

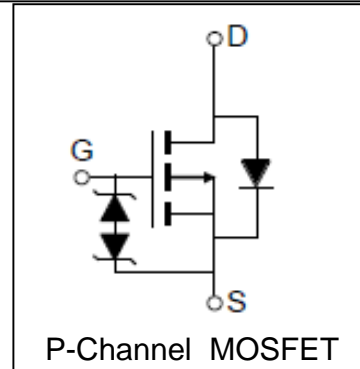
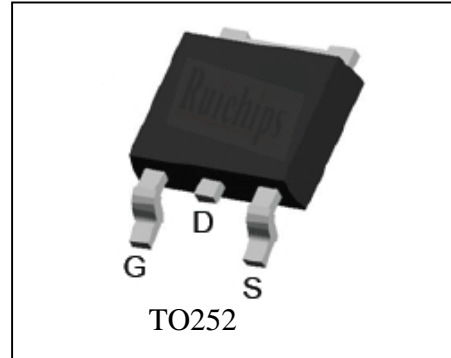
## Features

- -100V/-13A,  
 $R_{DS(ON)} = 160m$  (tpy.)@ $V_{GS} = -10V$   
 $R_{DS(ON)} = 180m$  (tpy.)@ $V_{GS} = -4.5V$
- Super High Dense Cell Design
- ESD protected
- Reliable and Rugged
- 100% avalanche tested
- Lead Free and Green Devices Available  
 (RoHS Compliant)

## Applications

- Power Management
- DC/DC Converters

## Pin Description



## Absolute Maximum Ratings

Symbol	Parameter	Rating	Unit
<b>Common Ratings</b> ( $T_C = 25^\circ C$ Unless Otherwise Noted)			
$V_{DSS}$	Drain-Source Voltage	-100	V
$V_{GSS}$	Gate-Source Voltage	$\pm 20$	
$T_J$	Maximum Junction Temperature	175	$^\circ C$
$T_{STG}$	Storage Temperature Range	-55 to 175	$^\circ C$
$I_S$	Diode Continuous Forward Current	$T_C = 25^\circ C$ -13	A
<b>Mounted on Large Heat Sink</b>			
$I_{DP}$	300 $\mu s$ Pulse Drain Current Tested	$T_C = 25^\circ C$ -52 <sup>①</sup>	A
$I_D$	Continuous Drain Current	$T_C = 25^\circ C$ -13	A
		$T_C = 100^\circ C$ -9	
$P_D$	Maximum Power Dissipation	$T_C = 25^\circ C$ 50	W
		$T_C = 100^\circ C$ 25	
$R_{\theta JC}$	Thermal Resistance-Junction to Case	3	$^\circ C/W$
<b>Drain-Source Avalanche Ratings</b>			
$E_{AS}$ <sup>②</sup>	Avalanche Energy, Single Pulsed	56	mJ

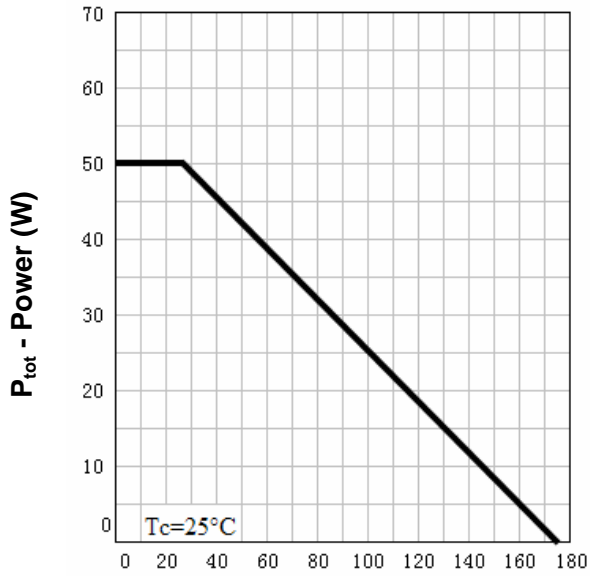
**Electrical Characteristics** ( $T_C=25^\circ\text{C}$  Unless Otherwise Noted)

Symbol	Parameter	Test Condition	RU1HL13L			Unit
			Min.	Typ.	Max.	
<b>Static Characteristics</b>						
$BV_{DSS}$	Drain-Source Breakdown Voltage	$V_{GS}=0V, I_{DS}=-250\mu A$	-100			V
$I_{DSS}$	Zero Gate Voltage Drain Current	$V_{DS}=-100V, V_{GS}=0V$ $T_J=85^\circ\text{C}$			-1	$\mu A$
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS}=V_{GS}, I_{DS}=-250\mu A$	-1.5	-2	-2.7	V
$I_{GSS}$	Gate Leakage Current	$V_{GS}=\pm 16V, V_{DS}=0V$			$\pm 10$	$\mu A$
$R_{DS(ON)}^{(3)}$	Drain-Source On-state Resistance	$V_{GS}=-10V, I_{DS}=-8A$		160	180	$m\Omega$
		$V_{GS}=-4.5V, I_{DS}=-6A$		180	210	$m\Omega$
<b>Diode Characteristics</b>						
$V_{SD}^{(3)}$	Diode Forward Voltage	$I_{SD}=-1A, V_{GS}=0V$			-1.2	V
$t_{rr}$	Reverse Recovery Time	$I_{SD}=-13A, dI_{SD}/dt=100A/\mu s$		35		ns
$Q_{rr}$	Reverse Recovery Charge			65		nC
<b>Dynamic Characteristics</b> <sup>(4)</sup>						
$R_G$	Gate Resistance	$V_{GS}=0V, V_{DS}=0V, F=1\text{MHz}$		1.8		$\Omega$
$C_{iss}$	Input Capacitance	$V_{GS}=0V,$ $V_{DS}=-50V,$ Frequency=1.0MHz		1840		pF
$C_{oss}$	Output Capacitance			270		
$C_{rss}$	Reverse Transfer Capacitance			140		
$t_{d(ON)}$	Turn-on Delay Time	$V_{DD}=-50V, R_L=3.8\Omega,$ $I_{DS}=-13A, V_{GEN}=-10V,$ $R_G=6\Omega$		13		ns
$t_r$	Turn-on Rise Time			16		
$t_{d(OFF)}$	Turn-off Delay Time			31		
$t_f$	Turn-off Fall Time			18		
<b>Gate Charge Characteristics</b> <sup>(4)</sup>						
$Q_g$	Total Gate Charge	$V_{DS}=-80V, V_{GS}=-10V,$ $I_{DS}=-13A$		28		nC
$Q_{gs}$	Gate-Source Charge			9		
$Q_{gd}$	Gate-Drain Charge			10		

- Notes: ① Pulse width limited by safe operating area.  
 ② Limited by  $T_{Jmax}, I_{AS}=15A, V_{DD}=-48V, R_G=50\Omega$ , Starting  $T_J=25^\circ\text{C}$ .  
 ③ Pulse test; Pulse width  $\leq 300\mu s$ , duty cycle  $\leq 2\%$ .  
 ④ Guaranteed by design, not subject to production testing.

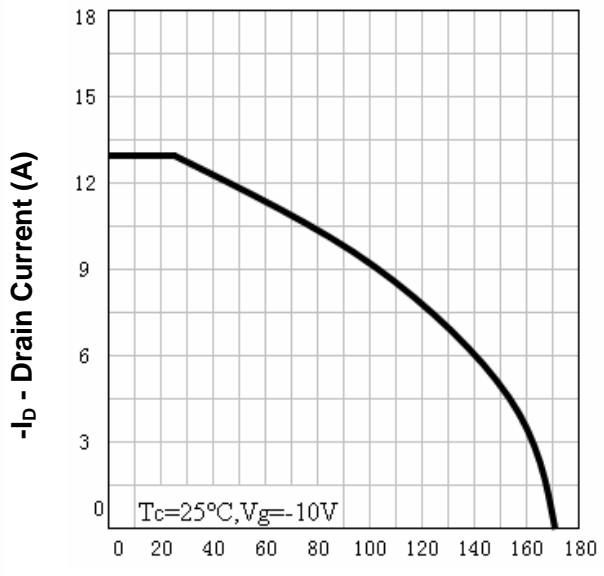
**Typical Characteristics**

**Power Dissipation**



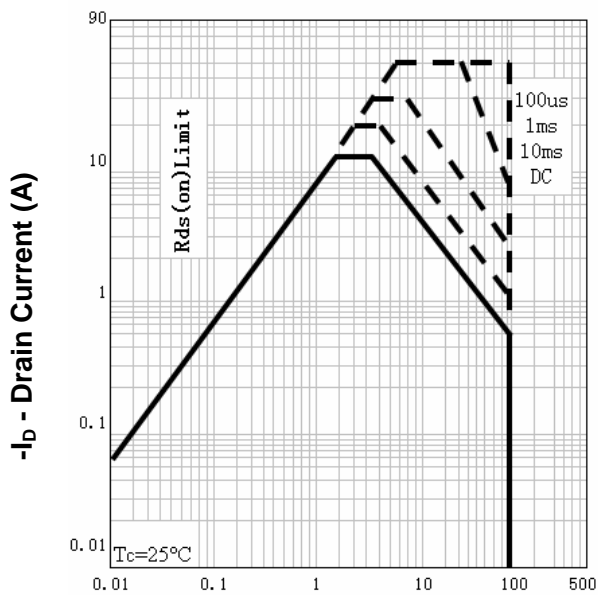
T<sub>j</sub> - Junction Temperature (°C)

**Drain Current**



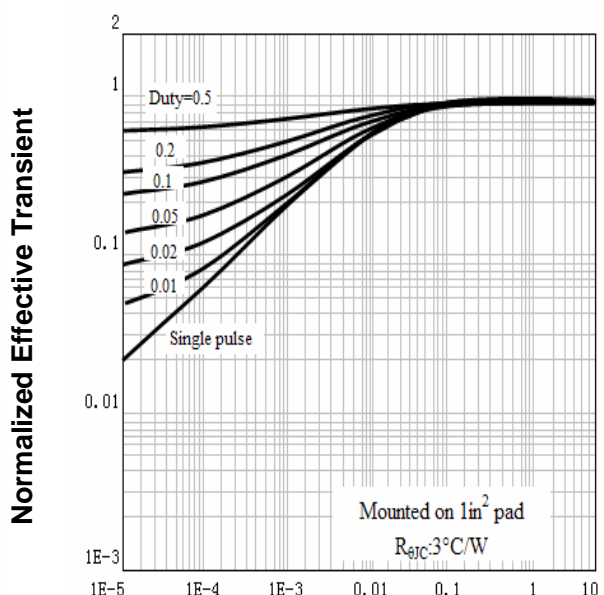
T<sub>j</sub> - Junction Temperature (°C)

**Safe Operation Area**



-V<sub>DS</sub> - Drain-Source Voltage (V)

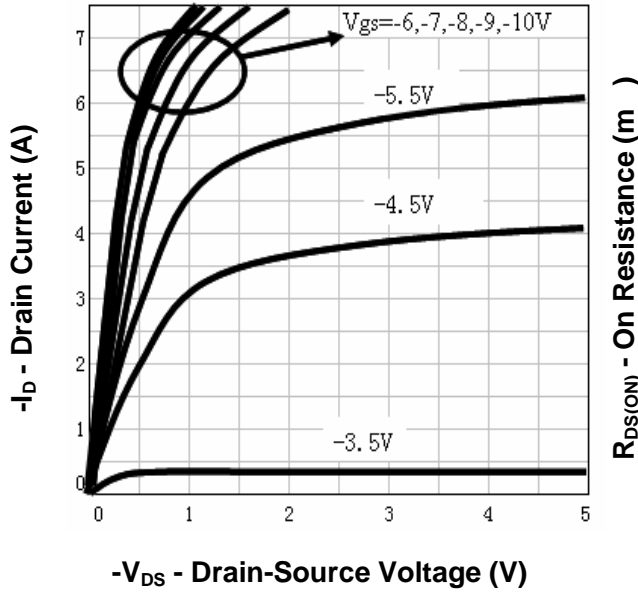
**Thermal Transient Impedance**



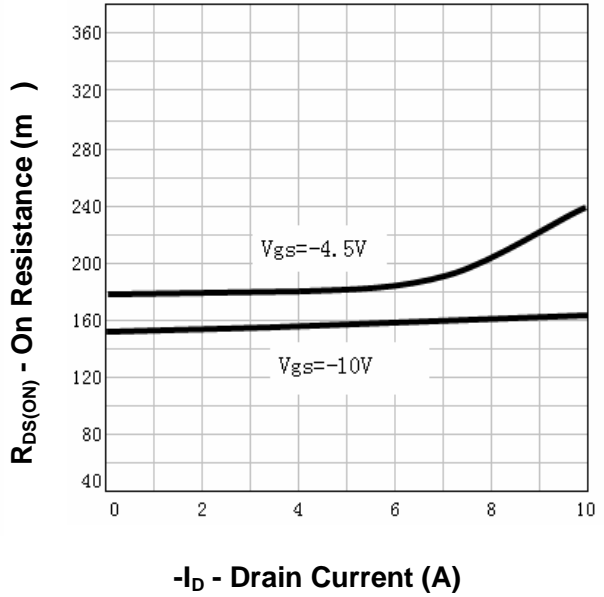
Square Wave Pulse Duration (sec)

**Typical Characteristics**

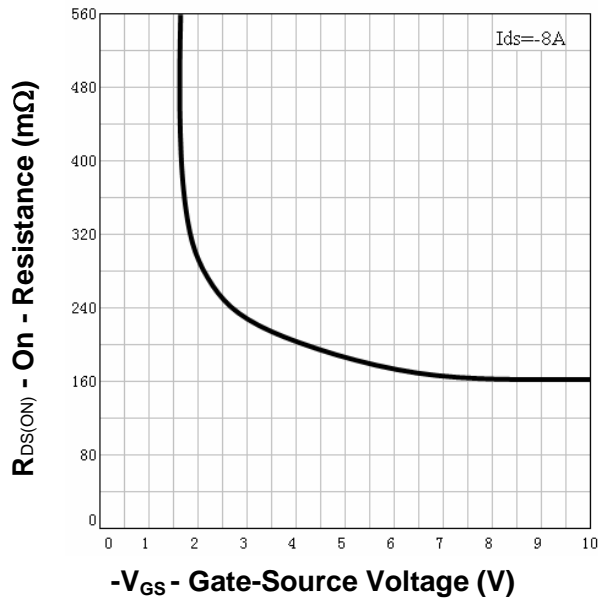
**Output Characteristics**



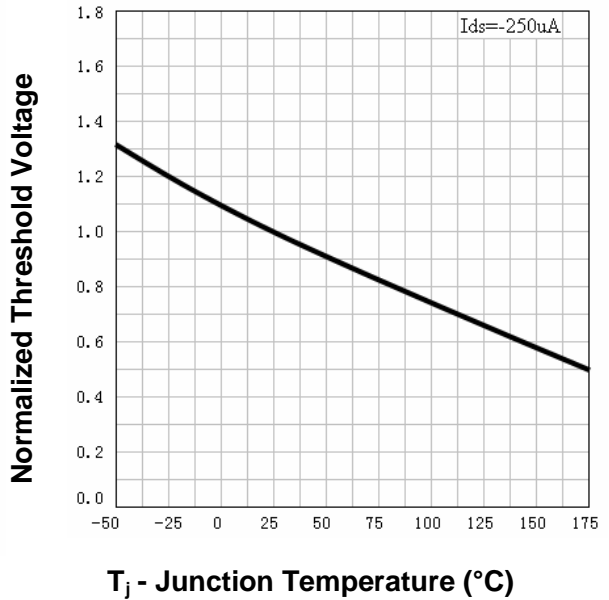
**Drain-Source On Resistance**



**Drain-Source On Resistance**

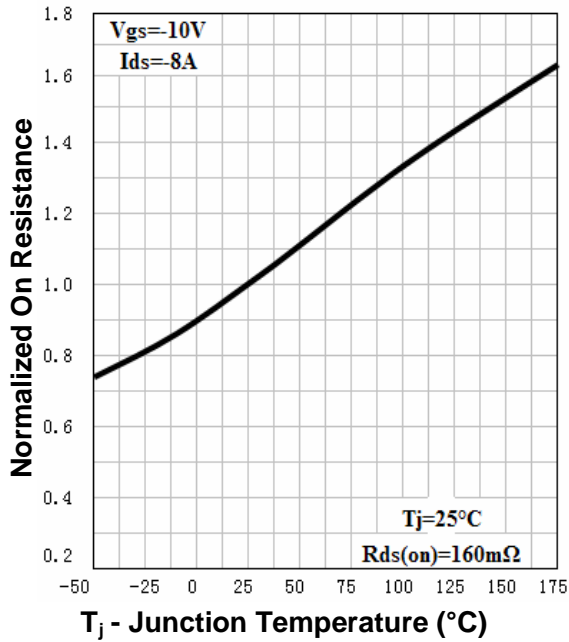


**Gate Threshold Voltage**

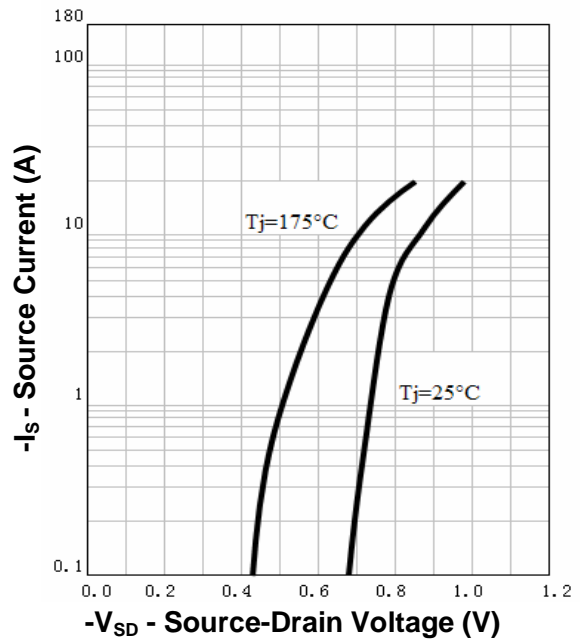


**Typical Characteristics**

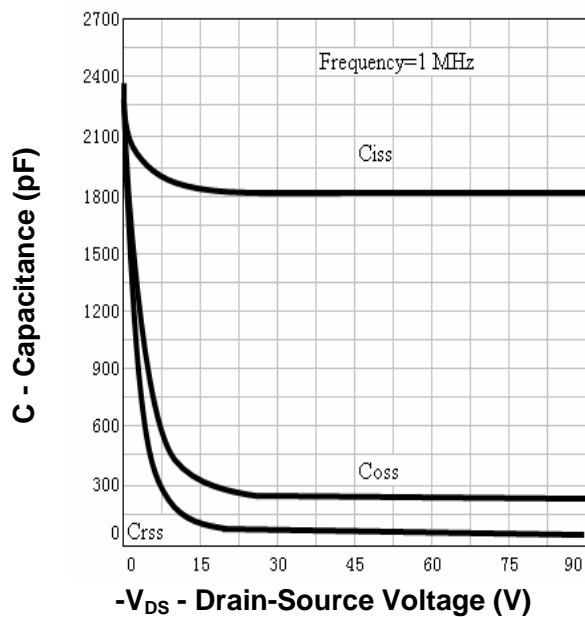
**Drain-Source On Resistance**



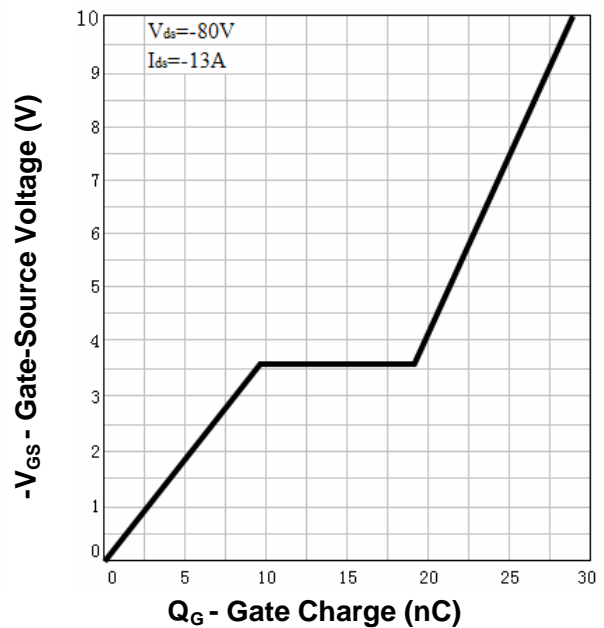
**Source-Drain Diode Forward**



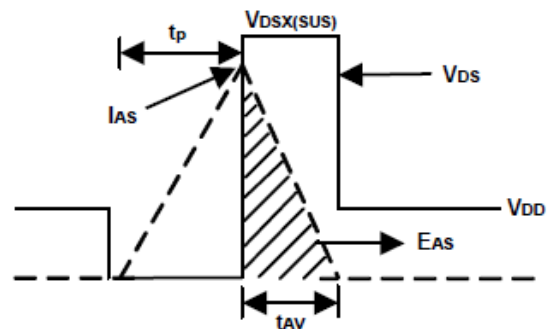
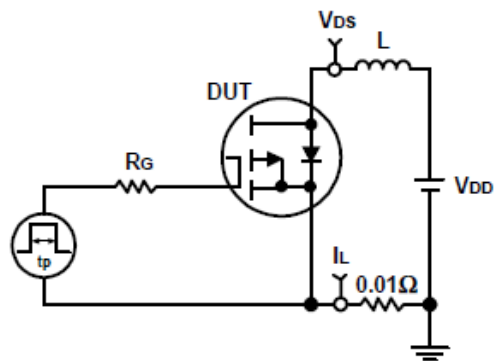
**Capacitance**



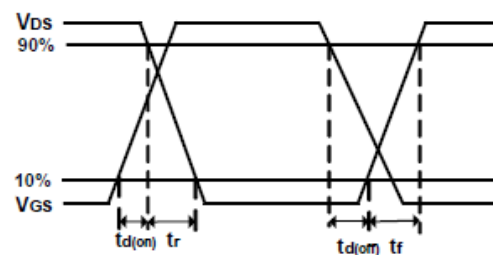
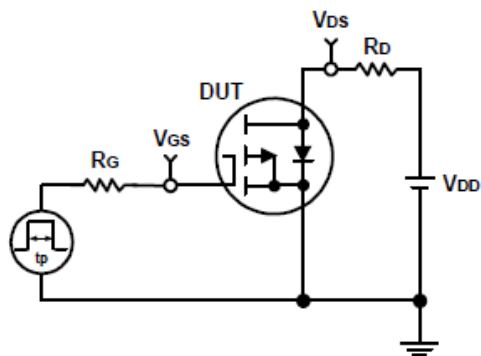
**Gate Charge**



### Avalanche Test Circuit and Waveforms



### Switching Time Test Circuit and Waveforms



**Ordering and Marking Information****RU1HL13****Package (Available)**

L : TO252

**Operating Temperature Range**

C : -55 to 175 °C

**Assembly Material**

G : Green &amp; Lead Free

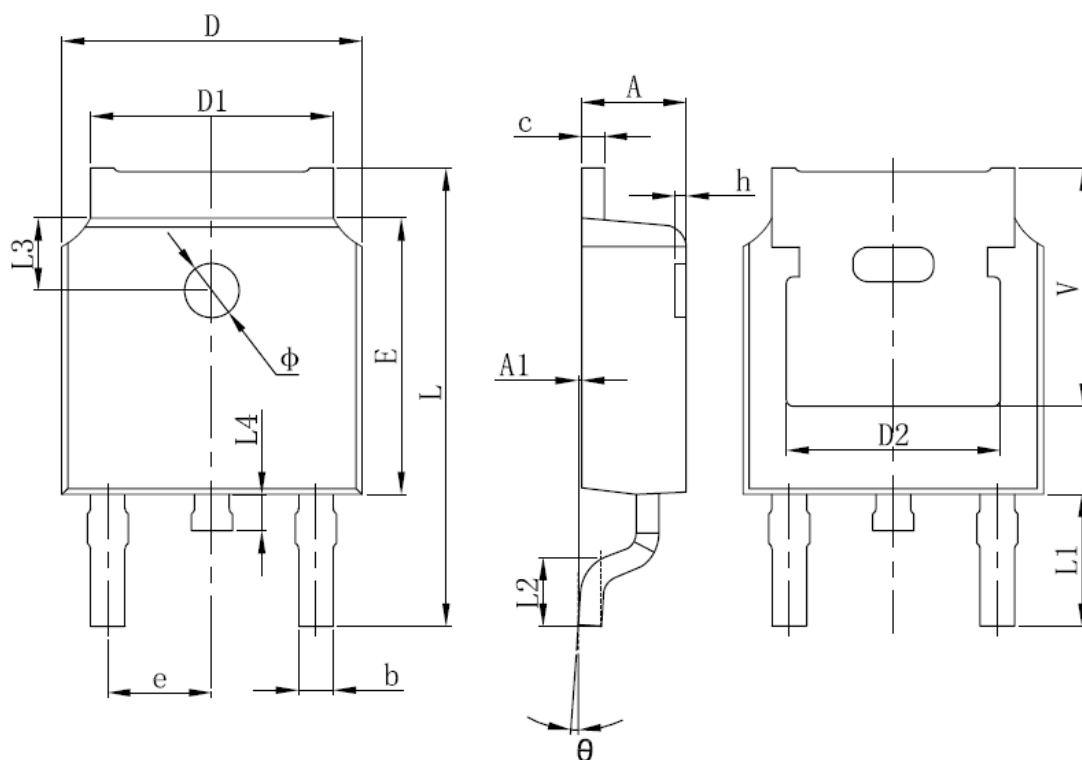
**Packaging**

T : TUBE

TR : Tape &amp; Reel

**Package Information**

**TO252-2L**



SYMBOL	MM		INCH		SYMBOL	MM		INCH	
	MIN	MAX	MIN	MAX		MIN	MAX	MIN	MAX
A	2.200	2.400	0.087	0.094	L	9.800	10.400	0.386	0.409
A1	0.000	0.127	0.000	0.005	L1	2.900 REF.		0.114 REF.	
b	0.660	0.860	0.026	0.034	L2	1.400	1.700	0.055	0.067
C	0.460	0.580	0.018	0.023	L3	1.600 REF.		0.063 REF.	
D	6.500	6.700	0.256	0.264	L4	0.600	1.000	0.024	0.039
D1	5.100	5.460	0.201	0.215	Φ	1.100	1.300	0.043	0.051
D2	4.830 REF.		0.190 REF.		θ	0°	8°	0°	8°
E	6.000	6.200	0.236	0.244	h	0.000	0.300	0.000	0.012
e	2.186	2.386	0.086	0.094	V	5.350 REF.		0.211 REF.	

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



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