

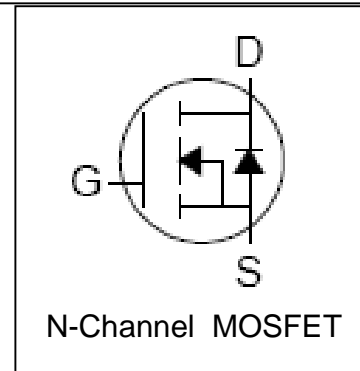
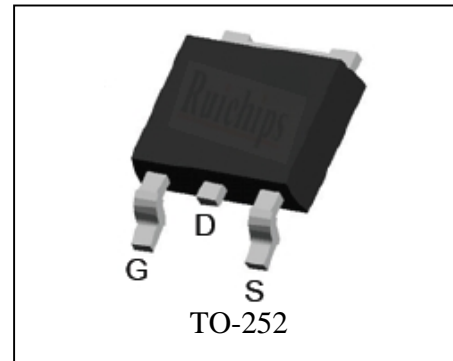
## Features

- 20V/130A,  
 $R_{DS(ON)} = 2.2m$  (Typ.)@ $V_{GS} = 10V$   
 $R_{DS(ON)} = 4.5m$  (Typ.)@ $V_{GS} = 4.5V$
- Super High Dense Cell Design
- Ultra Low On-Resistance
- 100% avalanche tested
- Lead Free and Green Devices Available  
 (RoHS Compliant)

## Applications

- High Frequency Synchronous Buck Converters for Computer Processor Power
- 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	20	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	$T_C = 25^\circ C$ 120 <sup>①</sup>	A
<b>Mounted on Large Heat Sink</b>			
$I_{DP}$	300 $\mu s$ Pulse Drain Current Tested	$T_C = 25^\circ C$ 520 <sup>②</sup>	A
$I_D$	Continuous Drain Current ( $V_{GS} = 10V$ )	$T_C = 25^\circ C$ 130 <sup>①</sup>	A
		$T_C = 100^\circ C$ 96 <sup>①</sup>	
$P_D$	Maximum Power Dissipation	$T_C = 25^\circ C$ 108	W
		$T_C = 100^\circ C$ 53.5	W
$R_{\theta JC}$	Thermal Resistance-Junction to Case	1.4	$^\circ C/W$
<b>Drain-Source Avalanche Ratings</b>			
$E_{AS}$ <sup>③</sup>	Avalanche Energy, Single Pulsed	56	mJ

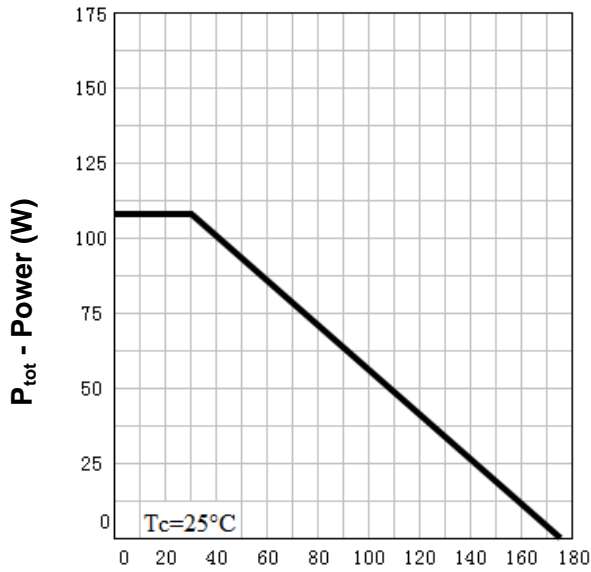
**Electrical Characteristics** ( $T_C=25^\circ\text{C}$  Unless Otherwise Noted)

Symbol	Parameter	Test Condition	RU20130L			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	$V_{DS}=20V, V_{GS}=0V$ $T_J=85^\circ\text{C}$			1 30	$\mu A$
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS}=V_{GS}, I_{DS}=250\mu A$	1	-	3	V
$I_{GSS}$	Gate Leakage Current	$V_{GS}=\pm 20V, V_{DS}=0V$			$\pm 100$	nA
$R_{DS(on)}^{(4)}$	Drain-Source On-state Resistance	$V_{GS}=10V, I_{DS}=50A$		2.2	2.8	m $\Omega$
		$V_{GS}=4.5V, I_{DS}=35A$		4.5	5.5	m $\Omega$
<b>Diode Characteristics</b>						
$V_{SD}^{(4)}$	Diode Forward Voltage	$I_{SD}=50A, V_{GS}=0V$			1.2	V
$t_{rr}$	Reverse Recovery Time	$I_{SD}=50A, dI_{SD}/dt=100A/\mu s$		25		ns
$Q_{rr}$	Reverse Recovery Charge			20		nC
<b>Dynamic Characteristics</b> <sup>(5)</sup>						
$R_G$	Gate Resistance	$V_{GS}=0V, V_{DS}=0V, F=1\text{MHz}$		1.2		$\Omega$
$C_{iss}$	Input Capacitance	$V_{GS}=0V,$ $V_{DS}=10V,$ Frequency=1.0MHz		2750		pF
$C_{oss}$	Output Capacitance			520		
$C_{rss}$	Reverse Transfer Capacitance			280		
$t_{d(ON)}$	Turn-on Delay Time	$V_{DD}=10V, R_L=0.2\Omega,$ $I_{DS}=50A, V_{GEN}=10V,$ $R_G=5\Omega$		10		ns
$t_r$	Turn-on Rise Time			26		
$t_{d(OFF)}$	Turn-off Delay Time			22		
$t_f$	Turn-off Fall Time			14		
<b>Gate Charge Characteristics</b> <sup>(5)</sup>						
$Q_g$	Total Gate Charge	$V_{DS}=16V, V_{GS}=10V,$ $I_{DS}=50A$		28		nC
$Q_{gs}$	Gate-Source Charge			7		
$Q_{gd}$	Gate-Drain Charge			9		

- Notes: ① Calculated continuous current based on maximum allowable junction temperature. Package limitation current is 60A.  
 ② Pulse width limited by safe operating area.  
 ③ Limited by  $T_{Jmax}, I_{AS}=15A, V_{DD}=12V, R_G=50\Omega$ , Starting  $T_J=25^\circ\text{C}$ .  
 ④ Pulse test; Pulse width  $\leq 300\mu s$ , duty cycle  $\leq 2\%$ .  
 ⑤ Guaranteed by design, not subject to production testing.

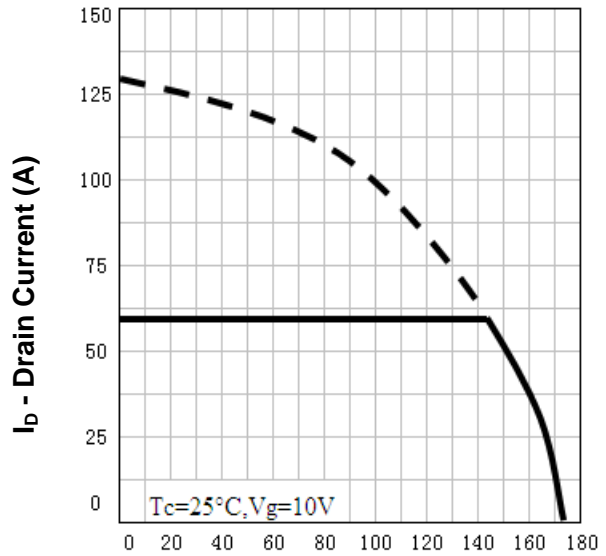
**Typical Characteristics**

**Power Dissipation**



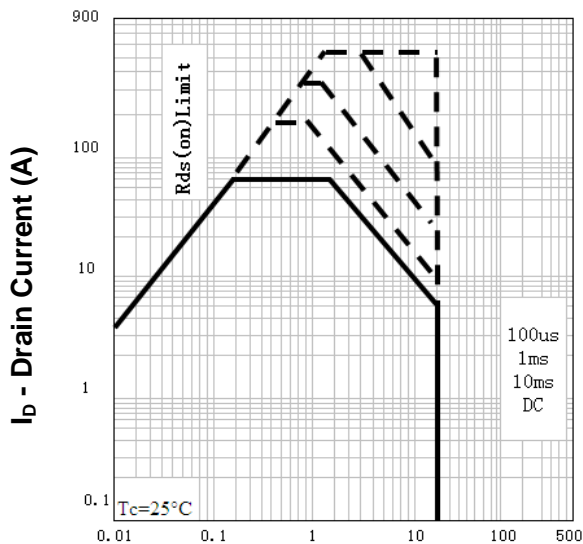
**$T_j$  - Junction Temperature (°C)**

**Drain Current**



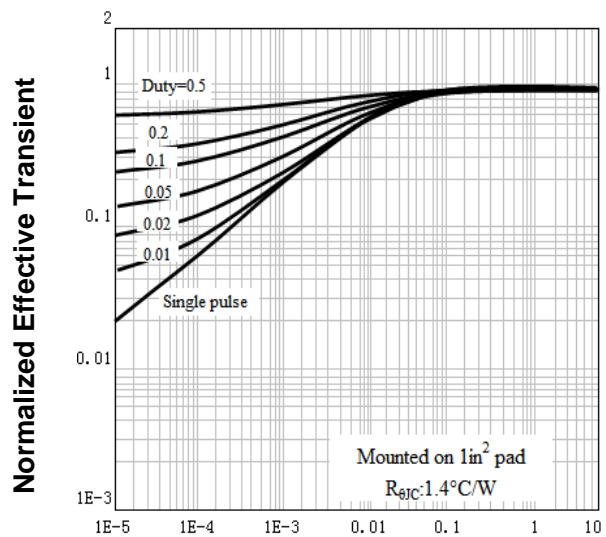
**$T_j$  - Junction Temperature (°C)**

**Safe Operation Area**



**$V_{DS}$  - Drain-Source Voltage (V)**

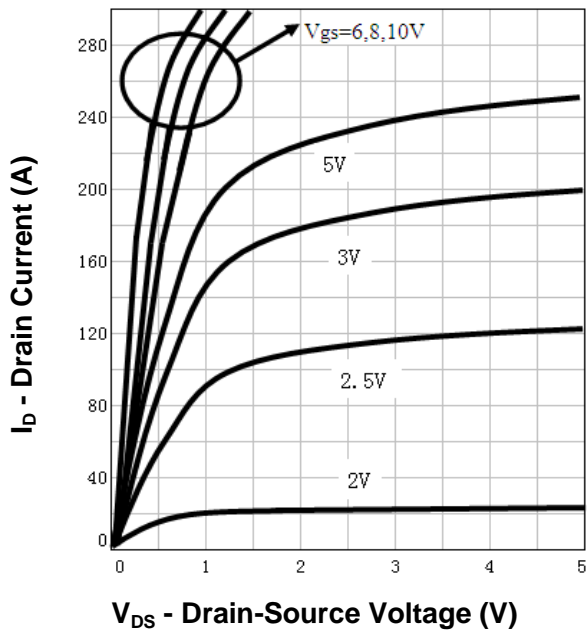
**Thermal Transient Impedance**



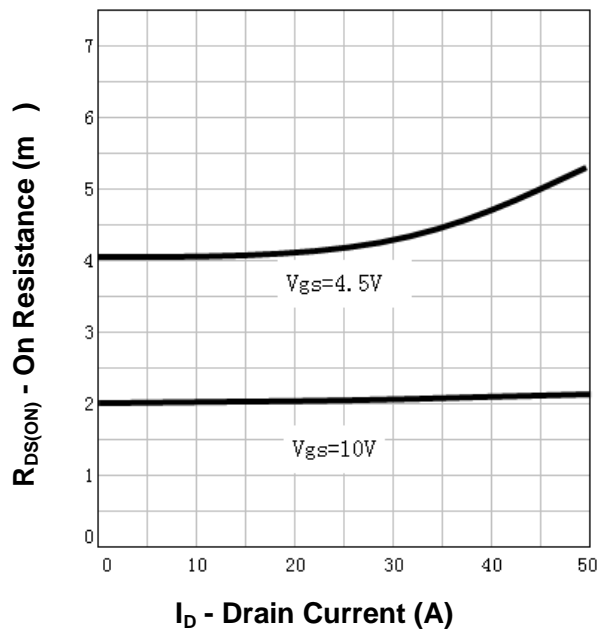
**Square Wave Pulse Duration (sec)**

**Typical Characteristics**

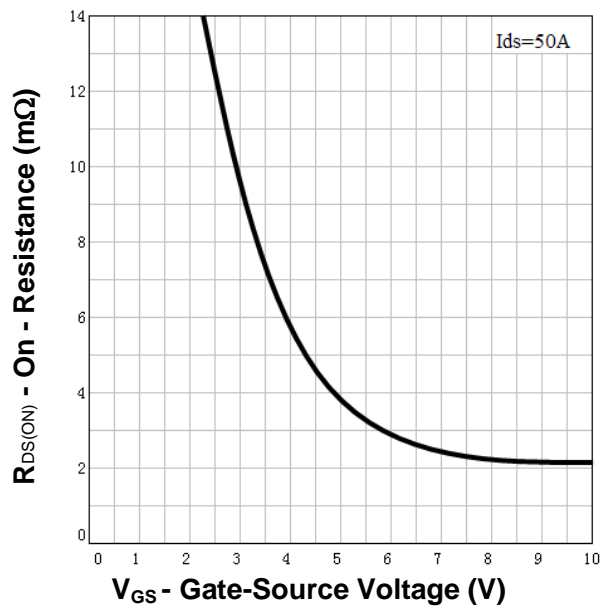
**Output Characteristics**



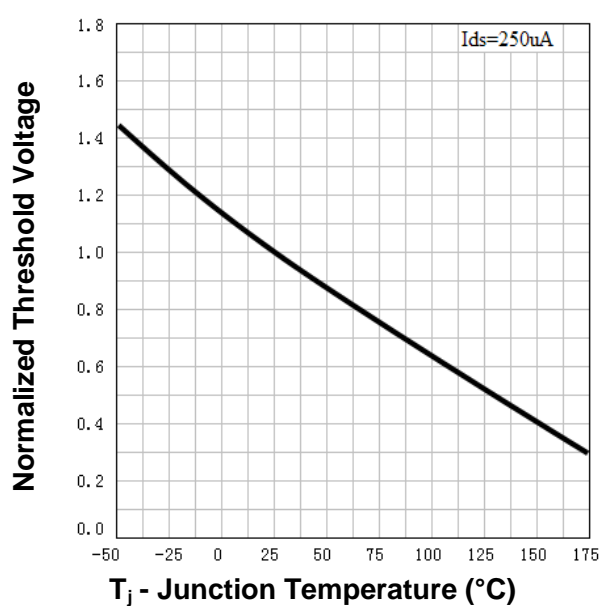
**Drain-Source On Resistance**



**Drain-Source On Resistance**

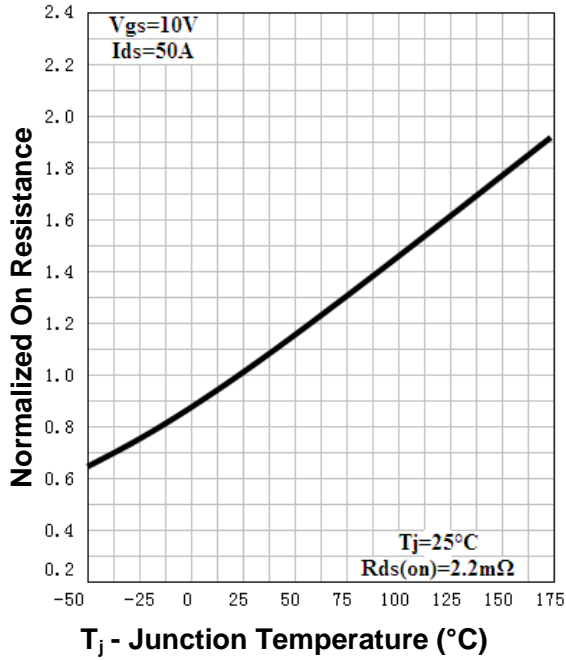


**Gate Threshold Voltage**

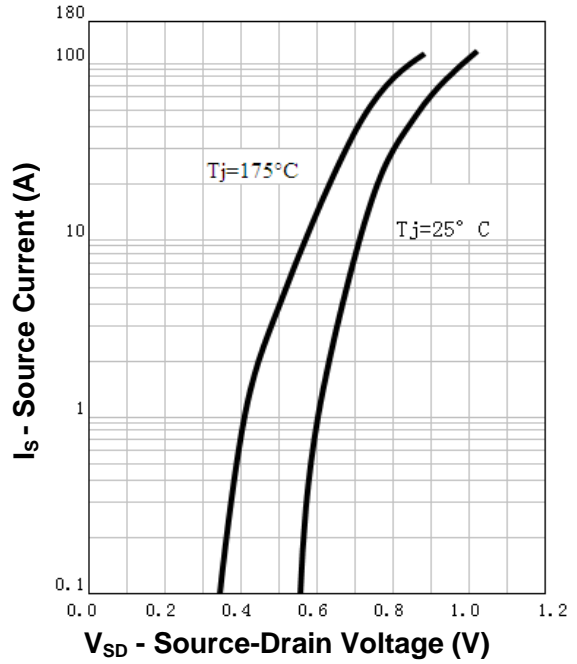


**Typical Characteristics**

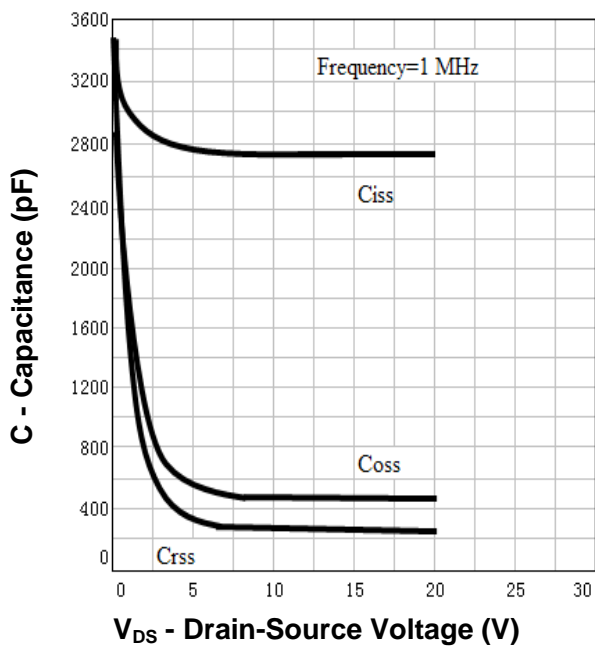
**Drain-Source On Resistance**



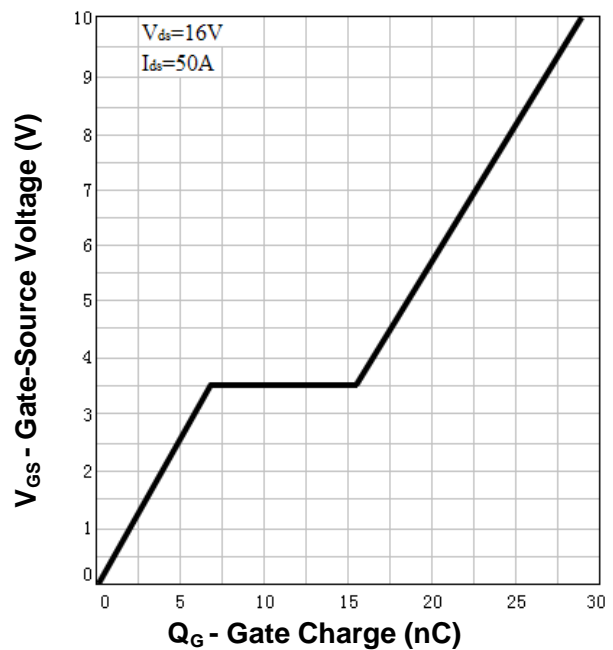
**Source-Drain Diode Forward**



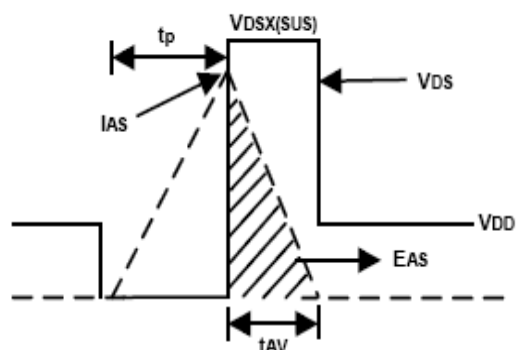
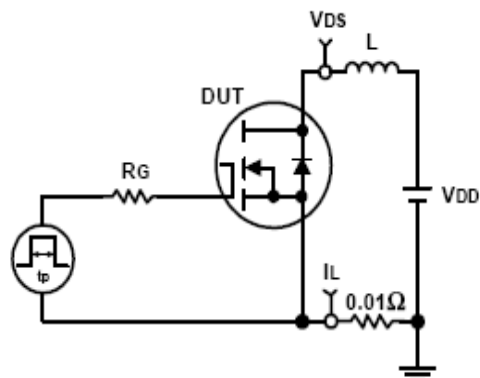
**Capacitance**



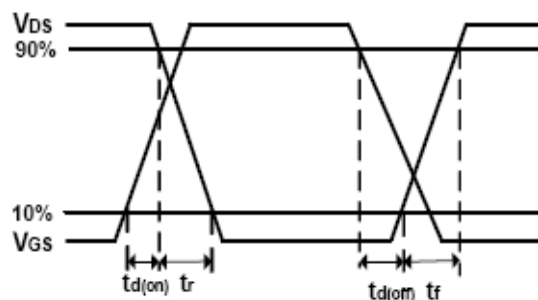
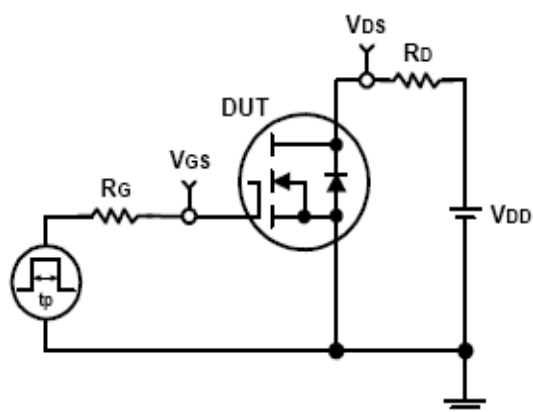
**Gate Charge**



### Avalanche Test Circuit and Waveforms



### Switching Time Test Circuit and Waveforms

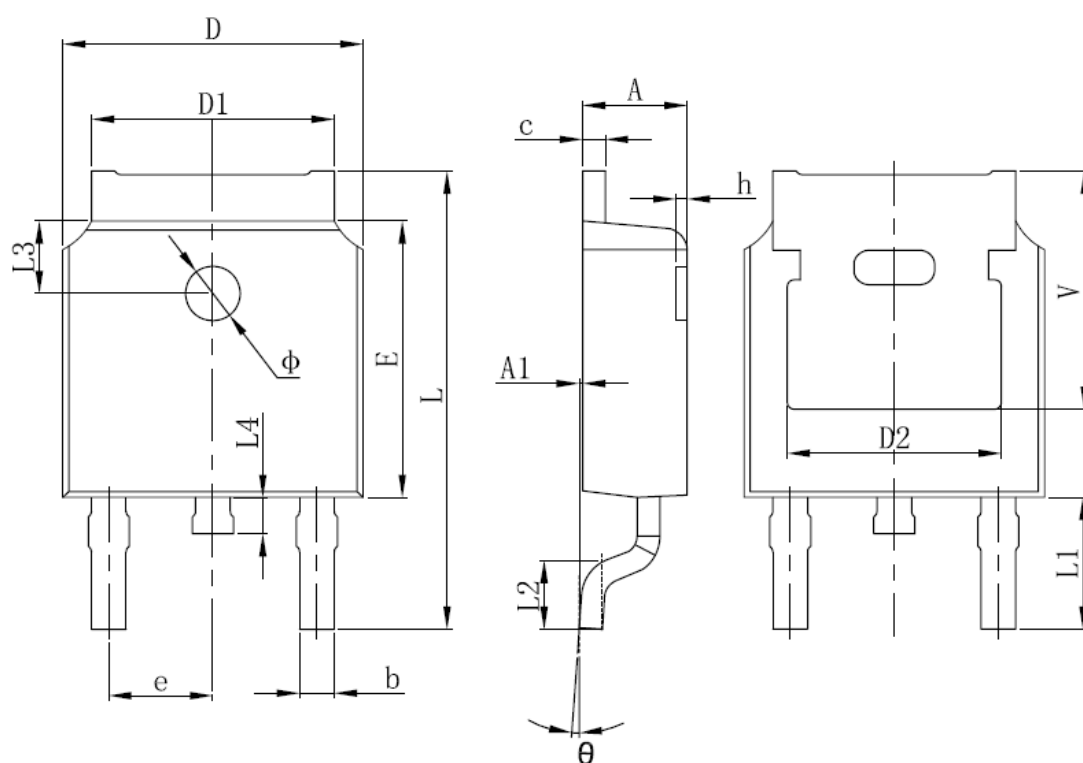


**Ordering and Marking Information**

<b>Device</b>	<b>Marking</b>	<b>Package</b>	<b>Packaging</b>	<b>Quantity</b>	<b>Reel Size</b>	<b>Tape width</b>
RU20130L	RU20130L	TO-252	Tape&Reel	2500	13''	16mm

**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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