified)

PARAMETER	SYMBOL	RATINGS	UNIT
Drain-Source Voltage	$V_{DSS}$	650	V
Gate-Source Voltage	$V_{GSS}$	±30	V
Avalanche Current (Note 2)	$I_{AR}$	7	A
Drain Current	Continuous	$I_D$	7
	Pulsed (Note 2)	$I_{DM}$	29.6
Avalanche Energy	Single Pulsed (Note 3)	$E_{AS}$	530
	Repetitive (Note 2)	$E_{AR}$	14.2
Peak Diode Recovery dv/dt (Note 4)	dv/dt	4.5	V/ns
Power Dissipation	TO-252/251	$P_D$	120
Junction Temperature	$T_J$	+150	°C
Storage Temperature	$T_{STG}$	-55 ~ +150	°C

Notes: 1. Absolute maximum ratings are those values beyond which the device could be permanently damaged.

Absolute maximum ratings are stress ratings only and functional device operation is not implied.

2. Repetitive Rating : Pulse width limited by maximum junction temperature

3.  $L = 19.5\text{mH}$ ,  $I_{AS} = 7A$ ,  $V_{DD} = 50V$ ,  $R_G = 25\Omega$ , Starting  $T_J = 25^\circ\text{C}$

4.  $I_{SD} \leq 7A$ ,  $di/dt \leq 200A/\mu\text{s}$ ,  $V_{DD} \leq BV_{DSS}$ , Starting  $T_J = 25^\circ\text{C}$

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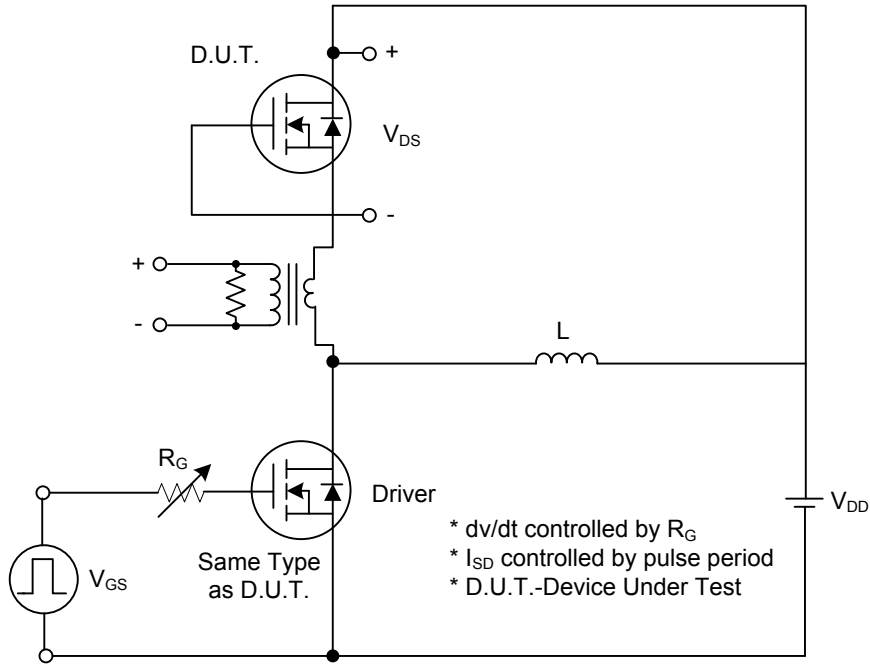
■ ELECTRICAL CHARACTERISTICS (T<sub>C</sub> = 25°C, unless otherwise specified)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
<b>OFF CHARACTERISTICS</b>						
Drain-Source Breakdown Voltage	BV <sub>DSS</sub>	V <sub>GS</sub> = 0V, I <sub>D</sub> = 250μA	650			V
Drain-Source Leakage Current	I <sub>DSS</sub>	V <sub>DS</sub> = 650V, V <sub>GS</sub> = 0V			1	μA
Gate- Source Leakage Current	Forward	I <sub>GSS</sub> V <sub>GS</sub> = 30V, V <sub>DS</sub> = 0V			100	nA
	Reverse		V <sub>GS</sub> = -30V, V <sub>DS</sub> = 0V			-100
Breakdown Voltage Temperature Coefficient	ΔBV <sub>DSS</sub> /ΔT <sub>J</sub>	I <sub>D</sub> =250μA, Referenced to 25°C		0.67		V/°C
<b>ON CHARACTERISTICS</b>						
Gate Threshold Voltage	V <sub>GS(TH)</sub>	V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = 250μA	2.0		4.0	V
Static Drain-Source On-State Resistance	R <sub>DS(ON)</sub>	V <sub>GS</sub> = 10V, I <sub>D</sub> = 3.5A		0.94	1.2	Ω
<b>DYNAMIC CHARACTERISTICS</b>						
Input Capacitance	C <sub>ISS</sub>	V <sub>DS</sub> =25V, V <sub>GS</sub> =0V, f=1.0 MHz			1400	pF
Output Capacitance	C <sub>OSS</sub>				180	pF
Reverse Transfer Capacitance	C <sub>RSS</sub>			16	21	pF
<b>SWITCHING CHARACTERISTICS</b>						
Turn-On Delay Time	t <sub>D(ON)</sub>	V <sub>DD</sub> = 325V, I <sub>D</sub> = 7.4A, R <sub>G</sub> = 25Ω (Note 1, 2)			70	ns
Turn-On Rise Time	t <sub>R</sub>				170	ns
Turn-Off Delay Time	t <sub>D(OFF)</sub>				140	ns
Turn-Off Fall Time	t <sub>F</sub>				130	ns
<b>SWITCHING CHARACTERISTICS</b>						
Total Gate Charge	Q <sub>G</sub>	V <sub>DS</sub> =520V, I <sub>D</sub> = 7A, V <sub>GS</sub> =10 V (Note 1, 2)		29	38	nC
Gate-Source Charge	Q <sub>GS</sub>			7		nC
Gate-Drain Charge	Q <sub>GD</sub>			14.5		nC
<b>DRAIN-SOURCE DIODE CHARACTERISTICS AND MAXIMUM RATINGS</b>						
Drain-Source Diode Forward Voltage	V <sub>SD</sub>	V <sub>GS</sub> = 0V, I <sub>S</sub> = 7A			1.4	V
Maximum Continuous Drain-Source Diode Forward Current	I <sub>S</sub>				7	A
Maximum Pulsed Drain-Source Diode Forward Current	I <sub>SM</sub>				29.6	A
Reverse Recovery Time	t <sub>rr</sub>	V <sub>GS</sub> = 0V, I <sub>S</sub> = 7A,		320		ns
Reverse Recovery Charge	Q <sub>RR</sub>	dI <sub>F</sub> / dt = 100A/μs (Note 1)		2.4		μC

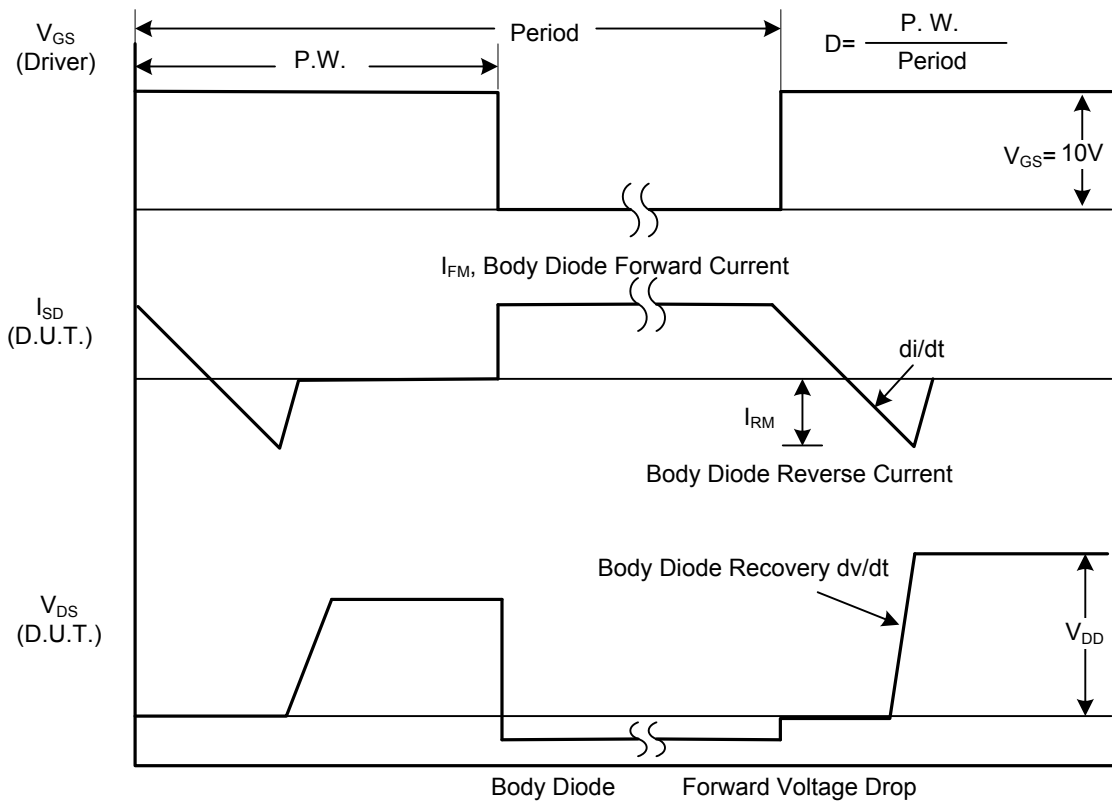
Notes: 1. Pulse Test: Pulse width ≤ 300μs, Duty cycle ≤ 2%

2. Essentially independent of operating temperature

■ TEST CIRCUITS AND WAVEFORMS



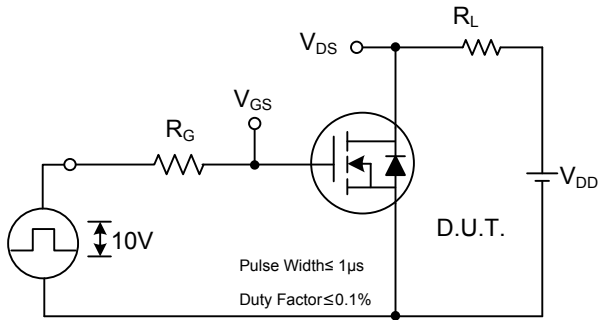
Peak Diode Recovery  $dv/dt$  Test Circuit



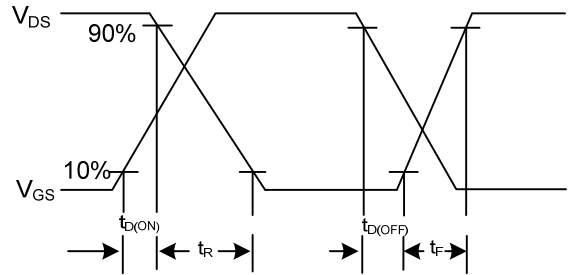
Peak Diode Recovery  $dv/dt$  Waveforms

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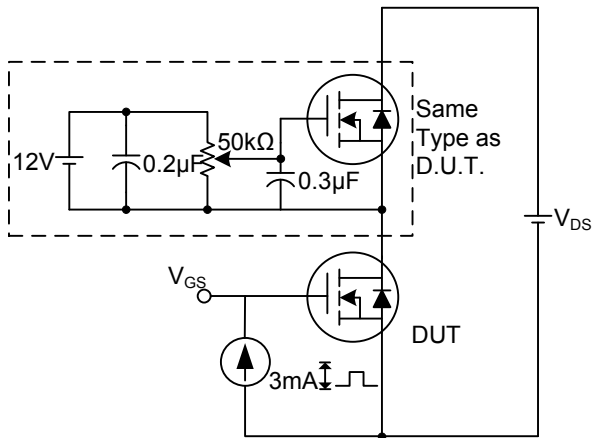
■ TEST CIRCUITS AND WAVEFORMS (Cont.)



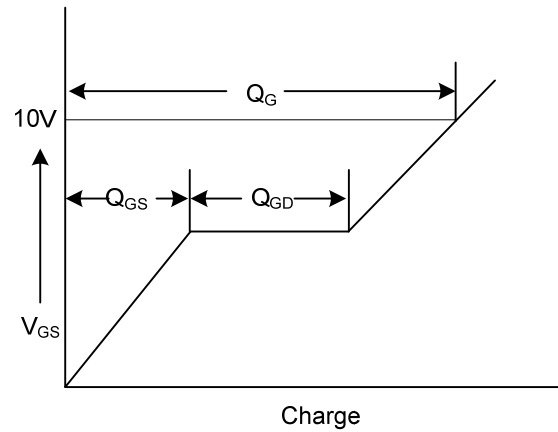
Switching Test Circuit



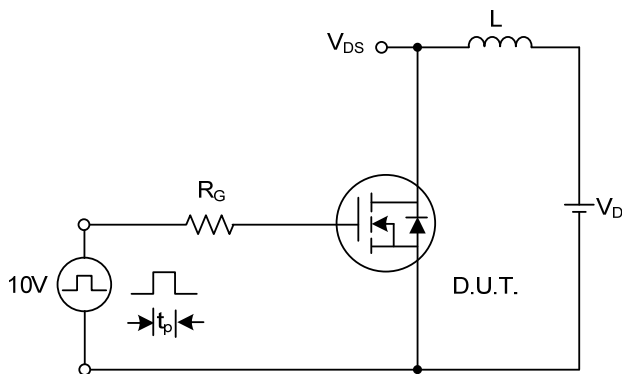
Switching Waveforms



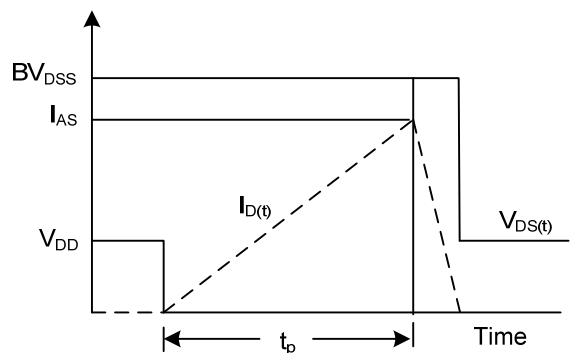
Gate Charge Test Circuit



Gate Charge Waveform



Unclamped Inductive Switching Test Circuit

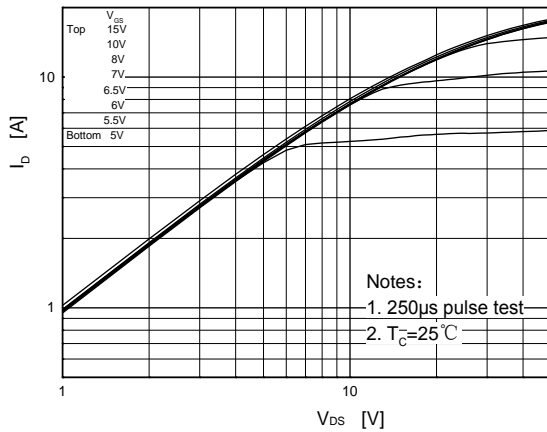


Unclamped Inductive Switching Waveforms

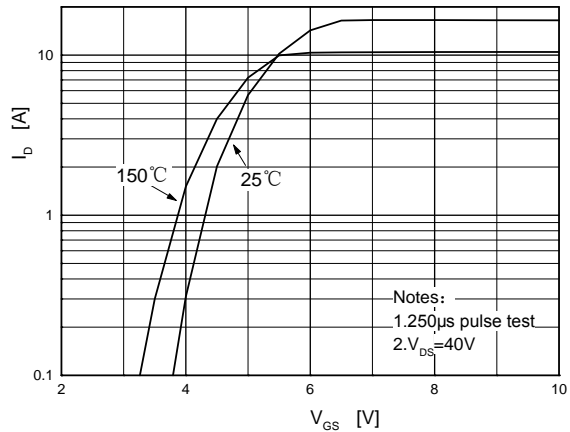
### ELECTRICAL CHARACTERISTICS

### N-CHANNEL MOSFET

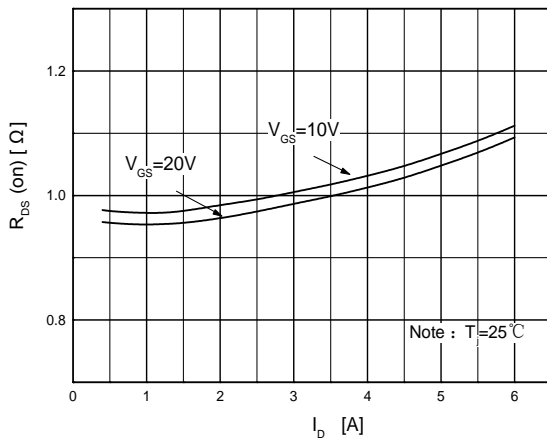
#### On-Region Characteristics



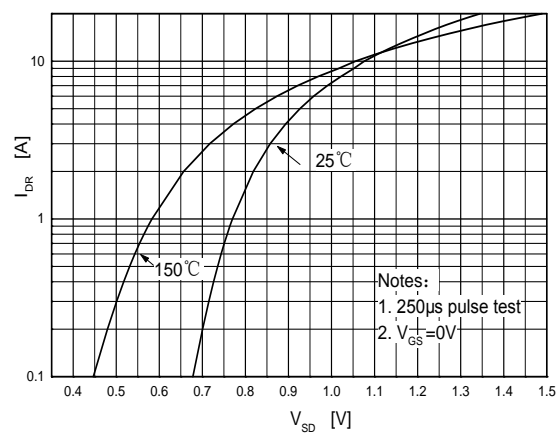
#### Transfer Characteristics



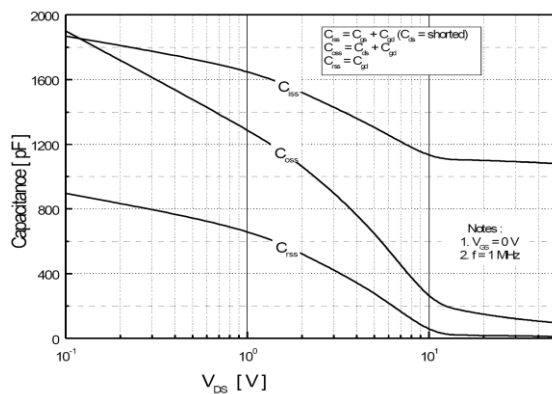
#### On-Resistance Variation vs. Drain Current and Gate Voltage



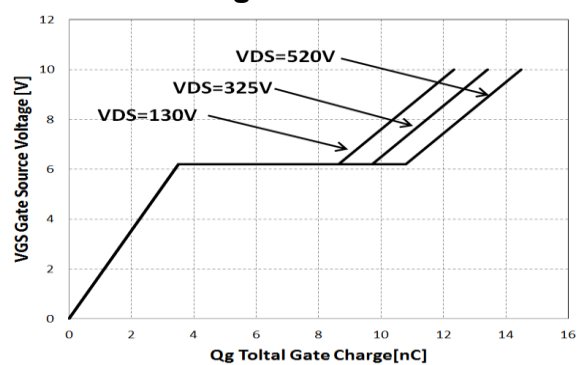
#### Body Diode Forward Voltage Variation vs. Source Current and Temperature



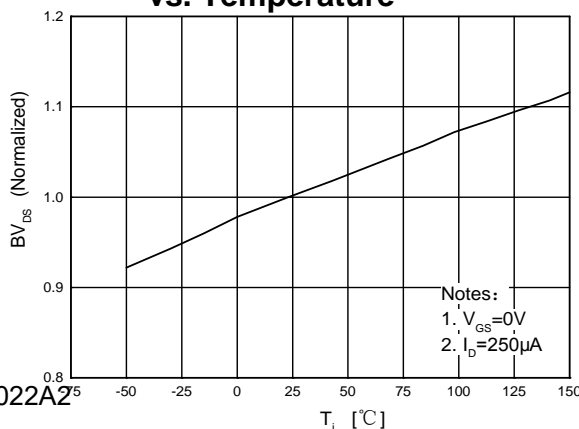
#### Capacitance Characteristics



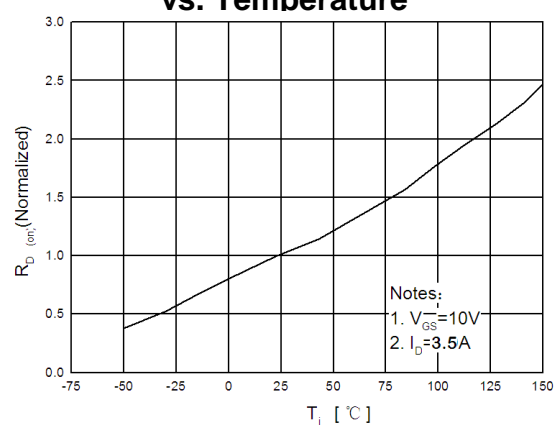
#### Gate Charge Characteristics



#### Breakdown Voltage Variation vs. Temperature

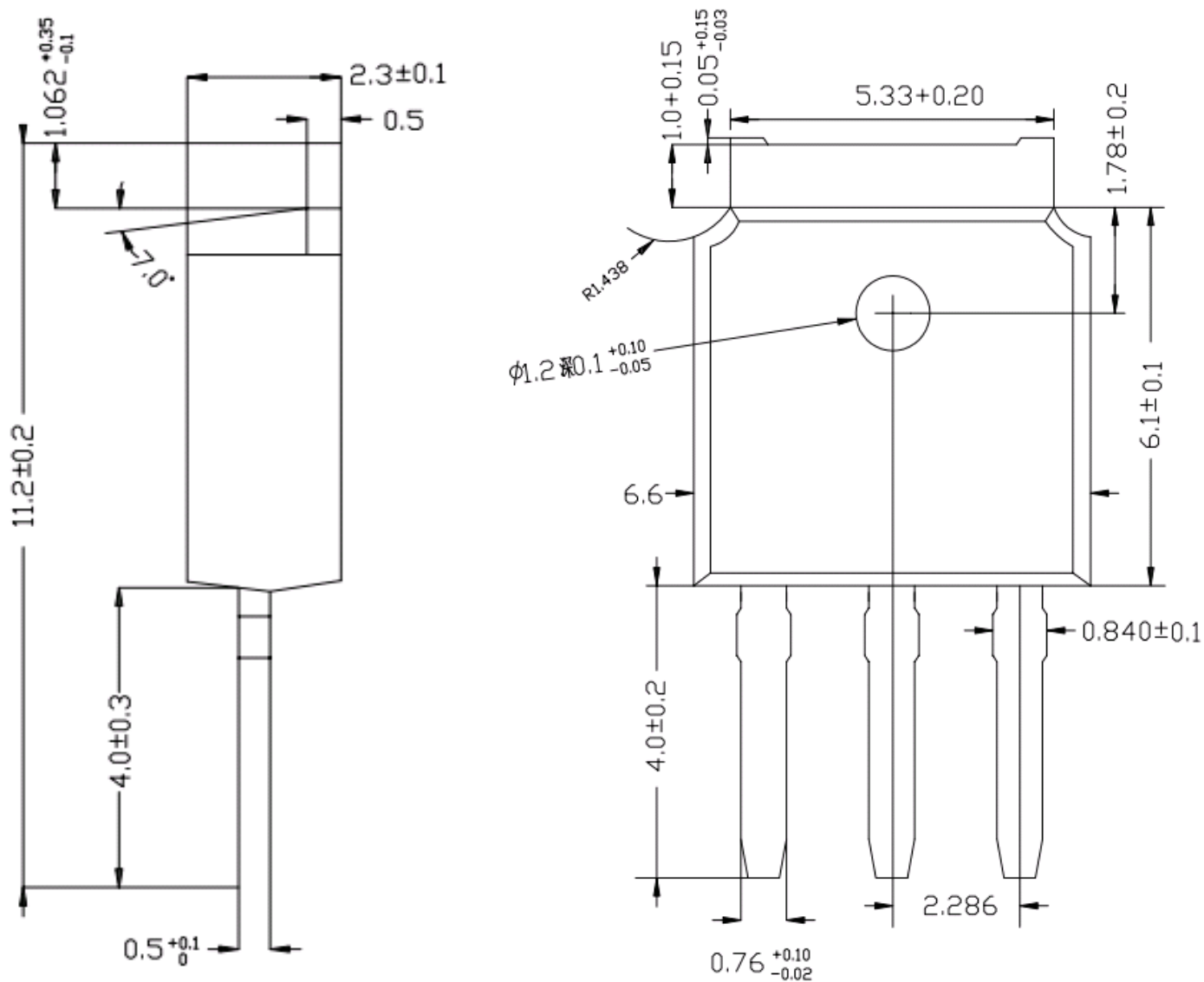


#### On-Resistance Variation vs. Temperature



**N-CHANNEL MOSFET**

■ TO-251 PACKAGE OUTLINE DIMENSIONS



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#### TO-252 PACKAGE OUTLINE DIMENSIONS

