

N-Channel Enhancement Mode Power MOSFET

Description

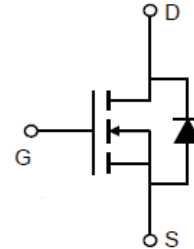
The RM45N60DF uses advanced trench technology and design to provide excellent $R_{DS(ON)}$ with low gate charge. It can be used in a wide variety of applications.

General Features

- $V_{DS} = 60V, I_D = 45A$
 $R_{DS(ON)} < 13m\Omega @ V_{GS}=10V$ (Typ:10m Ω)
 $R_{DS(ON)} < 17m\Omega @ V_{GS}=4.5V$ (Typ:13m Ω)
- High density cell design for ultra low R_{dson}
- Fully characterized avalanche voltage and current
- Low gate to drain charge to reduce switching losses

Application

- Power switching application
- Load switch
- P/N suffix V means AEC-Q101 qualified, e.g:RM45N60DFV
- Halogen-free



Schematic diagram



DFN5X6-8L top view

Package Marking and Ordering Information

Device Marking	Device	Device Package	Reel Size	Tape width	Quantity
45N60	RM45N60DF	DFN5X6-8L	Ø330mm	12mm	5000

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

Parameter	Symbol	Limit	Unit
Drain-Source Voltage	V_{DS}	60	V
Gate-Source Voltage	V_{GS}	± 20	V
Drain Current-Continuous	I_D	45	A
Drain Current-Continuous($T_C=100^\circ C$)	$I_D(100^\circ C)$	32	A
Pulsed Drain Current	I_{DM}	140	A
Maximum Power Dissipation	P_D	60	W
Operating Junction and Storage Temperature Range	T_J, T_{STG}	-55 To 175	$^\circ C$

Thermal Characteristic

Thermal Resistance, Junction-to-Case ^(Note 2)	$R_{\theta JC}$	2.5	$^\circ C/W$
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Electrical Characteristics ($T_C=25^\circ C$ unless otherwise noted)

Parameter	Symbol	Condition	Min	Typ	Max	Unit
Off Characteristics						
Drain-Source Breakdown Voltage	BV_{DSS}	$V_{GS}=0V, I_D=250\mu A$	60		-	V

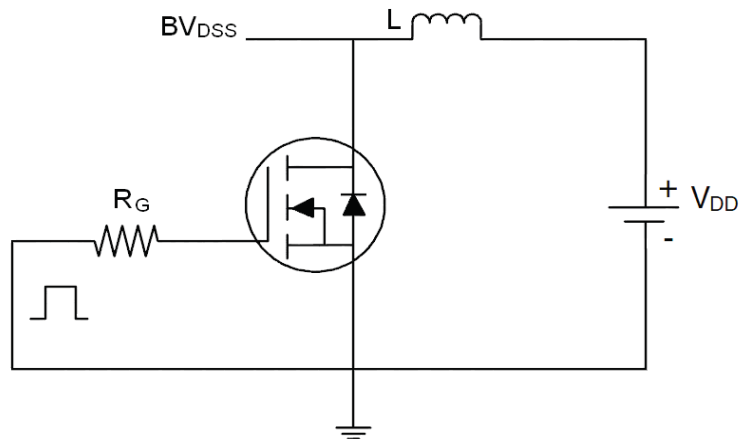
Zero Gate Voltage Drain Current	I_{DSS}	$V_{DS}=60V, V_{GS}=0V$	-	-	1	μA
Gate-Body Leakage Current	I_{GSS}	$V_{GS}=\pm 20V, V_{DS}=0V$	-	-	± 100	nA
On Characteristics ^(Note 3)						
Gate Threshold Voltage	$V_{GS(th)}$	$V_{DS}=V_{GS}, I_D=250\mu A$	1.2	1.8	2.2	V
Drain-Source On-State Resistance	$R_{DS(ON)}$	$V_{GS}=10V, I_D=20A$	-	10	13	m Ω
		$V_{GS}=4.5V, I_D=20A$	-	13	17	m Ω
Forward Transconductance	g_{FS}	$V_{DS}=5V, I_D=9A$	25	-	-	S
Dynamic Characteristics ^(Note4)						
Input Capacitance	C_{iss}	$V_{DS}=30V, V_{GS}=0V,$ $F=1.0MHz$	-	2180	-	PF
Output Capacitance	C_{oss}		-	350	-	PF
Reverse Transfer Capacitance	C_{rss}		-	270	-	PF
Switching Characteristics ^(Note 4)						
Turn-on Delay Time	$t_{d(on)}$	$V_{DD}=30V, R_L=1\Omega$ $V_{GS}=10V, R_{GEN}=3\Omega$	-	8.5	-	nS
Turn-on Rise Time	t_r		-	6	-	nS
Turn-Off Delay Time	$t_{d(off)}$		-	30	-	nS
Turn-Off Fall Time	t_f		-	5	-	nS
Total Gate Charge	Q_g	$V_{DS}=30V, I_D=20A,$ $V_{GS}=10V$	-	58	-	nC
Gate-Source Charge	Q_{gs}		-	8	-	nC
Gate-Drain Charge	Q_{gd}		-	17	-	nC
Drain-Source Diode Characteristics						
Diode Forward Voltage ^(Note 3)	V_{SD}	$V_{GS}=0V, I_S=20A$	-	-	1.2	V
Diode Forward Current ^(Note 2)	I_S		-	-	45	A
Reverse Recovery Time	t_{rr}	$T_J = 25^\circ C, I_F=20A$ $di/dt = 100A/\mu s$ ^(Note3)	-	30	-	nS
Reverse Recovery Charge	Q_{rr}		-	44	-	nC

Notes:

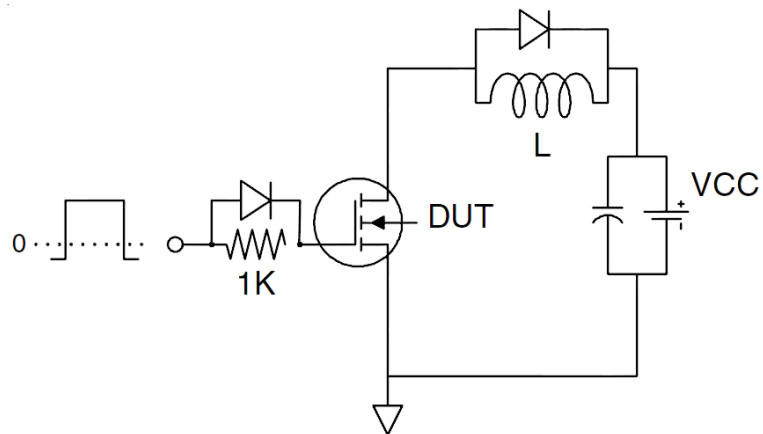
1. Repetitive Rating: Pulse width limited by maximum junction temperature.
2. Surface Mounted on FR4 Board, $t \leq 10$ sec.
3. Pulse Test: Pulse Width $\leq 300\mu s$, Duty Cycle $\leq 2\%$.
4. Guaranteed by design, not subject to production

Test Circuit

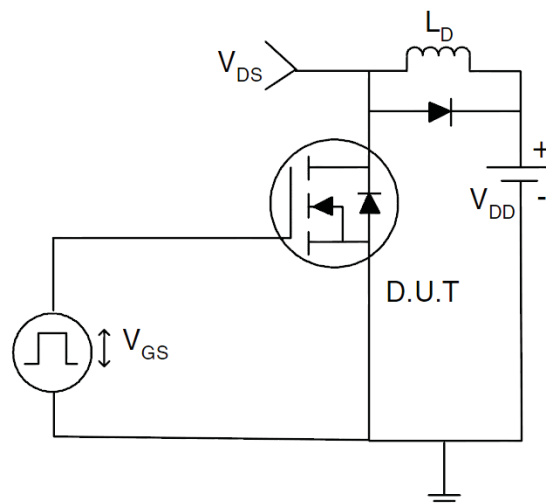
1) E_{AS} test Circuit



2) Gate charge test Circuit



3) Switch Time Test Circuit



RATING AND CHARACTERISTICS CURVES (RM45N60DF)

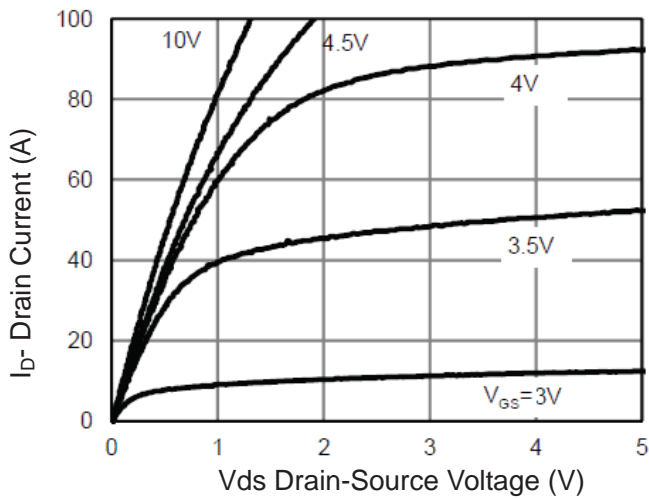


Figure 1 Output Characteristics

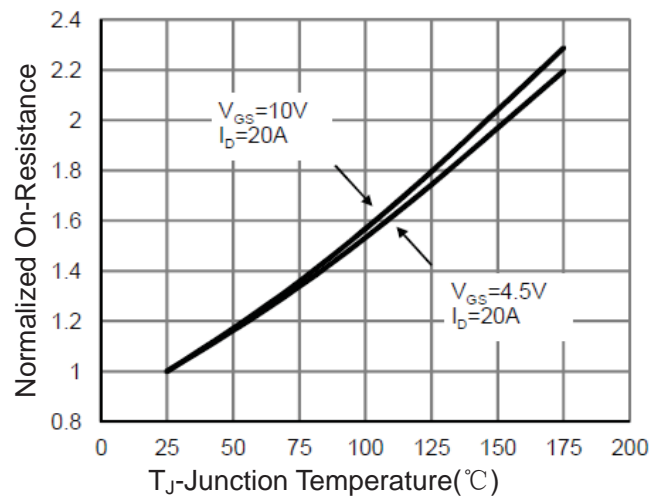


Figure 4 Rdson-Junction Temperature

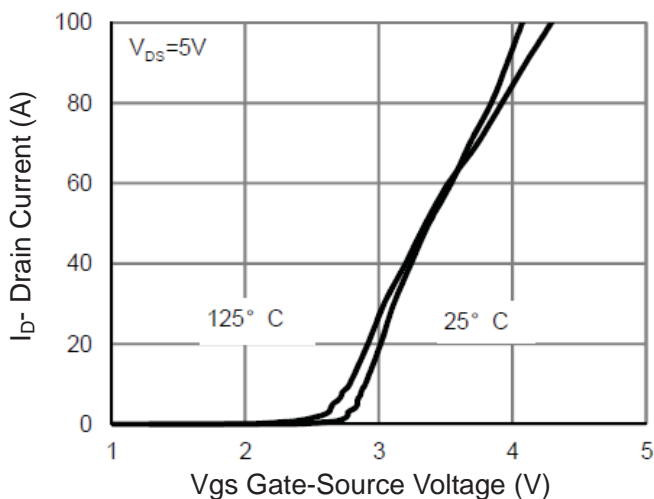


Figure 2 Transfer Characteristics

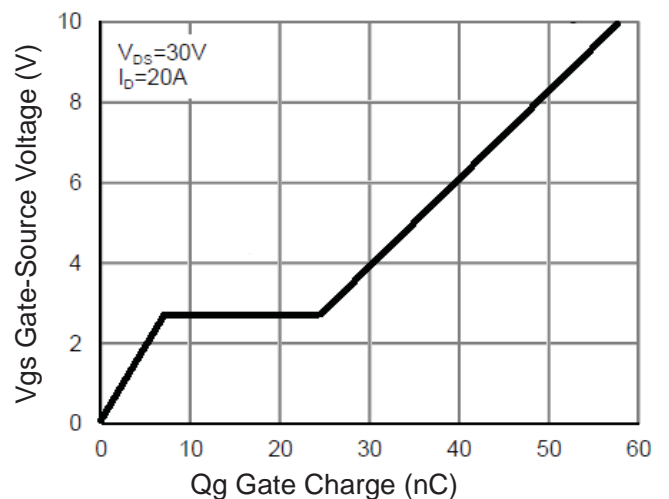


Figure 5 Gate Charge

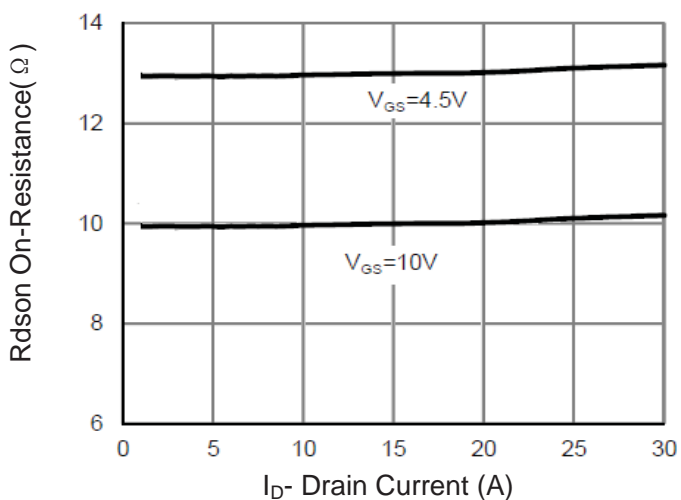


Figure 3 Rdson- Drain Current

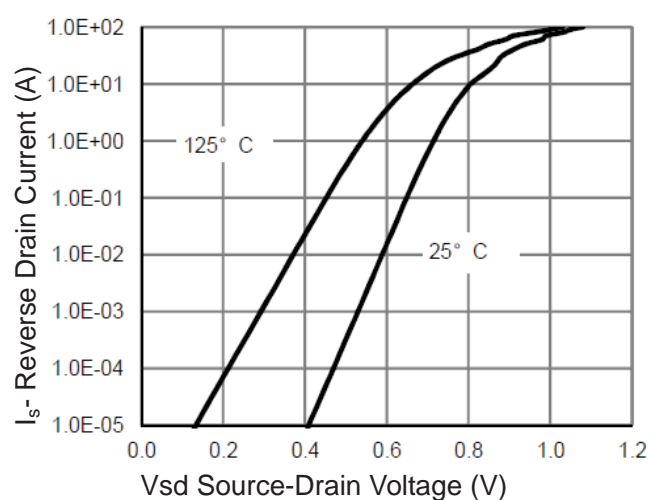


Figure 6 Source- Drain Diode Forward

RATING AND CHARACTERISTICS CURVES (RM45N60DF)

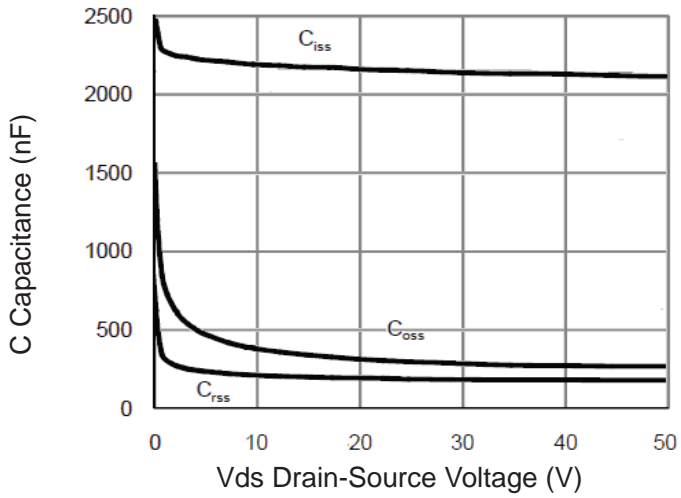


Figure 7 Capacitance vs Vds

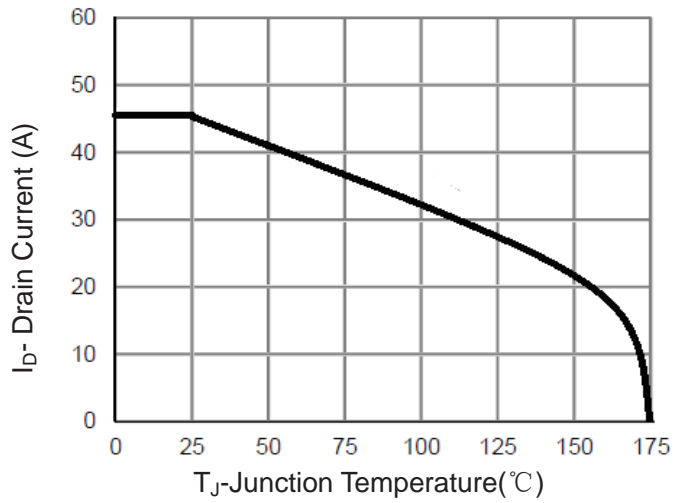


Figure 9 Current De-rating

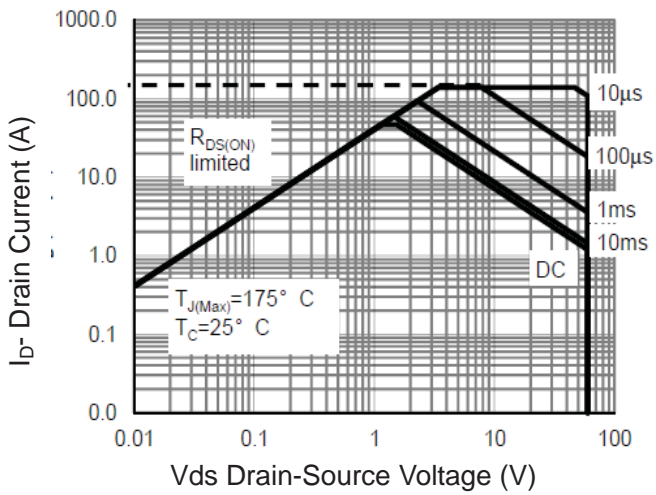


Figure 8 Safe Operation Area

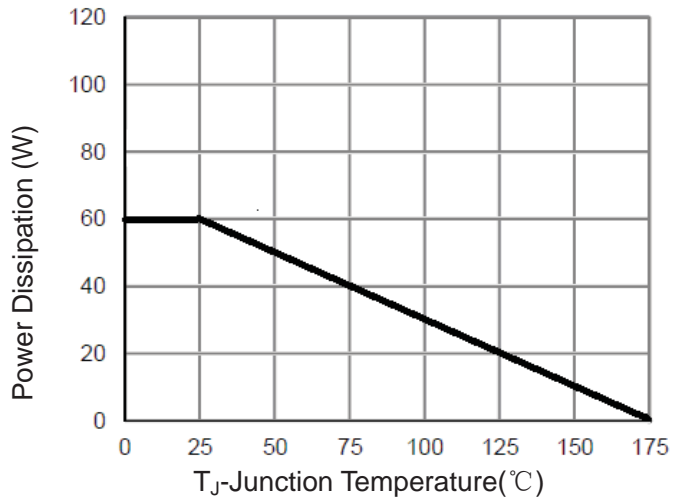


Figure 10 Power De-rating

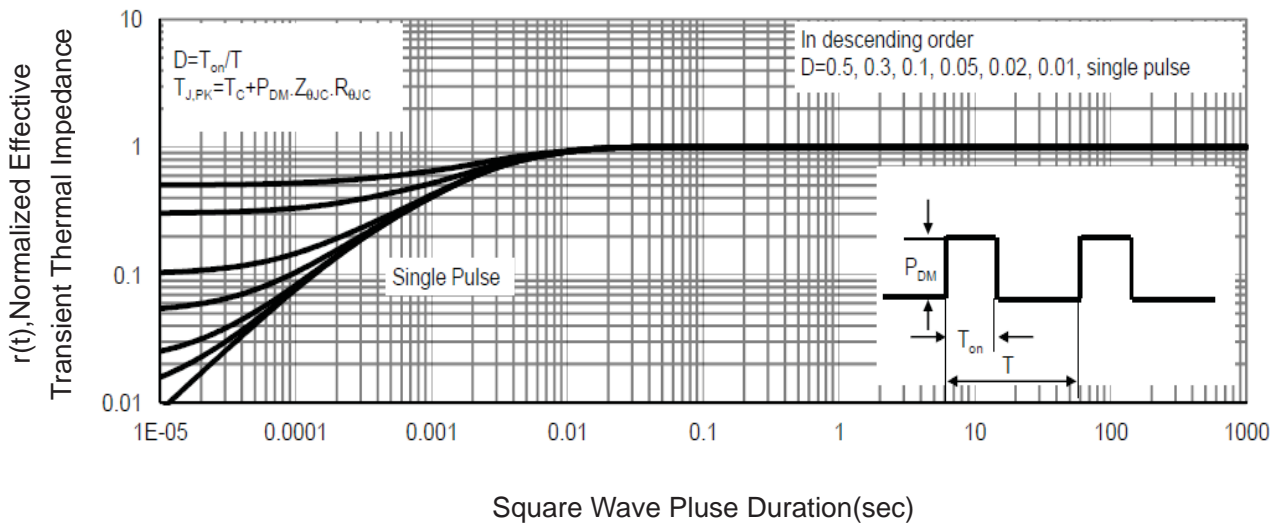


Figure 11 Normalized Maximum Transient Thermal Impedance



RECTRON

Marking on the body



← Rectron Logo

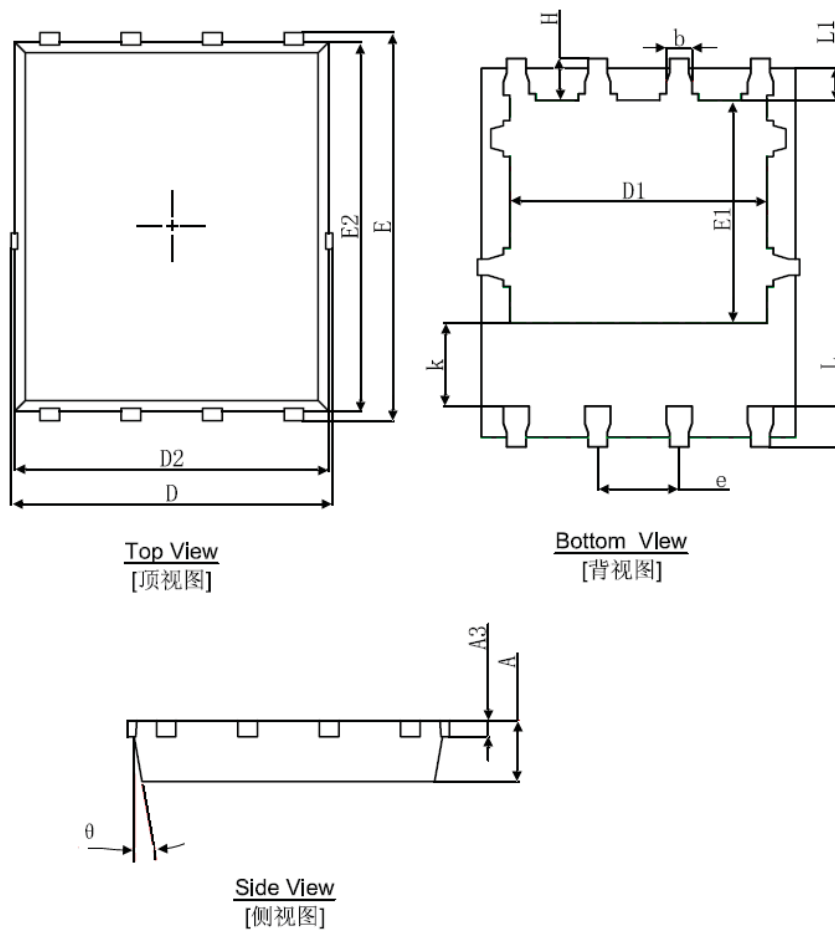
4 5 N 6 0 ← Part No.

17 **XX**

Year – Code
(Y:17-----2017
18-----2018.....)

Week – code
(WW:01~52)

DFN5X6-8L Package Information



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	0.900	1.000	0.035	0.039
A3	0.254REF.		0.010REF.	
D	4.944	5.096	0.195	0.201
E	5.974	6.126	0.235	0.241
D1	3.910	4.110	0.154	0.162
E1	3.375	3.575	0.133	0.141
D2	4.824	4.976	0.190	0.196
E2	5.674	5.826	0.223	0.229
K	1.190	1.390	0.047	0.055
b	0.035	0.450	0.014	0.018
e	1.270(TYP.)		0.050(TYP.)	
L	0.559	0.711	0.022	0.028
L1	0.424	0.576	0.017	0.023
H	0.574	0.726	0.023	0.029
θ	8°	12°	8°	12°

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
SOT223	—	—	—	2,500	2,500	20,000
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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