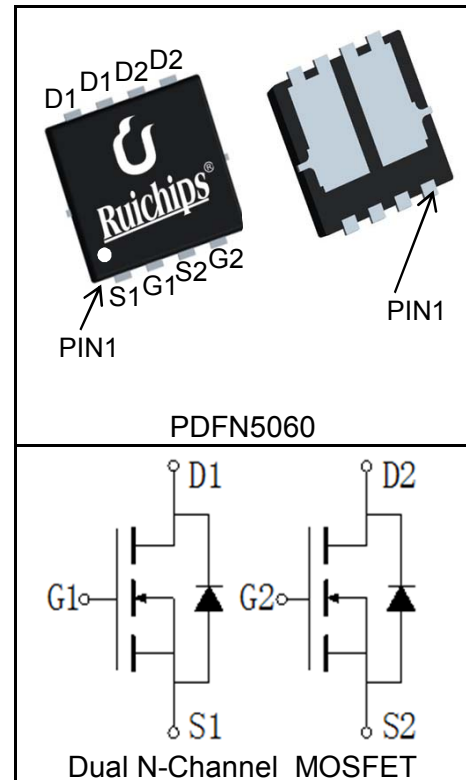


### Features

- 60V/20A,  
 $R_{DS(ON)} = 19m\Omega(Typ.)@V_{GS}=10V$   
 $R_{DS(ON)} = 21m\Omega(Typ.)@V_{GS}=4.5V$
- Ultra Low On-Resistance
- Fast Switching Speed
- Lead Free and Green Devices Available (RoHS Compliant)

### Pin Description



### Applications

- DC/DC Converters
- Li-battery protection

### Absolute Maximum Ratings

Symbol	Parameter	Rating	Unit
<b>Common Ratings</b> ( $T_C=25^\circ C$ Unless Otherwise Noted)			
$V_{DSS}$	Drain-Source Voltage	60	V
$V_{GSS}$	Gate-Source Voltage	$\pm 20$	
$T_J$	Maximum Junction Temperature	150	$^\circ C$
$T_{STG}$	Storage Temperature Range	-55 to 150	$^\circ C$
$I_S$	Diode Continuous Forward Current	$T_C=25^\circ C$ 20	A
<b>Mounted on Large Heat Sink</b>			
$I_{DP}^{①}$	300 $\mu s$ Pulse Drain Current Tested	$T_C=25^\circ C$ 80	A
$I_D^{②}$	Continuous Drain Current@ $T_C(V_{GS}=10V)$	$T_C=25^\circ C$ 20	A
		$T_C=100^\circ C$ 13	
	Continuous Drain Current@ $T_A(V_{GS}=10V)^{③}$	$T_A=25^\circ C$ 14	
		$T_A=70^\circ C$ 10	
$P_D$	Maximum Power Dissipation@ $T_C$	$T_C=25^\circ C$ 32	W
		$T_C=100^\circ C$ 13	
	Maximum Power Dissipation@ $T_A^{③}$	$T_A=25^\circ C$ 2.5	
		$T_A=70^\circ C$ 1.6	

Symbol	Parameter	Rating	Unit
$R_{\theta JC}$	Thermal Resistance-Junction to Case	4	°C/W
$R_{\theta JA}^{(3)}$	Thermal Resistance-Junction to Ambient	50	°C/W
<b>Drain-Source Avalanche Ratings</b>			
$E_{AS}^{(4)}$	Avalanche Energy, Single Pulsed	80	mJ

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

Symbol	Parameter	Test Condition	RU60D20M			Unit
			Min.	Typ.	Max.	
<b>Static Characteristics</b>						
$BV_{DSS}$	Drain-Source Breakdown Voltage	$V_{GS}=0V, I_{DS}=250\mu A$	60			V
$I_{DSS}$	Zero Gate Voltage Drain Current	$V_{DS}=60V, V_{GS}=0V$			1	$\mu A$
		$T_J=125^\circ C$			30	
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS}=V_{GS}, I_{DS}=250\mu A$	1		2.5	V
$I_{GSS}$	Gate Leakage Current	$V_{GS}=\pm 20V, V_{DS}=0V$			$\pm 1$	$\mu A$
$R_{DS(ON)}^{(5)}$	Drain-Source On-state Resistance	$V_{GS}=4.5V, I_{DS}=16A$		21	28	$m\Omega$
		$V_{GS}=10V, I_{DS}=20A$		19	24	$m\Omega$
<b>Diode Characteristics</b>						
$V_{SD}^{(5)}$	Diode Forward Voltage	$I_{SD}=20A, V_{GS}=0V$			1.2	V
$t_{rr}$	Reverse Recovery Time	$I_{SD}=20A, di_{SD}/dt=100A/\mu s$		27		ns
$Q_{rr}$	Reverse Recovery Charge			16		nC
<b>Dynamic Characteristics</b> <sup>(6)</sup>						
$R_G$	Gate Resistance	$V_{GS}=0V, V_{DS}=0V, F=1MHz$		1.5		$\Omega$
$C_{iss}$	Input Capacitance	$V_{GS}=0V,$ $V_{DS}=30V,$ Frequency=1.0MHz		2150		pF
$C_{oss}$	Output Capacitance			410		
$C_{rss}$	Reverse Transfer Capacitance			190		
$t_{d(ON)}$	Turn-on Delay Time	$V_{DD}=30V, I_{DS}=20A,$ $V_{GEN}=10V, R_G=4.7\Omega$		13		ns
$t_r$	Turn-on Rise Time			59		
$t_{d(OFF)}$	Turn-off Delay Time			31		
$t_f$	Turn-off Fall Time			26		
<b>Gate Charge Characteristics</b> <sup>(6)</sup>						
$Q_g$	Total Gate Charge	$V_{DS}=48V, V_{GS}=10V,$ $I_{DS}=20A$		39		nC
$Q_{gs}$	Gate-Source Charge			9		
$Q_{gd}$	Gate-Drain Charge			11		

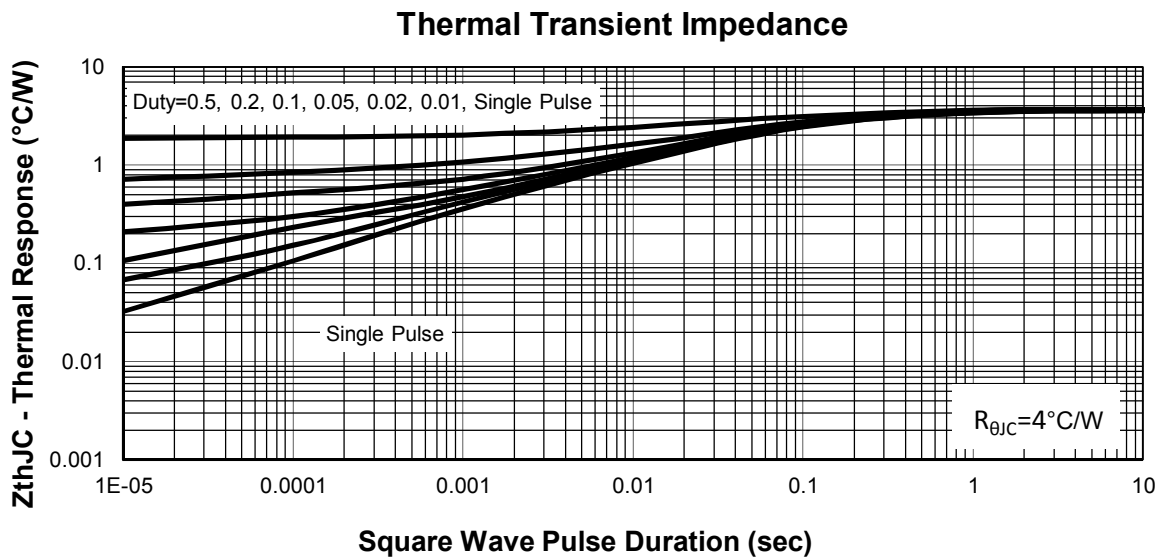
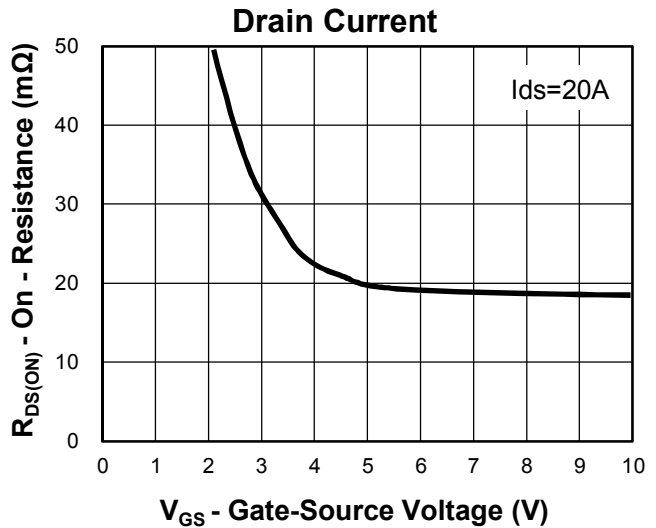
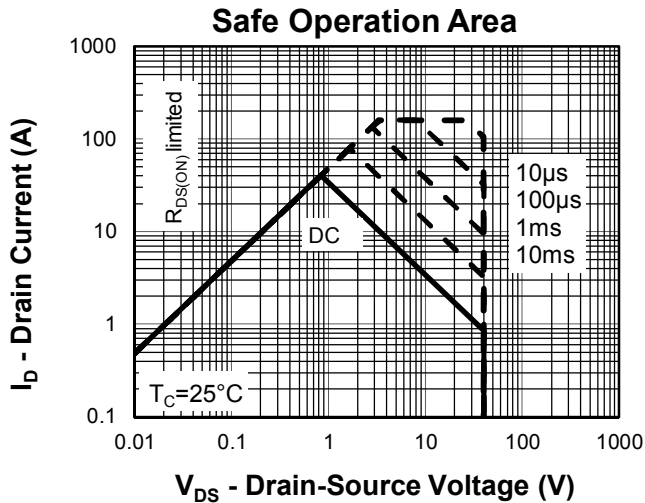
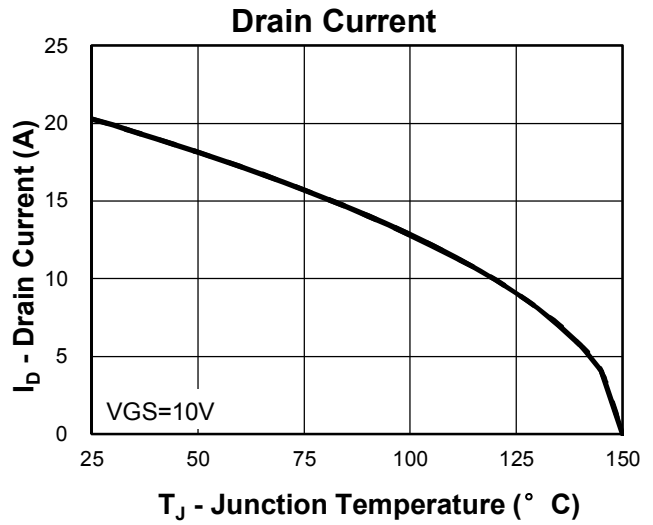
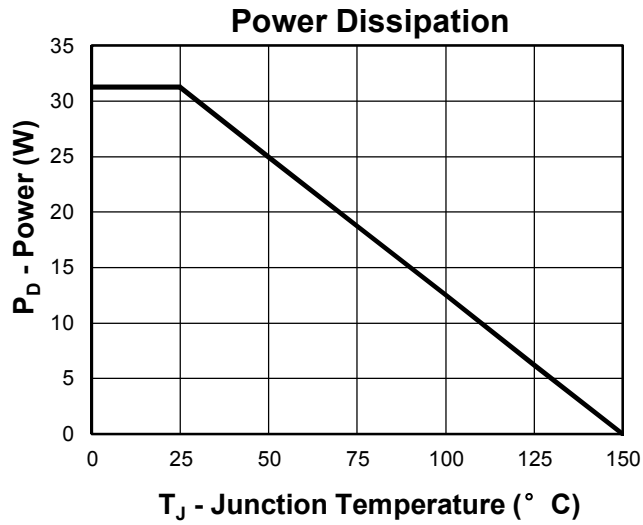
**Notes:**

- ① Pulse width limited by safe operating area.
- ② Calculated continuous current based on maximum allowable junction temperature.
- ③ When mounted on 1 inch square copper board,  $t \leq 10$ sec.
- ④ Limited by  $T_{Jmax}$ ,  $I_{AS} = 18A$ ,  $V_{DD} = 48V$ ,  $R_G = 50 \Omega$ , Starting  $T_J = 25^\circ C$ .
- ⑤ Pulse test ; Pulse width 300s, duty cycle 2%.
- ⑥ Guaranteed by design, not subject to production testing.

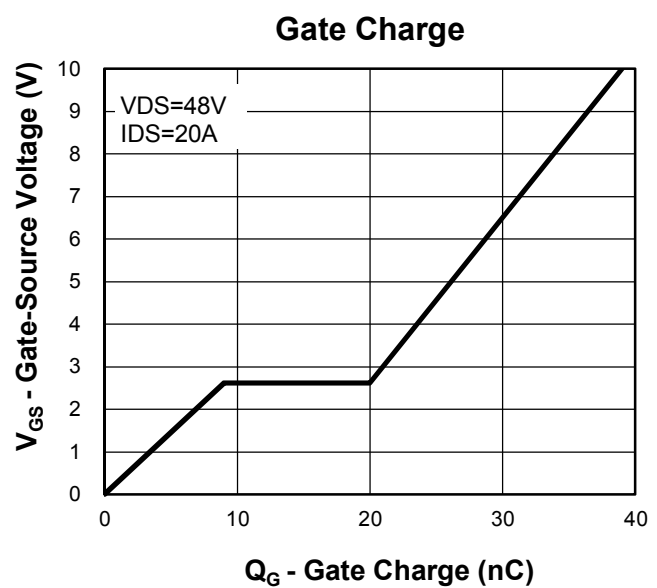
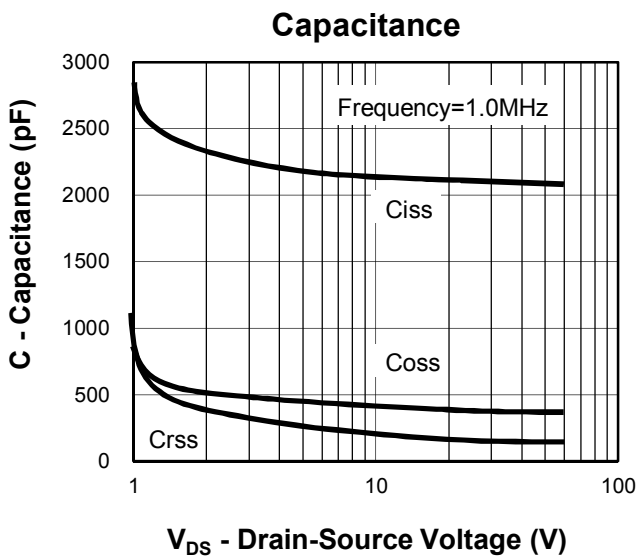
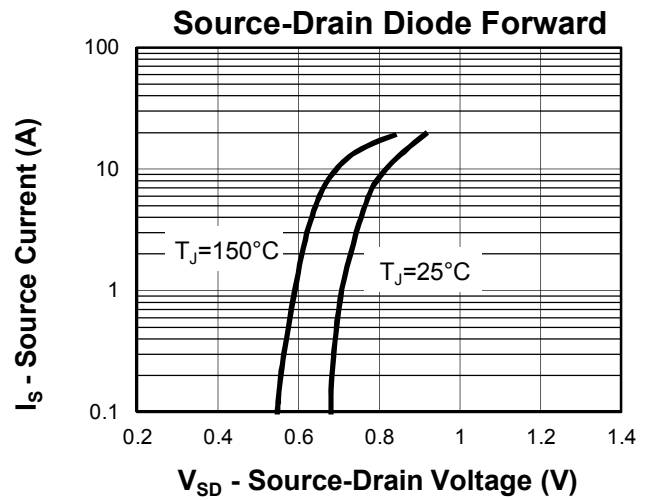
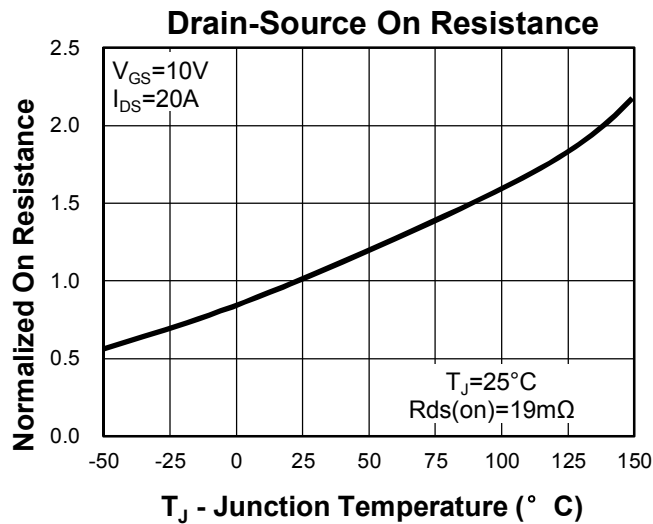
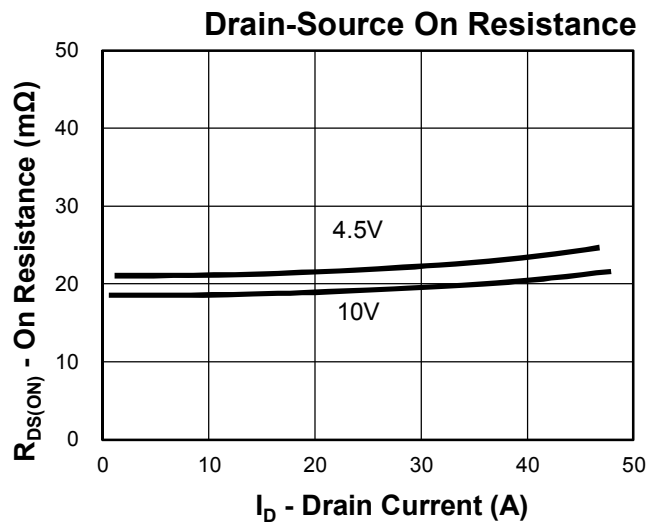
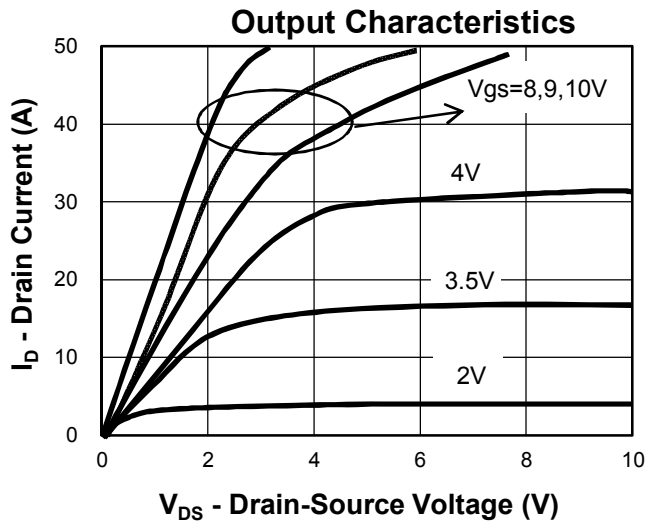
**Ordering and Marking Information**

<b>Device</b>	<b>Marking</b>	<b>Package</b>	<b>Packaging</b>	<b>Quantity</b>	<b>Reel Size</b>	<b>Tape width</b>
RU60D20M	RU60D20M	PDFN5060	Tape&Reel	3000	13"	12mm

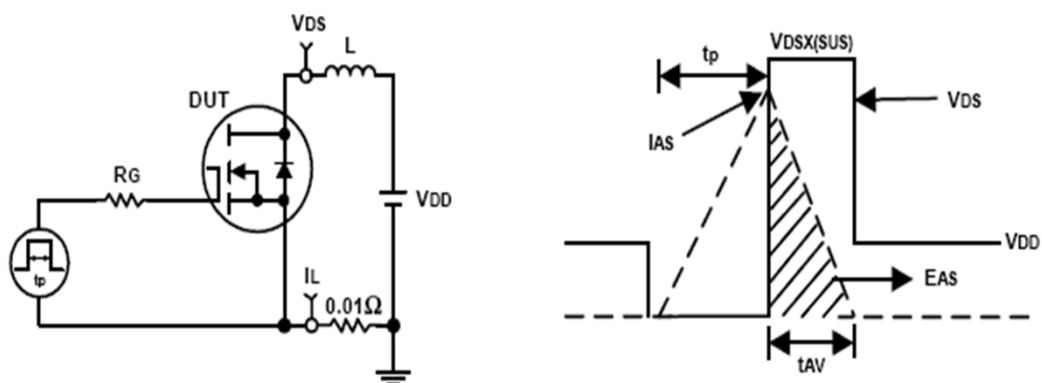
**Typical Characteristics**



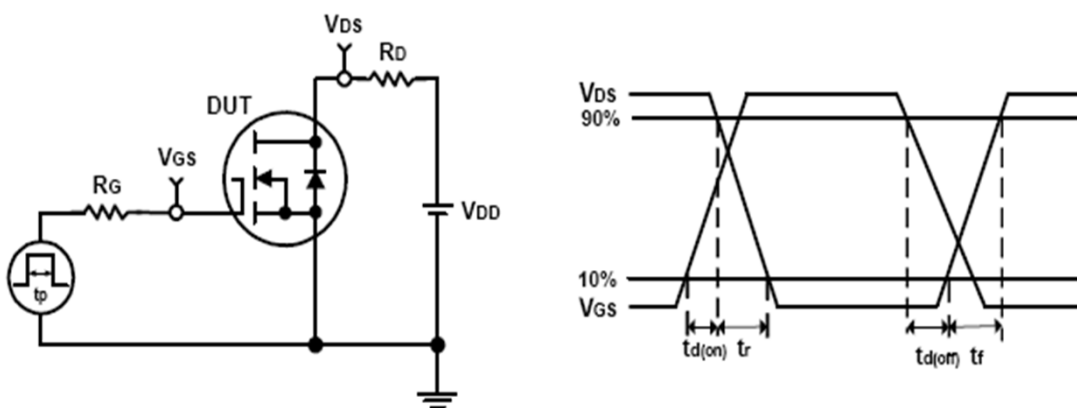
**Typical Characteristics**



**Avalanche Test Circuit and Waveforms**

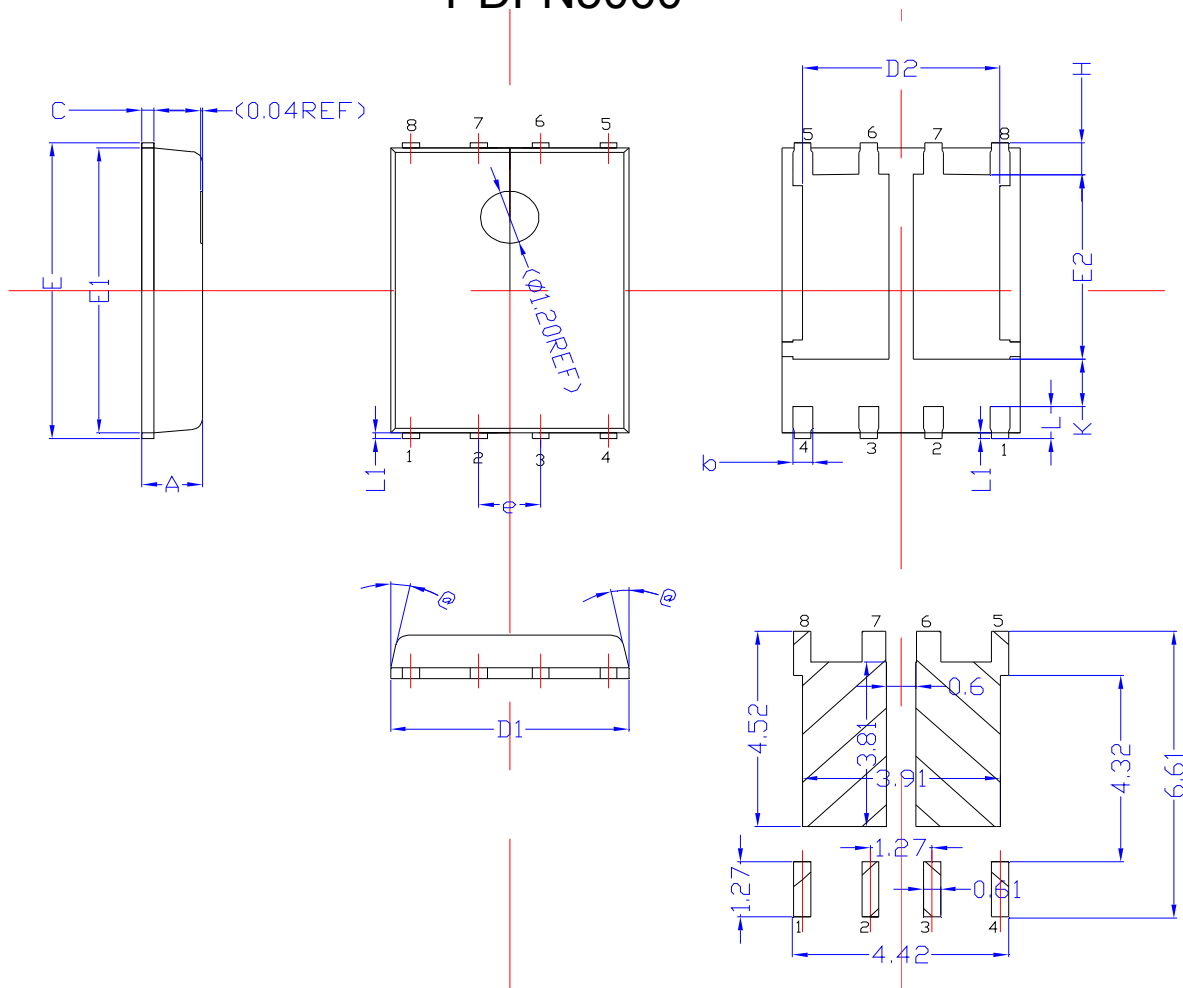


**Switching Time Test Circuit and Waveforms**



**Package Information**

**PDFN5060**



**NOTE:**

- 1: ALL UNITS ARE IN MILLIMETER.
- 2: EJECTOR PIN MARK POSITION MAY VARY FROM DIFFERENT MOLD.
- 3: ALL DIMENSIONS REFER TO JEDEC.DO NOT INCLUDE MOLD FLASH OR PROTRUSIONS.

SYMBOL	MM			INCH			SYMBOL	MM			INCH		
	MIN	NOM	MAX	MIN	NOM	MAX		MIN	NOM	MAX	MIN	NOM	MAX
A	0.90	1.00	1.10	0.035	0.039	0.043	E1	5.70	5.75	5.80	0.224	0.226	0.228
b	0.33	0.41	0.51	0.013	0.016	0.020	E2	3.38	3.58	3.78	0.133	0.141	0.149
c	0.20	0.25	0.30	0.008	0.010	0.012	e	1.27BSC			0.05BSC		
D1	4.80	4.90	5.00	0.189	0.193	0.197	H	0.41	0.51	0.61	0.016	0.020	0.024
D2	3.61	3.81	3.96	0.142	0.150	0.156	L	0.51	0.61	0.71	0.020	0.024	0.028
L1	0.06	0.13	0.20	0.002	0.005	0.008							
E	5.90	6.00	6.10	0.232	0.236	0.240	@	0°	*	12°	*	10°	12°
K	1.10	*	*	0.043	*	*	M	0.50	*	*	0.020	*	*

**Customer Service****Worldwide Sales and Service:**

Sales@ruichips.com

**Technical Support:**

Technical@ruichips.com

**Investor Relations Contacts:**

Investor@ruichips.com

**Marcom Contact:**

Marcom@ruichips.com

**Editorial Contact:**

Editorial@ruichips.com

**HR Contact:**

HR@ruichips.com

**Legal Contact:**

Legal@ruichips.com

**Shen Zhen RUICHIPS Semiconductor CO., LTD**

4th Floor, Block 8, Changyuan New Material Port, Keyuan Middle Road, Science & Industry Park,  
Nanshan District, Shenzhen, CHINA

**TEL:** (86-755) 8311-5334

**FAX:** (86-755) 8311-4278

**E-mail:** Sales-SZ@ruichips.com