

## N-Channel 30 V (D-S) MOSFET

### Description

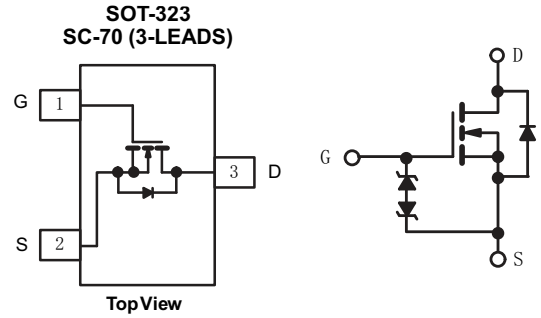
The RM1A5N30S3E uses advanced trench technology and design to provide excellent  $R_{DS(ON)}$  with low gate charge. It can be used in a wide variety of applications.

### General Features

- $V_{DS} = 30V, I_D = 1.5A$   
 $R_{DS(ON)} < 144m\Omega @ V_{GS} = 4.5V$   
 $R_{DS(ON)} < 185m\Omega @ V_{GS} = 2.5V$
- High density cell design for ultra low  $R_{dson}$
- Fully characterized avalanche voltage and current
- Excellent package for good heat dissipation

### Application

- Power switching application
- Hard switched and high frequency circuits
- DC-DC Converter
- Halogen-free



### Package Marking and Ordering Information

Device Marking	Device	Device Package	Reel Size	Tape width	Quantity
1A5N30	RM1A5N30S3AE	SOT-323	-	-	-

ABSOLUTE MAXIMUM RATINGS ( $T_A = 25^\circ C$ , unless otherwise noted)				
Parameter		Symbol	Limit	Unit
Drain-Source Voltage		$V_{DS}$	30	V
Gate-Source Voltage		$V_{GS}$	$\pm 10$	
Continuous Drain Current ( $T_J = 150^\circ C$ )(Note 1)	$T_C = 25^\circ C$	$I_D$	1.4	A
	$T_C = 70^\circ C$		1.1	
	$T_A = 25^\circ C$		1.5	
	$T_A = 70^\circ C$		1.2	
Pulsed Drain Current ( $t = 300 \mu s$ )		$I_{DM}$	6	
Continuous Source-Drain Diode Current	$T_C = 25^\circ C$	$I_S$	0.4	
	$T_A = 25^\circ C$		0.3	
Maximum Power Dissipation	$T_C = 25^\circ C$	$P_D$	0.5	W
	$T_C = 70^\circ C$		0.3	
	$T_A = 25^\circ C$		0.4(Note 1)	
	$T_A = 70^\circ C$		0.3(Note 1)	
Operating Junction and Storage Temperature Range		$T_J, T_{stg}$	- 50 to 150	$^\circ C$
Soldering Recommendations (Peak Temperature)			260	

#### Notes:

1. Surface mounted on 1" x 1" FR4 board.  $t = 10 s$ .
2. Based on  $T_C = 25^\circ C$ .

THERMAL RESISTANCE RATINGS					
Parameter		Symbol	Typ.	Max.	Unit
Maximum Junction-to-Ambient	$t \leq 10$ s	$R_{thJA}$	250	300	°C/W
Maximum Junction-to-Foot (Drain)	Steady State	$R_{thJF}$	225	270	

Notes:

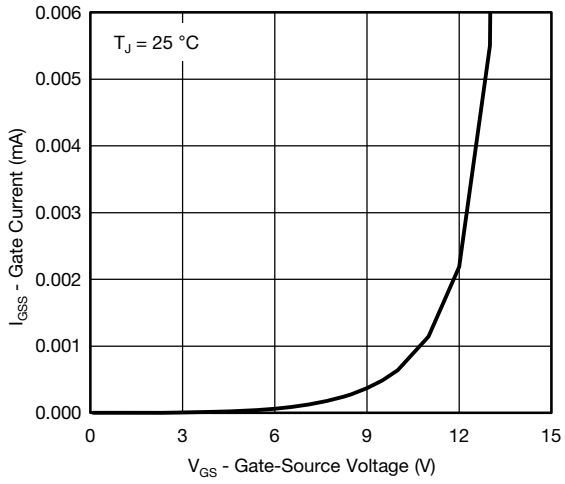
1. Surface mounted on 1" x 1" FR4 board.
2. Maximum under steady state conditions is 360 °C/W.

SPECIFICATIONS ( $T_J = 25$ °C, unless otherwise noted)						
Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Unit
<b>Static</b>						
Drain-Source Breakdown Voltage	$V_{DS}$	$V_{GS} = 0$ V, $I_D = 250$ $\mu$ A	30			V
$V_{DS}$ Temperature Coefficient	$\Delta V_{DS}/T_J$	$I_D = 250$ $\mu$ A		32		mV/°C
$V_{GS(th)}$ Temperature Coefficient	$\Delta V_{GS(th)}/T_J$			- 3		
Gate-Source Threshold Voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}$ , $I_D = 250$ $\mu$ A	0.6		1.5	V
Gate-Source Leakage	$I_{GSS}$	$V_{DS} = 0$ V, $V_{GS} = 4.5$ V			1	$\mu$ A
		$V_{DS} = 0$ V, $V_{GS} = \pm 12$ V			$\pm 20$	
Zero Gate Voltage Drain Current	$I_{DSS}$	$V_{DS} = 30$ V, $V_{GS} = 0$ V			1	
		$V_{DS} = 30$ V, $V_{GS} = 0$ V, $T_J = 55$ °C			10	
On-State Drain Current <sup>a</sup>	$I_{D(on)}$	$V_{DS} \geq 5$ V, $V_{GS} = 10$ V	2			A
Drain-Source On-State Resistance <sup>a</sup>	$R_{DS(on)}$	$V_{GS} = 4.5$ V, $I_D = 1$ A		0.120	0.144	$\Omega$
		$V_{GS} = 2.5$ V, $I_D = 0.5$ A		0.142	0.185	
Forward Transconductance <sup>a</sup>	$g_{fs}$	$V_{DS} = 10$ V, $I_D = 1.4$ A		5		S
<b>Dynamic<sup>b</sup></b>						
Input Capacitance	$C_{iss}$	$V_{DS} = 15$ V, $V_{GS} = 0$ V, $f = 1$ MHz		105		pF
Output Capacitance	$C_{oss}$			23		
Reverse Transfer Capacitance	$C_{rss}$			11		
Total Gate Charge	$Q_g$	$V_{DS} = 15$ V, $V_{GS} = 10$ V, $I_D = 1.4$ A		2.7	4.1	nC
		$V_{DS} = 15$ V, $V_{GS} = 4.5$ V, $I_D = 1.4$ A		1.4	2.1	
Gate-Source Charge	$Q_{gs}$			0.3		
Gate-Drain Charge	$Q_{gd}$			0.5		
Gate Resistance	$R_g$	$f = 1$ MHz	1.4	7	14	$\Omega$
Turn-On Delay Time	$t_{d(on)}$	$V_{DD} = 15$ V, $R_L = 13.6$ $\Omega$ $I_D \cong 1.1$ A, $V_{GEN} = 10$ V, $R_g = 1$ $\Omega$		2	4	ns
Rise Time	$t_r$			9	18	
Turn-Off Delay Time	$t_{d(off)}$			8	16	
Fall Time	$t_f$			8	16	
Turn-On Delay Time	$t_{d(on)}$	$V_{DD} = 15$ V, $R_L = 13.6$ $\Omega$ $I_D \cong 1.1$ A, $V_{GEN} = 4.5$ V, $R_g = 1$ $\Omega$		8	16	
Rise Time	$t_r$			13	20	
Turn-Off Delay Time	$t_{d(off)}$			15	23	
Fall Time	$t_f$			6	12	
<b>Drain-Source Body Diode Characteristics</b>						
Continuous Source-Drain Diode Current	$I_S$	$T_C = 25$ °C			0.4	A
Pulse Diode Forward Current <sup>a</sup>	$I_{SM}$				6	
Body Diode Voltage	$V_{SD}$	$I_F = 1.1$ A		0.8	1.2	V
Body Diode Reverse Recovery Time	$t_{rr}$	$I_F = 1.1$ A, $di/dt = 100$ A/ $\mu$ s, $T_J = 25$ °C		8	16	ns
Body Diode Reverse Recovery Charge	$Q_{rr}$			3	6	nC
Reverse Recovery Fall Time	$t_a$			5		ns
Reverse Recovery Rise Time	$t_b$			3		

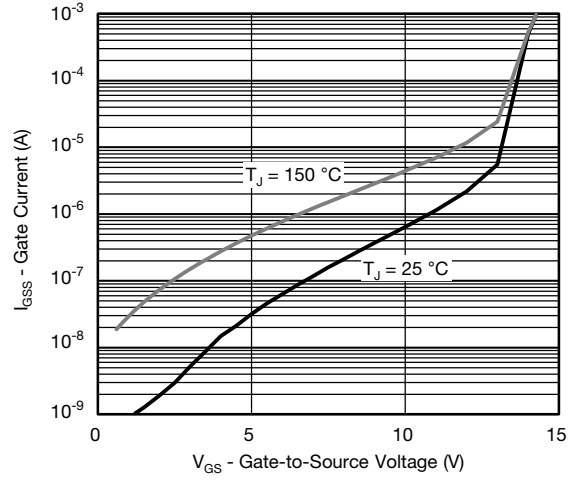
Notes:

1. Pulse test; pulse width  $\leq 300$   $\mu$ s, duty cycle  $\leq 2$  %.
2. Guaranteed by design, not subject to production testing.

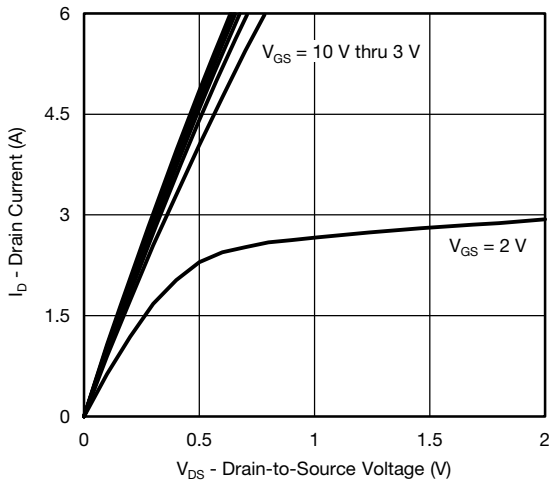
# RATING AND CHARACTERISTICS CURVES (RM1A5N30S3AE)



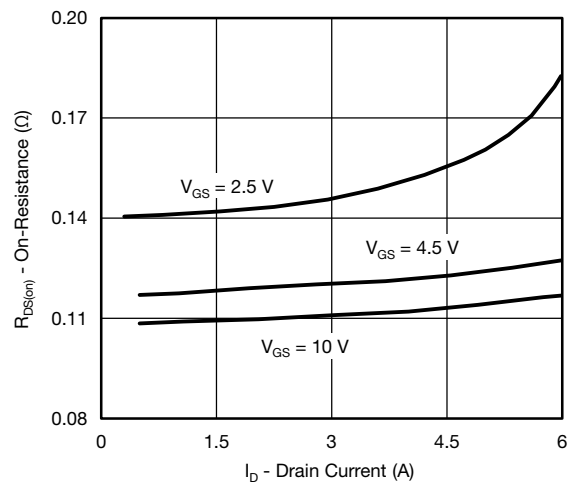
Gate Source Voltage vs. Gate Current



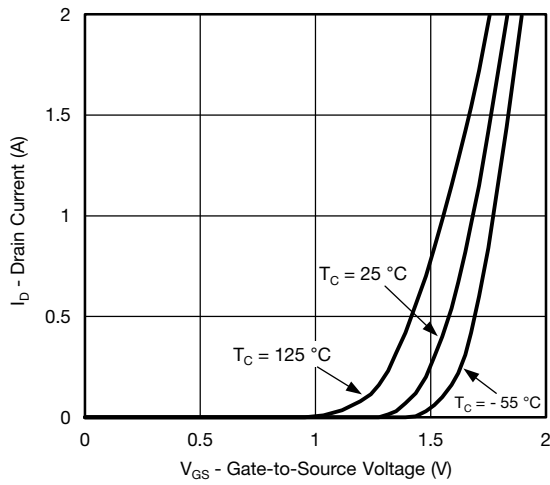
Current Derating\*Gate Source Voltage vs. Gate Current



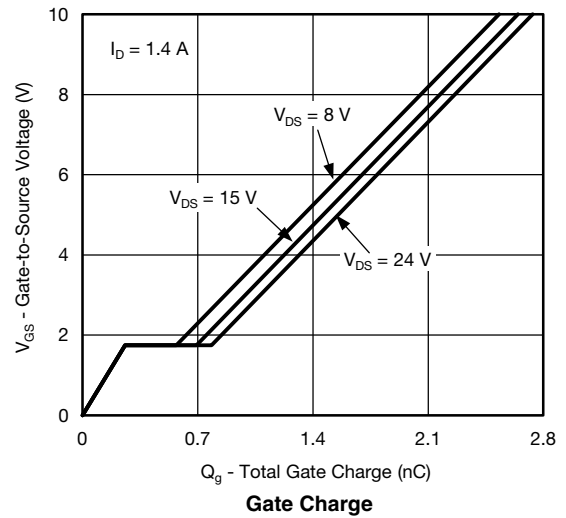
Output Characteristics



On-Resistance vs. Drain Current

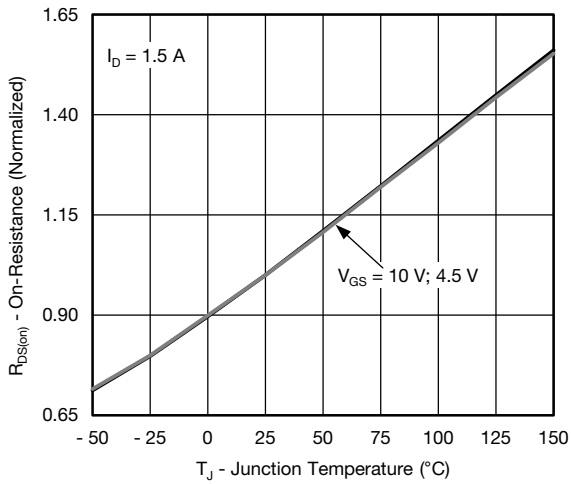


Transfer Characteristics

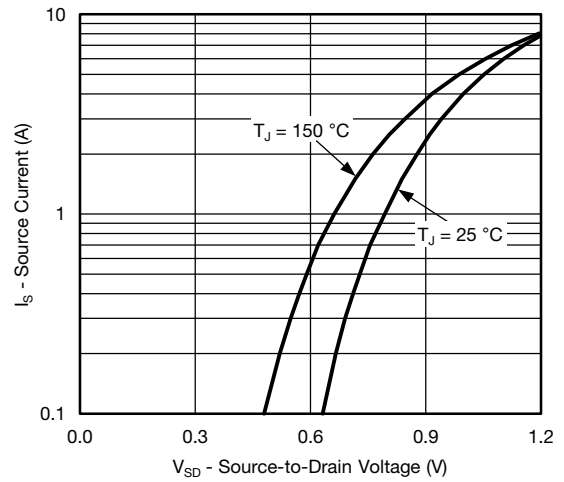


Gate Charge

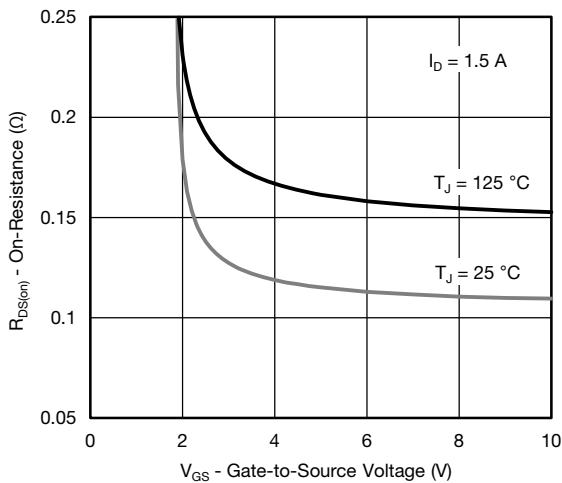
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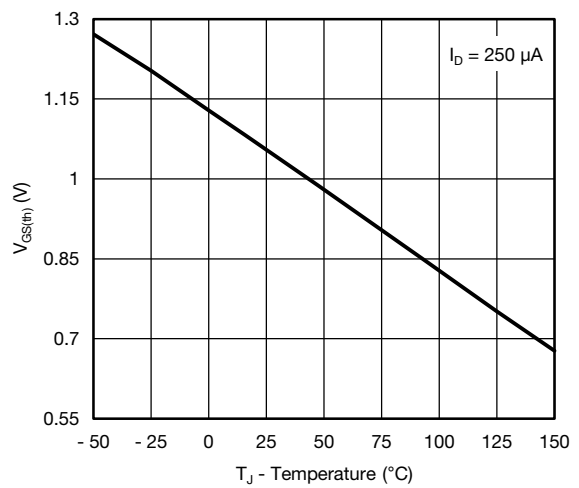
**On-Resistance vs. Junction Temperature**



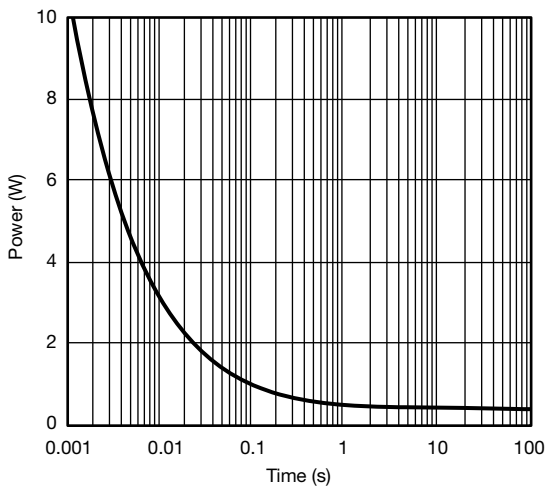
**Source-Drain Diode Forward Voltage**



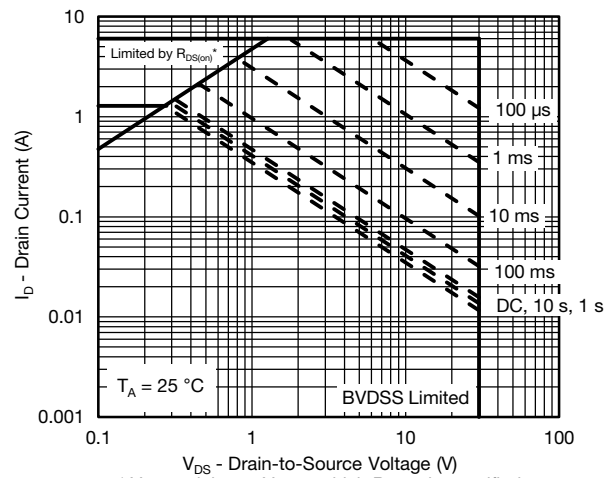
**On-Resistance vs. Gate-to-Source Voltage**



**Threshold Voltage**

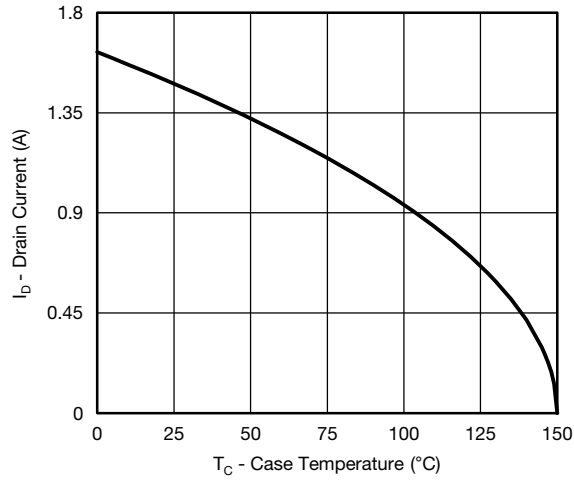


**Single Pulse Power, Junction-to-Ambient**

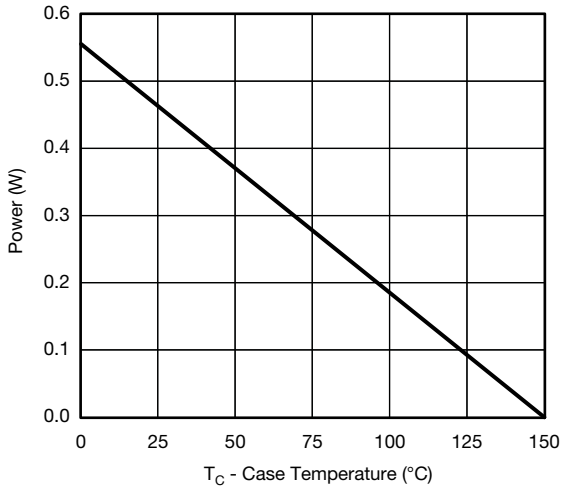


**Safe Operating Area, Junction-to-Ambient**

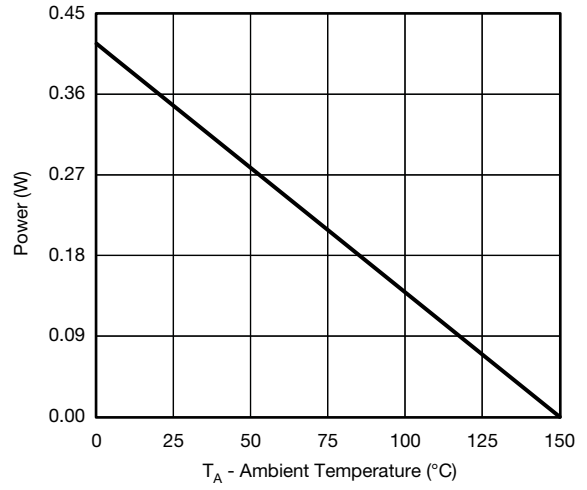
# RATING AND CHARACTERISTICS CURVES (RM1A5N30S3AE)



**Current Derating\***

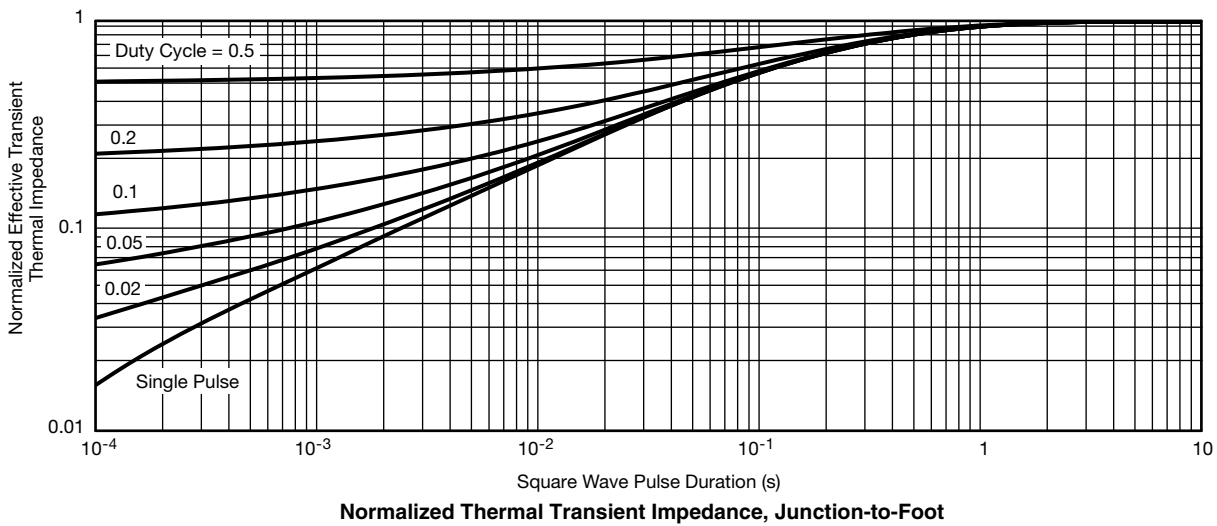
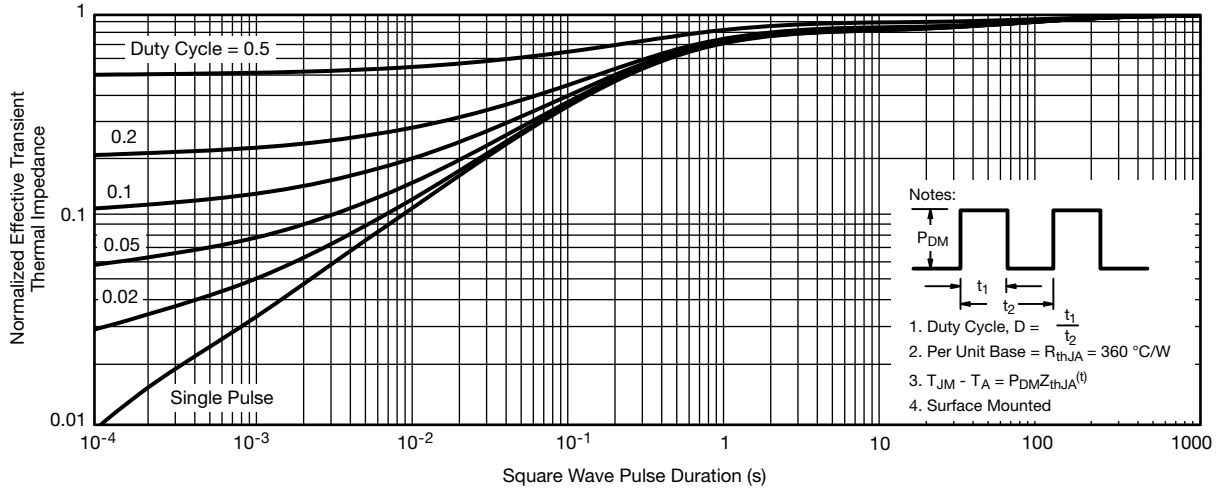


**Power, Junction-to-Case**



**Power, Junction-to-Ambient**

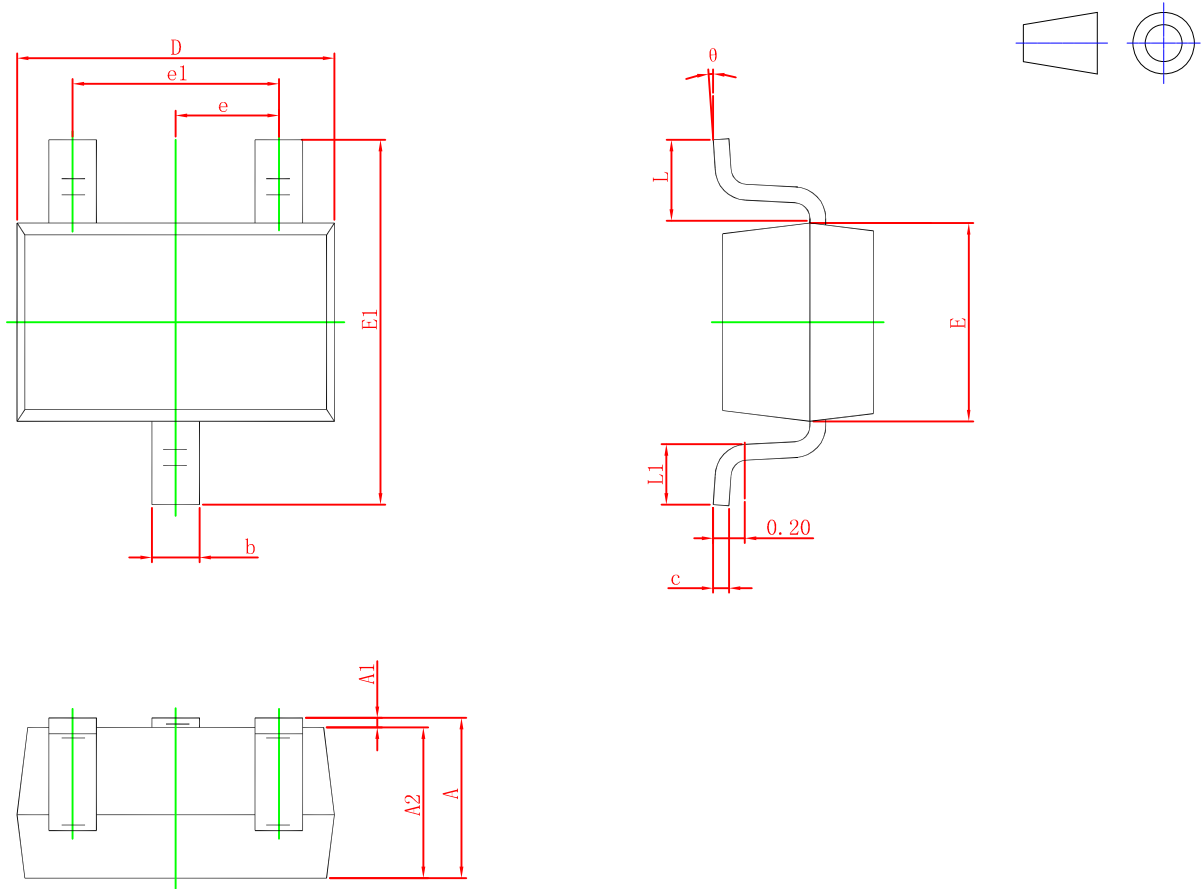
## RATING AND CHARACTERISTICS CURVES (RM1A5N30S3AE)



# PACKAGE OUTLINE

Plastic surface mounted package; 3 leads

SOT-323



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	0.900	1.100	0.035	0.043
A1	0.000	0.100	0.000	0.004
A2	0.900	1.000	0.035	0.039
b	0.200	0.400	0.008	0.016
c	0.080	0.150	0.003	0.006
D	2.000	2.200	0.079	0.087
E	1.150	1.350	0.045	0.053
E1	2.150	2.450	0.085	0.096
e	0.650 TYP.		0.026 TYP.	
e1	1.200	1.400	0.047	0.055
L	0.525 REF.		0.021 REF.	
L1	0.260	0.460	0.010	0.018
θ	0°	8°	0°	8°

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