

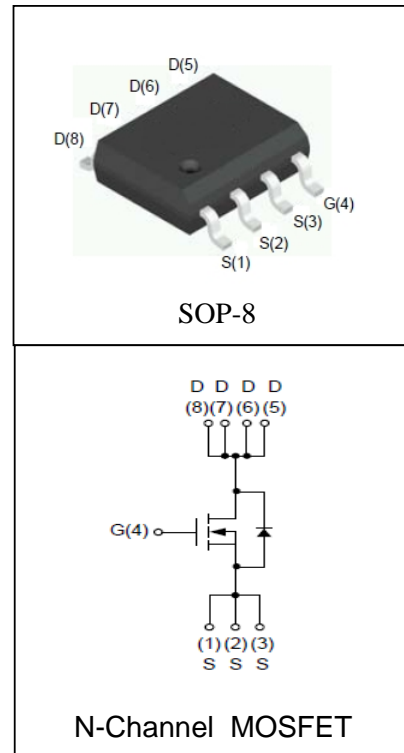
## Features

- 20V/13A,  
 $R_{DS(ON)} = 13m\Omega$  (Typ.) @  $V_{GS} = 10V$   
 $R_{DS(ON)} = 16m\Omega$  (Typ.) @  $V_{GS} = 4.5V$   
 $R_{DS(ON)} = 22m\Omega$  (Typ.) @  $V_{GS} = 2.5V$
- Super High Dense Cell Design
- Low On-Resistance
- Reliable and Rugged
- Lead Free and Green Available

## Applications

- DC/DC Converters

## Pin Description



## Absolute Maximum Ratings

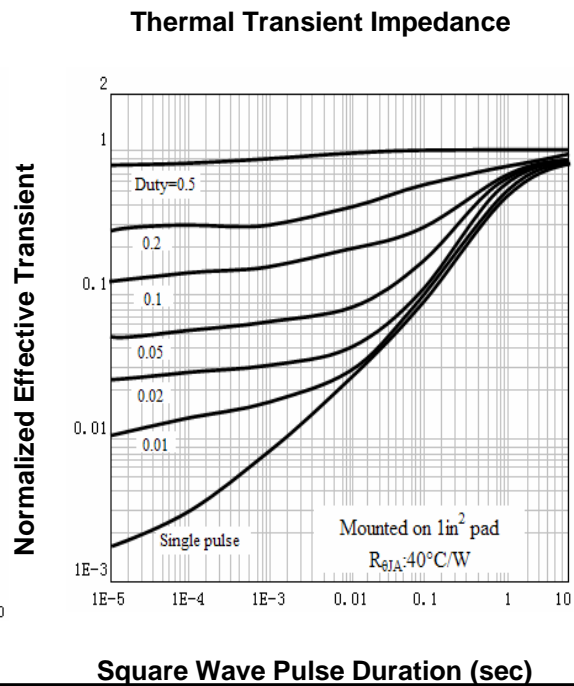
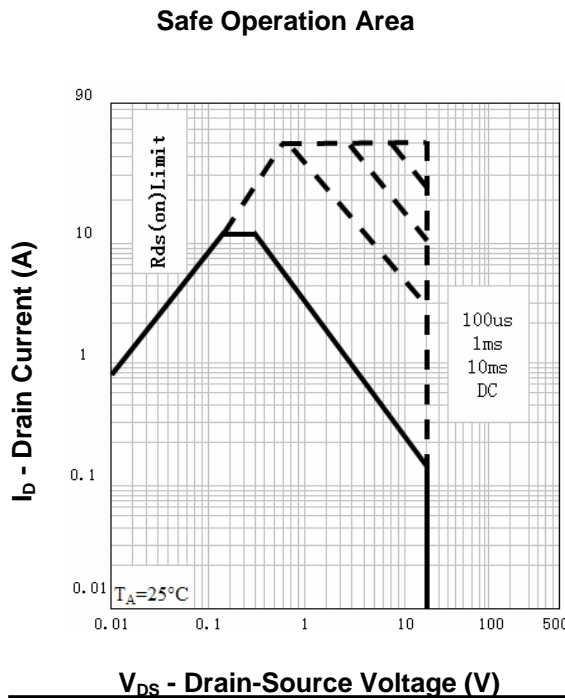
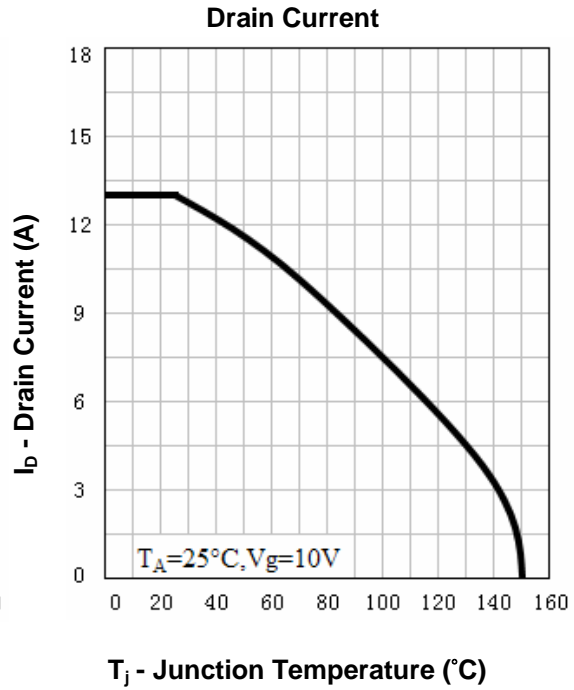
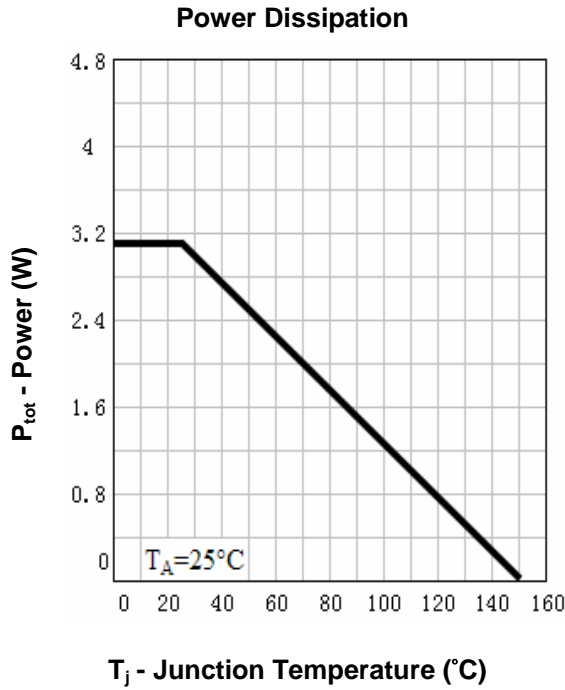
Symbol	Parameter	Rating	Unit	
<b>Common Ratings</b> ( $T_A = 25^\circ C$ Unless Otherwise Noted)				
$V_{DSS}$	Drain-Source Voltage	20	V	
$V_{GSS}$	Gate-Source Voltage	$\pm 12$		
$T_J$	Maximum Junction Temperature	150	$^\circ C$	
$T_{STG}$	Storage Temperature Range	-55 to 150	$^\circ C$	
$I_S$	Diode Continuous Forward Current	$T_A = 25^\circ C$	4.5	A
<b>Mounted on Large Heat Sink</b>				
$I_{DP}$	300 $\mu s$ Pulse Drain Current Tested	$T_A = 25^\circ C$	50 <sup>①</sup>	A
$I_D$	Continuous Drain Current	$T_A = 25^\circ C$	13	A
		$T_A = 70^\circ C$	10	
$P_D$	Maximum Power Dissipation	$T_A = 25^\circ C$	3.1	W
		$T_A = 70^\circ C$	2	
$R_{\theta JA}$ <sup>②</sup>	Thermal Resistance-Junction to Ambient		40	$^\circ C/W$

**Electrical Characteristics** ( $T_A=25^\circ\text{C}$  Unless Otherwise Noted)

Symbol	Parameter	Test Condition	RU2013H			Unit
			Min.	Typ.	Max.	
<b>Static Characteristics</b>						
$BV_{DSS}$	Drain-Source Breakdown Voltage	$V_{GS}=0V, I_{DS}=250\mu A$	20			V
$I_{DSS}$	Zero Gate Voltage Drain Current	$V_{DS}=20V, V_{GS}=0V$			1	$\mu A$
		$T_J=85^\circ C$			30	
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS}=V_{GS}, I_{DS}=250\mu A$	0.5	0.8	1.5	V
$I_{GSS}$	Gate Leakage Current	$V_{GS}=\pm 12V, V_{DS}=0V$			$\pm 100$	nA
$R_{DS(ON)}^{(3)}$	Drain-Source On-state Resistance	$V_{GS}=10V, I_{DS}=10A$		13	16	$m\Omega$
		$V_{GS}=4.5V, I_{DS}=8A$		16	20	$m\Omega$
		$V_{GS}=2.5V, I_{DS}=6A$		22	26	$m\Omega$
<b>Diode Characteristics</b>						
$V_{SD}^{(3)}$	Diode Forward Voltage	$I_{SD}=1A, V_{GS}=0V$			1	V
$t_{rr}$	Reverse Recovery Time	$I_{SD}=10A, dI_{SD}/dt=100A/\mu s$		9		ns
$Q_{rr}$	Reverse Recovery Charge			12		nC
<b>Dynamic Characteristics</b> <sup>(4)</sup>						
$R_G$	Gate Resistance	$V_{GS}=0V, V_{DS}=0V, F=1\text{MHz}$		1.2		$\Omega$
$C_{iss}$	Input Capacitance	$V_{GS}=0V, V_{DS}=10V, \text{Frequency}=1.0\text{MHz}$		580		pF
$C_{oss}$	Output Capacitance			124		
$C_{rss}$	Reverse Transfer Capacitance			65		
$t_{d(ON)}$	Turn-on Delay Time	$V_{DD}=10V, R_L=1\Omega, I_{DS}=10A, V_{GEN}=10V, R_G=6\Omega$		4		ns
$t_r$	Turn-on Rise Time			11		
$t_{d(OFF)}$	Turn-off Delay Time			19		
$t_f$	Turn-off Fall Time			8		
<b>Gate Charge Characteristics</b> <sup>(4)</sup>						
$Q_g$	Total Gate Charge	$V_{DS}=16V, V_{GS}=4.5V, I_{DS}=10A$		9	12	nC
$Q_{gs}$	Gate-Source Charge			2.1		
$Q_{gd}$	Gate-Drain Charge			3		

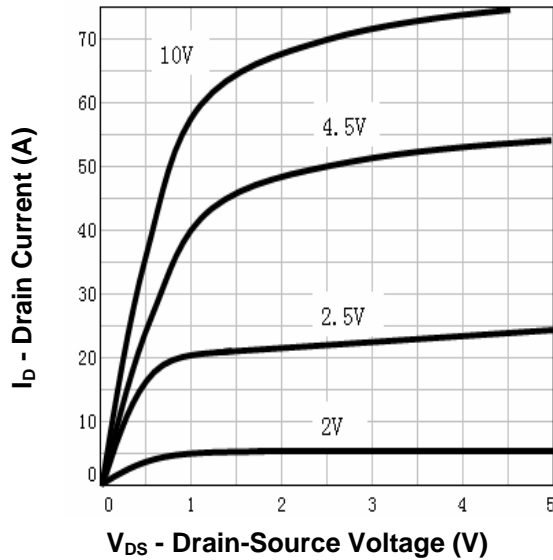
- Notes: ① Pulse width limited by safe operating area.  
 ② When mounted on 1 inch square copper board,  $t \leq 10\text{sec}$ .  
 ③ Pulse test ; Pulse width  $\leq 300\mu s$ , duty cycle  $\leq 2\%$ .  
 ④ Guaranteed by design, not subject to production testing.

**Typical Characteristics**

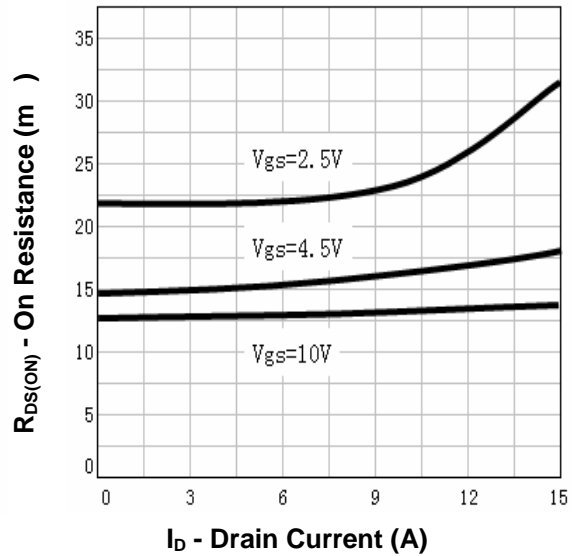


**Typical Characteristics**

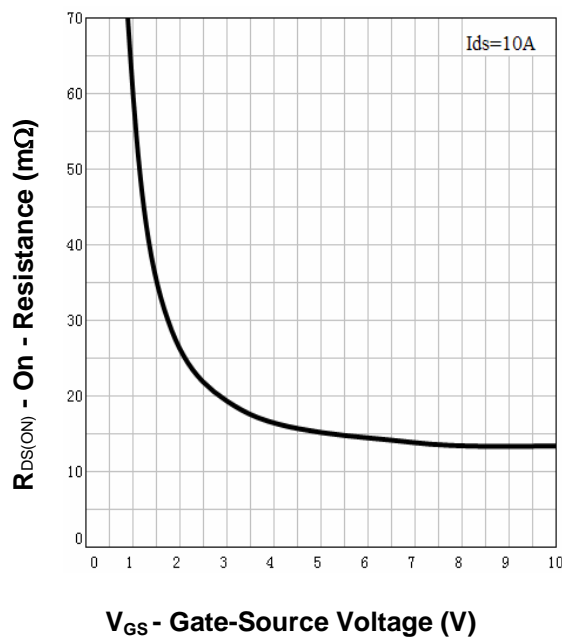
**Output Characteristics**



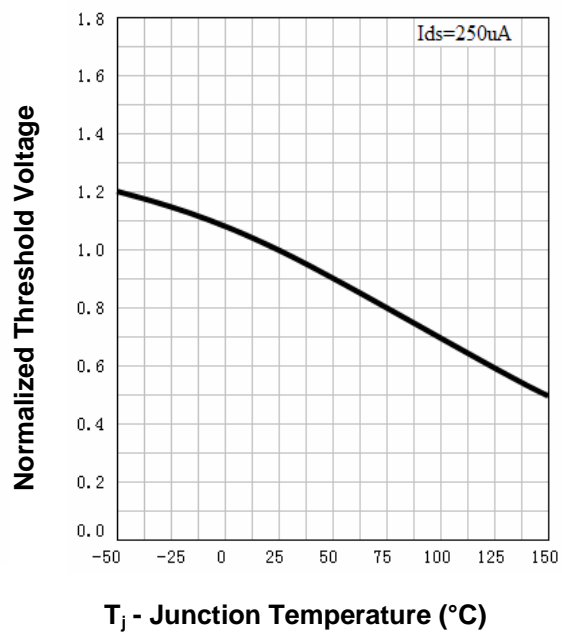
**Drain-Source On Resistance**



**Drain-Source On Resistance**

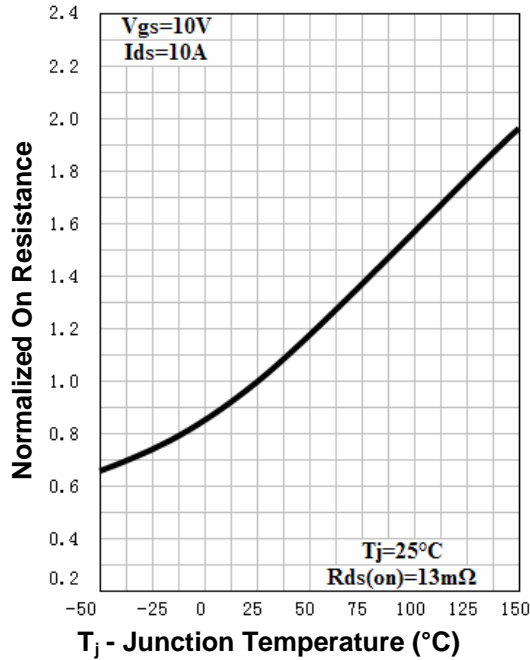


**Gate Threshold Voltage**

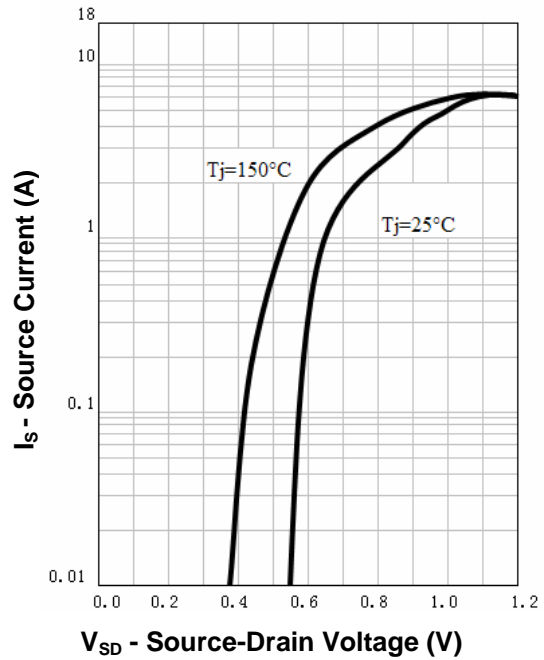


**Typical Characteristics**

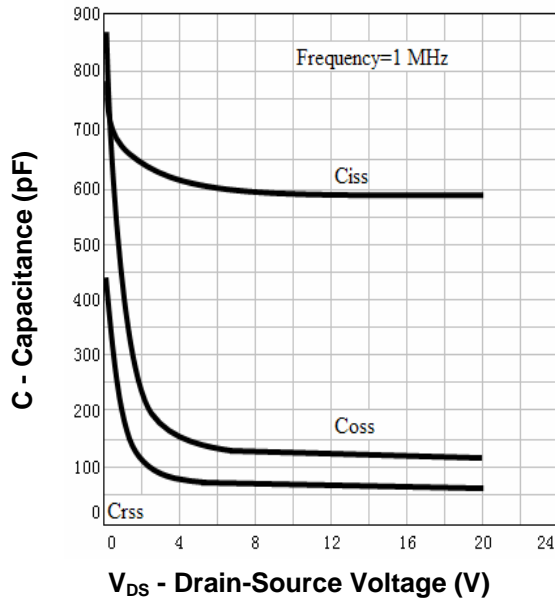
**Drain-Source On Resistance**



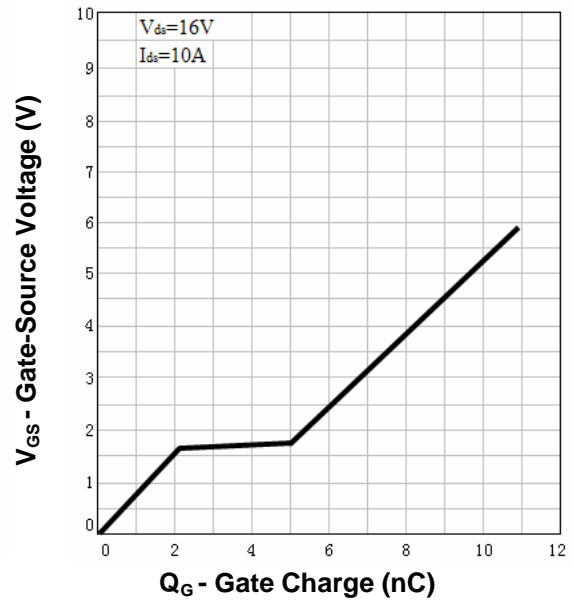
**Source-Drain Diode Forward**



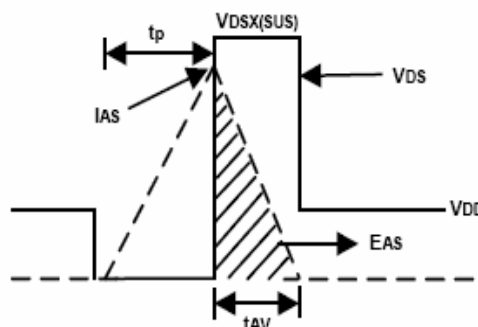
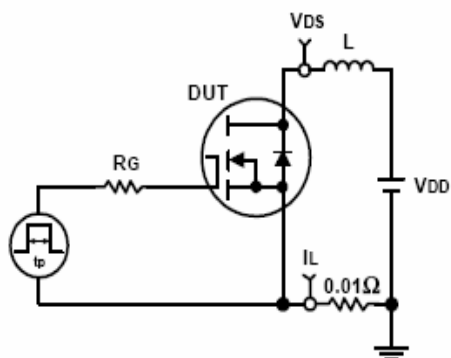
**Capacitance**



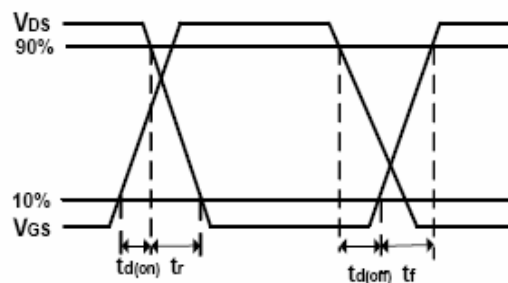
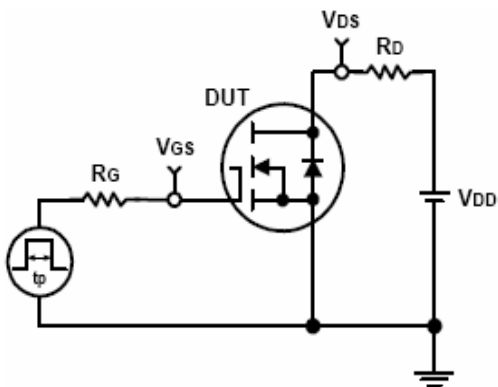
**Gate Charge**



**Avalanche Test Circuit and Waveforms**



**Switching Time Test Circuit and Waveforms**



**Ordering and Marking Information****RU2013****Package (Available)**

H : SOP-8

**Operating Temperature Range**

C : -55 to 150 °C

**Assembly Material**

G : Green &amp; Lead Free

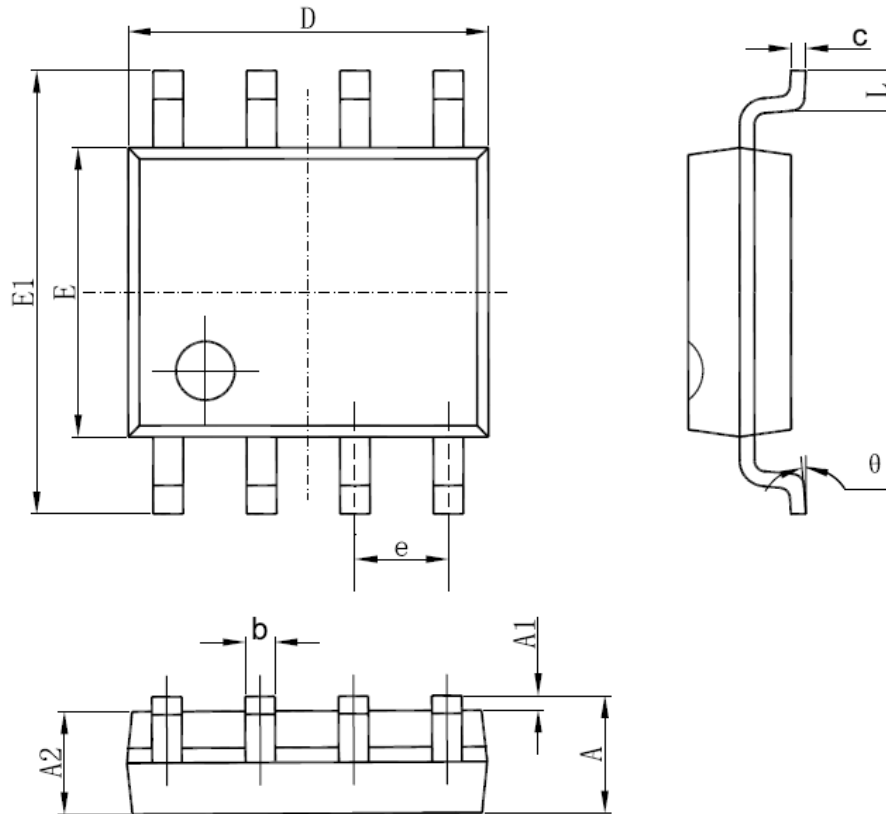
**Packaging**

T : TUBE

TR : Tape &amp; Reel

**Package Information**

**SOP-8**



SYMBOL	MM		INCH		SYMBOL	MM		INCH	
	MIN	MAX	MIN	MAX		MIN	MAX	MIN	MAX
A	1.350	1.750	0.053	0.069	E	3.800	4.000	0.150	0.157
A1	0.100	0.250	0.004	0.010	E1	5.800	6.200	0.228	0.244
A2	1.350	1.550	0.053	0.061	e	1.270 (BSC)		0.050 (BSC)	
b	0.330	0.510	0.013	0.020	L	0.400	1.270	0.016	0.050
c	0.170	0.250	0.006	0.010	$\theta$	0°	8°	0°	8°
D	4.700	5.100	0.185	0.200					

ALL DIMENSIONS REFER TO JEDEC STANDARD  
DO NOT INCLUDE MOLD FLASH OR PROTRUSIONS



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