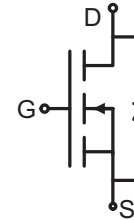


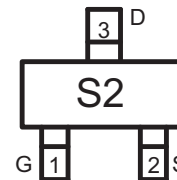
## N-Channel Enhancement Mode Power MOSFET

### Description

The RM2302 uses advanced trench technology to provide excellent  $R_{DS(ON)}$ , low gate charge and operation with gate voltages as low as 2.5V. This device is suitable for use as a Battery protection or in other Switching application.



Schematic diagram



Marking and pin assignment



SOT-23 top view

### General Features

- $V_{DS} = 20V, I_D = 4A$   
 $R_{DS(ON)} < 59m\Omega @ V_{GS}=2.5V$   
 $R_{DS(ON)} < 45m\Omega @ V_{GS}=4.5V$
- High power and current handling capability
- Lead free product is acquired
- Surface mount package

### Application

- Battery protection
- Load switch
- Power management

### Package Marking and Ordering Information

Device Marking	Device	Device Package	Reel Size	Tape width	Quantity
S2	RM2302	SOT-23	Ø180mm	8 mm	3000 units

### Absolute Maximum Ratings ( $T_A=25^\circ C$ unless otherwise noted)

Parameter	Symbol	Limit	Unit
Drain-Source Voltage	$V_{DS}$	20	V
Gate-Source Voltage	$V_{GS}$	$\pm 12$	V
Drain Current-Continuous	$I_D$	4	A
Drain Current-Pulsed <sup>(Note 1)</sup>	$I_{DM}$	10	A
Maximum Power Dissipation	$P_D$	1	W
Operating Junction and Storage Temperature Range	$T_J, T_{STG}$	-55 To 150	$^\circ C$

### Thermal Characteristic

Thermal Resistance, Junction-to-Ambient <sup>(Note 2)</sup>	$R_{\theta JA}$	125	$^\circ C/W$
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### Electrical Characteristics ( $T_A=25^\circ C$ unless otherwise noted)

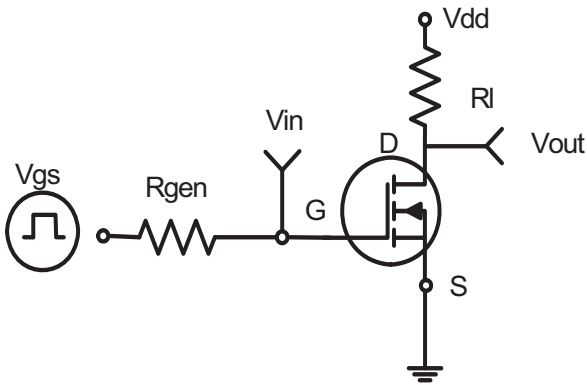
Parameter	Symbol	Condition	Min	Typ	Max	Unit
<b>Off Characteristics</b>						
Drain-Source Breakdown Voltage	$BV_{DSS}$	$V_{GS}=0V, I_D=250\mu A$	20	22	-	V
Zero Gate Voltage Drain Current	$I_{DSS}$	$V_{DS}=20V, V_{GS}=0V$	-	-	1	$\mu A$

Parameter	Symbol	Condition	Min	Typ	Max	Unit
Gate-Body Leakage Current	$I_{GSS}$	$V_{GS}=\pm 12V, V_{DS}=0V$	-	-	$\pm 100$	nA
<b>On Characteristics</b> <sup>(Note 3)</sup>						
Gate Threshold Voltage	$V_{GS(th)}$	$V_{DS}=V_{GS}, I_D=250\mu A$	0.5	0.85	1.2	V
Drain-Source On-State Resistance	$R_{DS(ON)}$	$V_{GS}=2.5V, I_D=2.5A$	-	37	59	m $\Omega$
		$V_{GS}=4.5V, I_D=2.9A$	-	30	45	m $\Omega$
Forward Transconductance	$g_{FS}$	$V_{DS}=5V, I_D=2.9A$	-	8	-	S
<b>Dynamic Characteristics</b> <sup>(Note 4)</sup>						
Input Capacitance	$C_{ISS}$	$V_{DS}=10V, V_{GS}=0V,$ $F=1.0MHz$	-	300	-	PF
Output Capacitance	$C_{OSS}$		-	120	-	PF
Reverse Transfer Capacitance	$C_{RSS}$		-	80	-	PF
<b>Switching Characteristics</b> <sup>(Note 4)</sup>						
Turn-on Delay Time	$t_{d(on)}$	$V_{DD}=10V, I_D=2.9A$ $V_{GS}=4.5V, R_{GEN}=6\Omega$	-	10	15	nS
Turn-on Rise Time	$t_r$		-	50	85	nS
Turn-Off Delay Time	$t_{d(off)}$		-	17	45	nS
Turn-Off Fall Time	$t_f$		-	10	20	nS
Total Gate Charge	$Q_g$	$V_{DS}=10V, I_D=2.9A,$ $V_{GS}=4.5V$	-	4.0	10	nC
Gate-Source Charge	$Q_{gs}$		-	0.65	-	nC
Gate-Drain Charge	$Q_{gd}$		-	1.2	-	nC
<b>Drain-Source Diode Characteristics</b>						
Diode Forward Voltage <sup>(Note 3)</sup>	$V_{SD}$	$V_{GS}=0V, I_S=2.9A$	-	0.75	1.2	V
Diode Forward Current <sup>(Note 2)</sup>	$I_S$		-	-	4	A

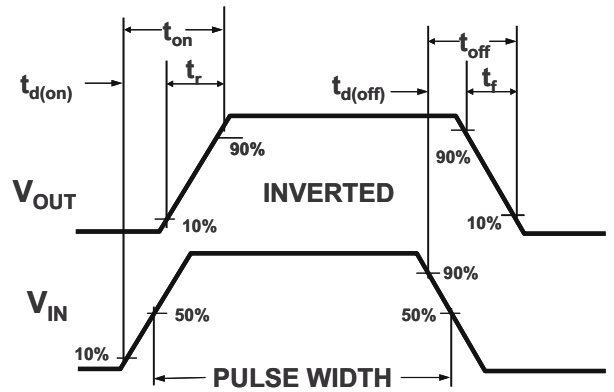
### Notes:

1. Repetitive Rating: Pulse width limited by maximum junction temperature.
2. Surface Mounted on FR4 Board,  $t \leq 10$  sec.
3. Pulse Test: Pulse Width  $\leq 300\mu s$ , Duty Cycle  $\leq 2\%$ .
4. Guaranteed by design, not subject to production

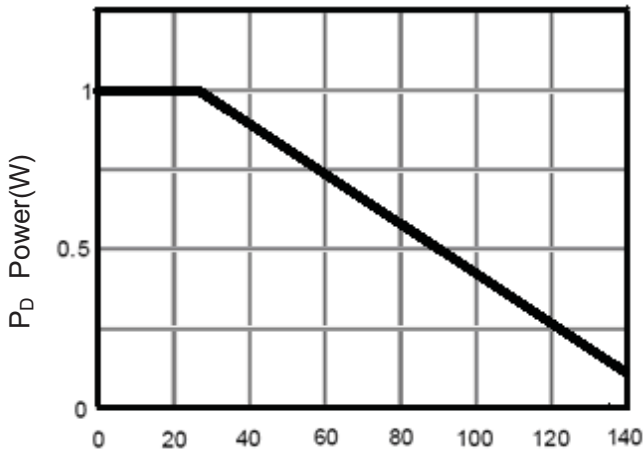
## RATING AND CHARACTERISTICS CURVES (RM2302)



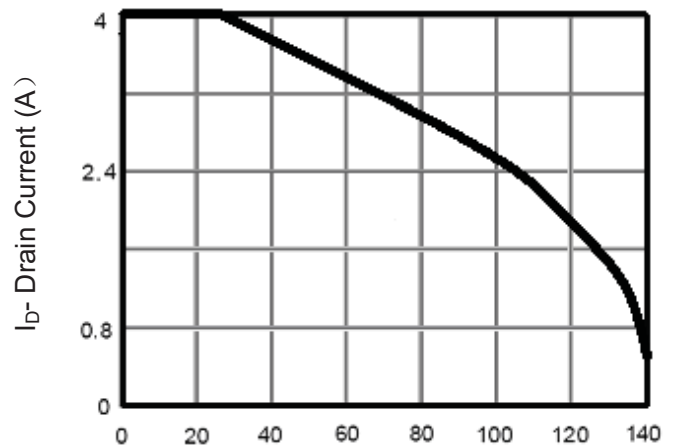
**Figure 1: Switching Test Circuit**



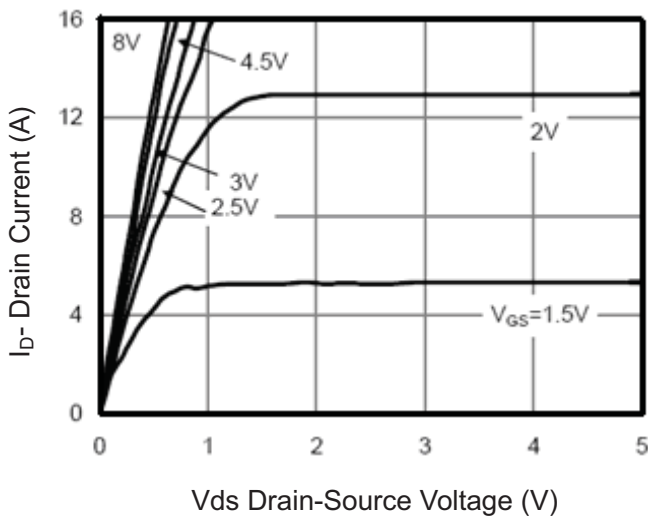
**Figure 2: Switching Waveforms**



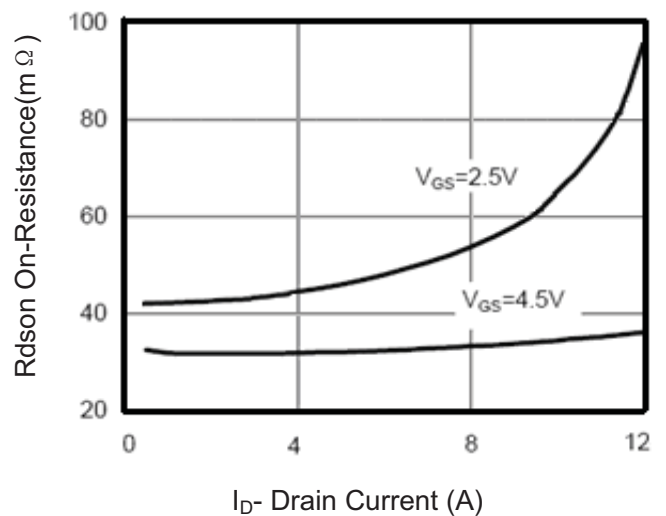
**Figure 3 Power Dissipation**



**Figure 4 Drain Current**

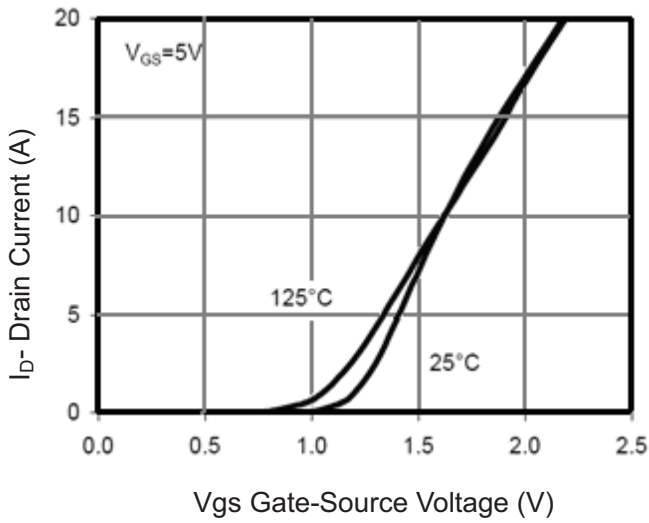


**Figure 5 Output Characteristics**

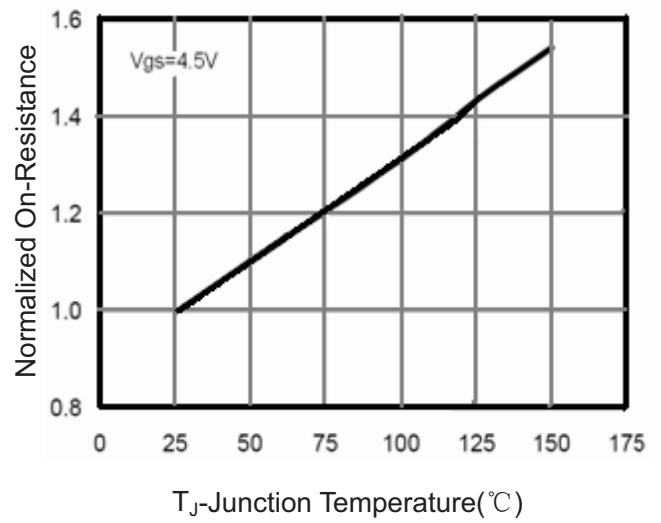


**Figure 6 Drain-Source On-Resistance**

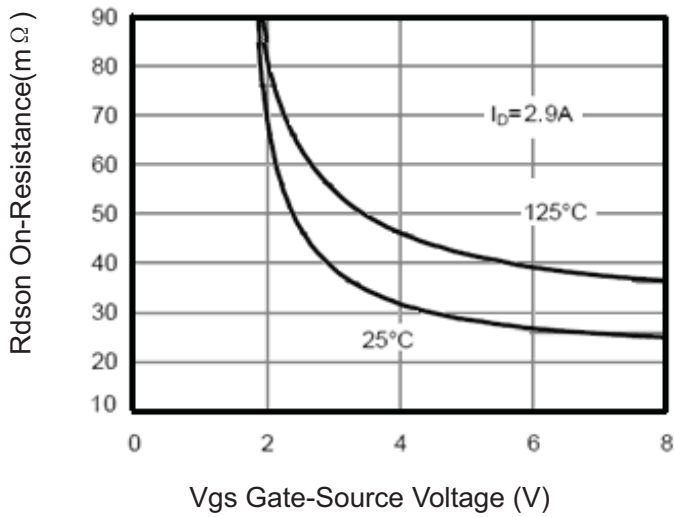
# RATING AND CHARACTERISTICS CURVES (RM2302)



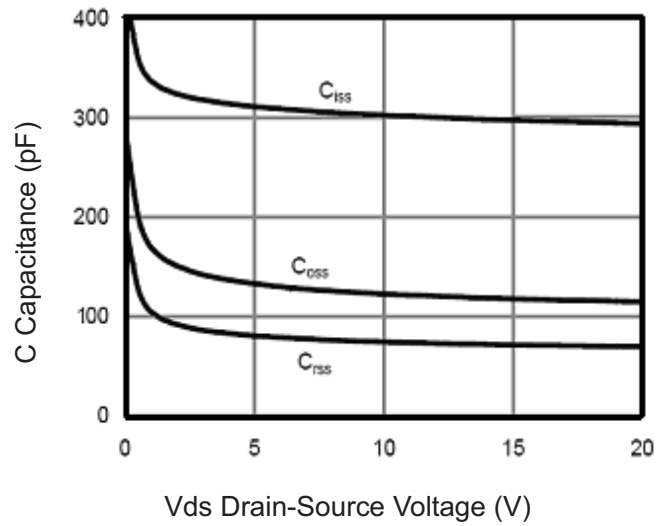
Vgs Gate-Source Voltage (V)  
**Figure 7 Transfer Characteristics**



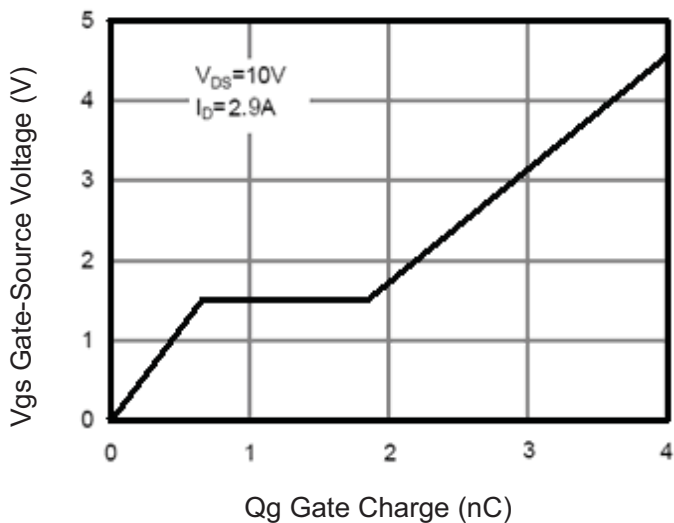
$T_J$ -Junction Temperature(°C)  
**Figure 8 Drain-Source On-Resistance**



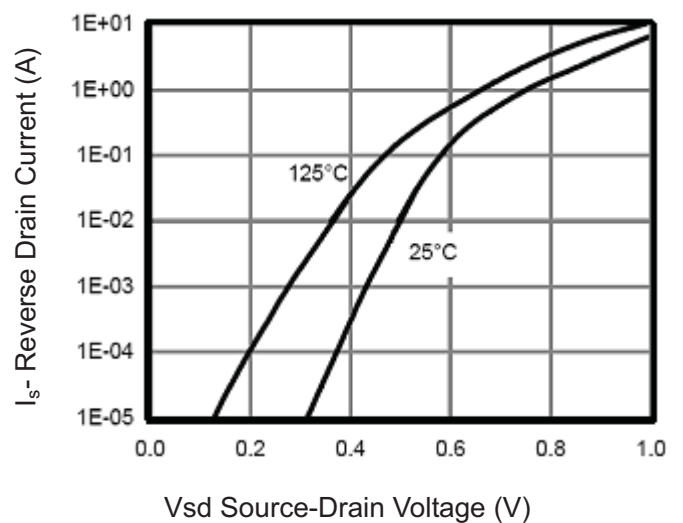
Vgs Gate-Source Voltage (V)  
**Figure 9 Rdson vs Vgs**



Vds Drain-Source Voltage (V)  
**Figure 10 Capacitance vs Vds**



Qg Gate Charge (nC)  
**Figure 11 Gate Charge**



Vsd Source-Drain Voltage (V)  
**Figure 12 Source- Drain Diode Forward**

## RATING AND CHARACTERISTICS CURVES (RM2302)

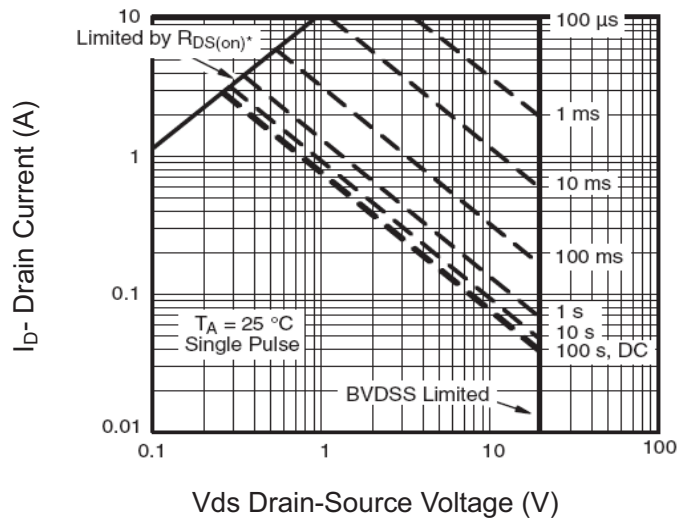


Figure 13 Safe Operation Area

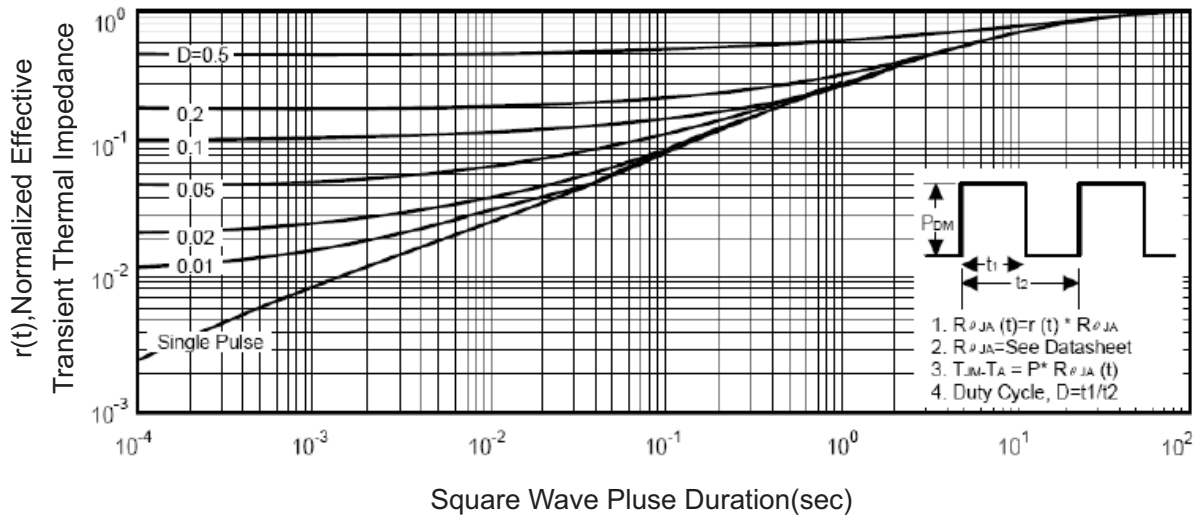
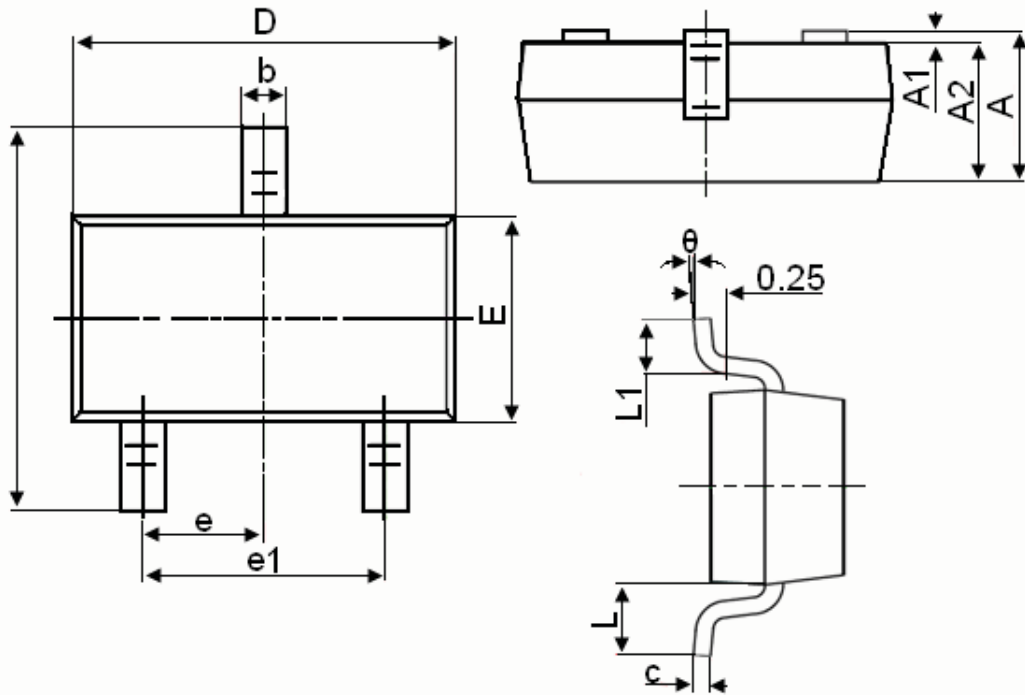


Figure 14 Normalized Maximum Transient Thermal Impedance

## SOT-23 Package Information



Symbol	Dimensions in Millimeters	
	MIN.	MAX.
A	0.900	1.150
A1	0.000	0.100
A2	0.900	1.050
b	0.300	0.500
c	0.080	0.150
D	2.800	3.000
E	1.200	1.400
E1	2.250	2.550
e	0.950TYP	
e1	1.800	2.000
L	0.550REF	
L1	0.300	0.500
$\theta$	0°	8°

### Notes

1. All dimensions are in millimeters.
2. Tolerance  $\pm 0.10\text{mm}$  (4 mil) unless otherwise specified
3. Package body sizes exclude mold flash and gate burrs. Mold flash at the non-lead sides should be less than 5 mils.
4. Dimension L is measured in gauge plane.
5. Controlling dimension is millimeter, converted inch dimensions are not necessarily exact.

	Package	Tube (pcs/tube)	Tube (pcs/inner box)	Tube (pcs/cartoon)	Tape&Reel (pcs/reel)	Tape&Reel (pcs/inner box)	Tape&Reel (pcs/cartoon)
	DFN	100	10,000	100,000	2,500	5,000	40,000
	SOP-8	100	10,000	100,000	4,000	4,000	20,000
	TSSOP-8	100	32,000	128,000	3,000	6,000	48,000
	SOT-23-3L	—	—	—	3,000	30,000	120,000
	SOT-23-6L	—	—	—	3,000	30,000	120,000
	SOT-23(6R)	—	—	—	3,000	30,000	120,000
	SOT-363	—	—	—	3,000	30,000	120,000
	SOT-523	—	—	—	3,000	30,000	120,000
	TO-220	50	1,000	5,000	—	—	—
	TO-220F	50	1,000	10,000	—	—	—
	TO-247	30	300	1,200	—	—	—
	TO-251	80	4,000	40,000	—	—	—
	TO-251S(4R)	80	4,000	40,000	—	—	—
	TO-252-2L(4R)	80	4,000	40,000	2,500	2,500	25,000
	TO-263-2L	50	1,000	10,000	800	800	8,000
	TO-3P	30	300	3,000	—	—	—
	TO-92	—	—	—	1,000(袋装)	10,000	100,000

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