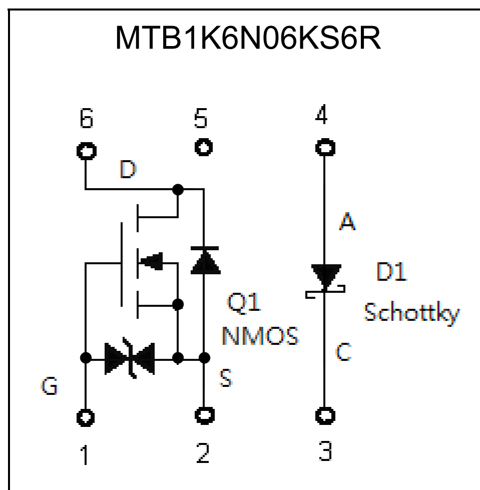
200mA Sychronous Rectifier featuring N-MOSFET and Schottky Diode

MTB1K6N06KS6R

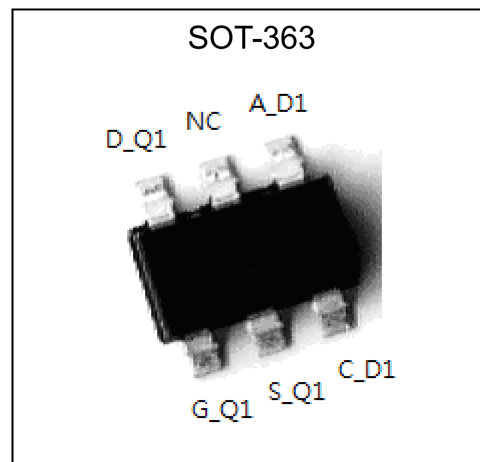
Features

- N-MOS with ESD Gate Protection
- N-MOS with Low On-Resistance
- Low V_F Schottky Diode
- Low Static, Switching and Conduction Losses
- Pb-free lead plating and halogen-free package

Equivalent Circuit

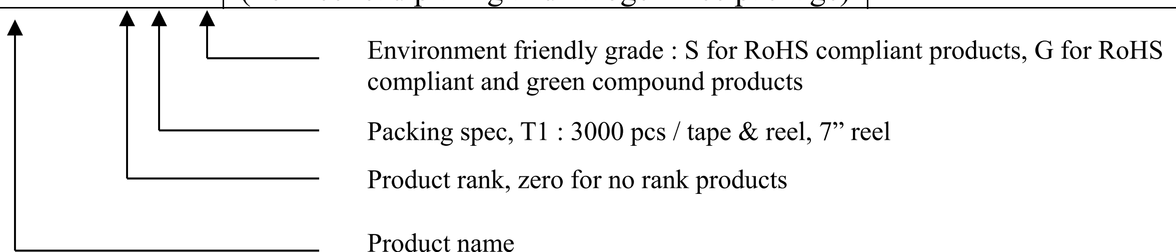


Outline



Ordering Information

Device	Package	Shipping
MTB1K6N06KS6R-0-T1-G	SOT-363 (Pb-free lead plating and halogen-free package)	3000 pcs / Tape & Reel



Absolute Maximum Ratings, Total Device (Ta=25°C, unless otherwise specified)

Characteristic	Symbol	Value	Unit
Power Dissipation (Note)	P_D	200	mW
Power Derating Factor above 25°C	P_{der}	1.6	mW/°C
Output Current	I_{OUT}	200	mA

Thermal Characteristics

Characteristic	Symbol	Value	Unit
Junction Operation and Storage Temperature Range	Tj ; Tstg	-55 ~ +150	°C
Thermal Resistance, Junction to Ambient to Air (Note)	$R_{\Theta JA}$	625	°C/W

Note : Surface mounted on a FR-4 board with area of 1 in x 0.85 in x 0.062 in copper pad.

Sub-Component Device : ESD Protected N-Channel MOSFET (Q1)

(Ta=25°C, unless otherwise specified)

Characteristic		Symbol	Value	Unit
Drain Source Voltage		V_{DSS}	60	V
Drain Gate Voltage (R_{GS}<1MΩ)		V_{DGR}	60	V
Gate Source Voltage		V_{GSS}	±20	V
Drain Current	Continuous(V_{GS}=10V)	I_D	200	mA
	Pulsed (tp≤10μs, Duty Cycle≤1%)	I_{DM}	800	mA
Continuous Source Current		I_S	200	mA

Sub-Component Device : Schottky Diode (D1)

Characteristic	Symbol	Value	Unit
Peak Repetitive Reverse Voltage Working Peak Reverse Voltage DC Blocking Voltage	V_{RRM} V_{RWM} V_R	40	V
RMS Reverse Voltage	$V_{R(RMS)}$	28	V
Forward Continuous Current	I_{FM}	350	mA
Non-Repetitive Peak Forward Surge Current @ t<1.0s	I_{FSM}	1.5	A

Electrical Characteristics (Tj=25°C, unless otherwise noted)

ESD protected N-Channel MOSFET (Q1) @ T_A=25°C, unless otherwise specified

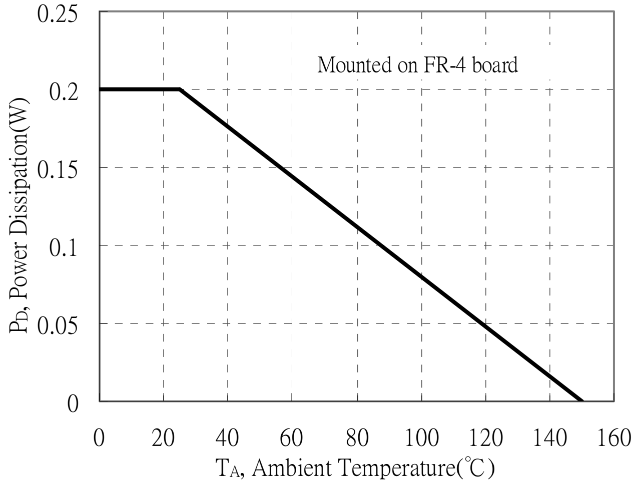
Symbol	Min.	Typ.	Max.	Unit	Test Conditions
Static					
BV_{DSS}	60	-	-	V	V_{GS}=0V, I_D=250μA
$\Delta BV_{DSS}/\Delta Tj$	-	0.07	-	V/°C	Reference to 25°C, I_D=250μA
$V_{GS(th)}$	0.8	1.5	2.3	V	V_{DS}=V_{GS}, I_D=250μA
	0.9	1.7	2.5		V_{DS}=V_{GS}, I_D=1mA
I_{GSS}	-	-	±10	μA	V_{GS}=±20V, V_{DS}=0V
I_{DSS}	-	-	1		V_{DS}=60V, V_{GS}=0V
	-	-	10		V_{DS}=48V, V_{GS}=0V (Tj=70°C)
*$R_{DS(ON)}$	-	1.8	2.5	Ω	V_{GS}=5V, I_D=50mA
	-	1.5	2		V_{GS}=10V, I_D=500mA
*G_{FS}	-	300	-	mS	V_{DS}=10V, I_D=200mA
Dynamic					
Ciss	-	29	50	pF	V_{DS}=25V, V_{GS}=0, f=1MHz
Coss	-	4.3	25		
Crss	-	2.9	5		
$t_{d(ON)}$	-	2.8	-	ns	V_{DS}=25V, I_D=500mA, V_{GS}=10V R_G=6Ω
t_r	-	16	-		
$t_{d(OFF)}$	-	7.6	-		
t_f	-	14.4	-		
Qg	-	2.0	-	nC	V_{DS}=30V, I_D=500mA, V_{GS}=10V
Qgs	-	0.9	-		
Qgd	-	0.7	-		
Source-Drain Diode					
*I_S	-	-	200	mA	
*I_{SM}	-	-	800		
*V_{SD}	-	0.87	1.2	V	V_{GS}=0V, I_S=300mA
*trr	-	12.3	-	ns	I_F=500mA, dI_F/dt=100A/μs
*Qrr	-	5.6	-	nC	

*Pulse Test : Pulse Width ≤300μs, Duty Cycle≤2%

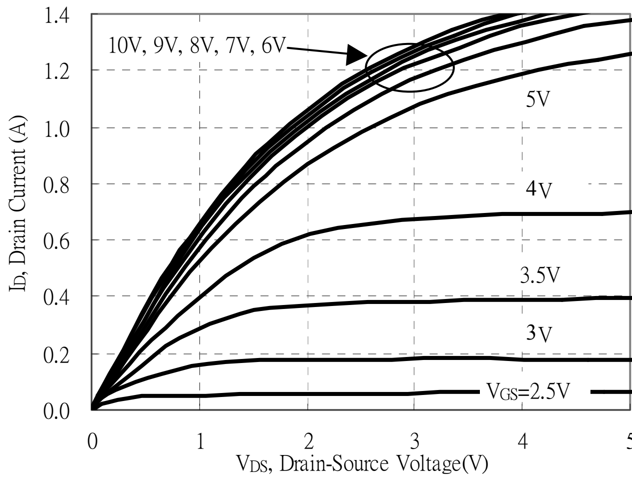
Schottky Barrier Diode (D1) @ T_A=25°C, unless otherwise specified

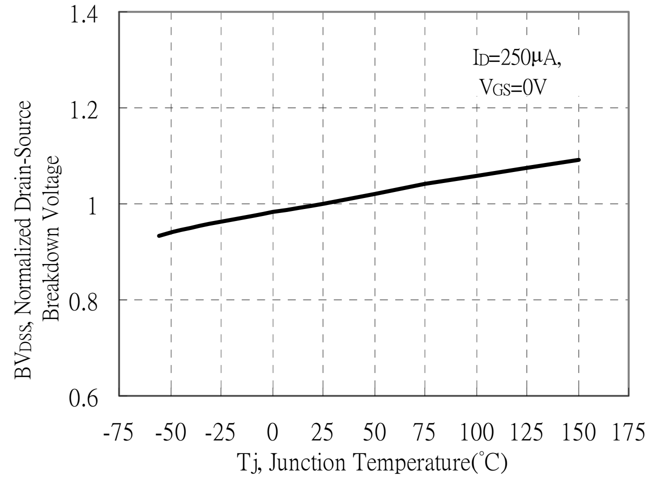
Characteristic	Symbol	Min	Typ	Max	Unit	Test Conditions
Reverse Breakdown Voltage	$V_{(BR)R}$	40	-	-	V	I_R=10μA
Forward Voltage Drop	V_{FM}	-	-	0.37	V	I_F=20mA
		-	-	0.6		I_F=200mA
Peak Reverse Current	I_{RM}	-	-	5	μA	V_R=30V
Total Capacitance	C_T	-	41	-	pF	V_R=0V, f=1MHz

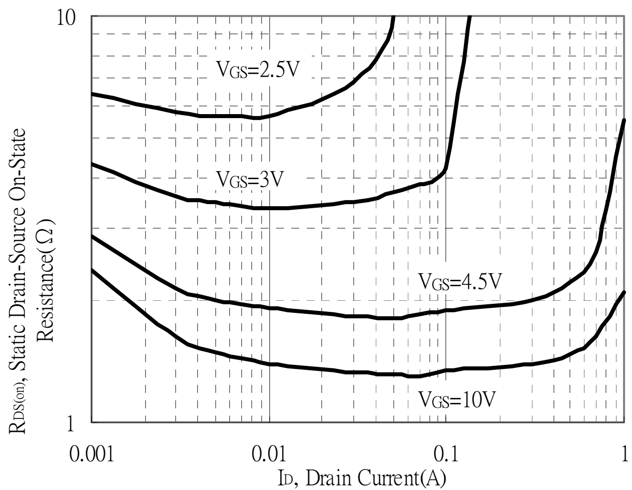
Typical Characteristics, total device

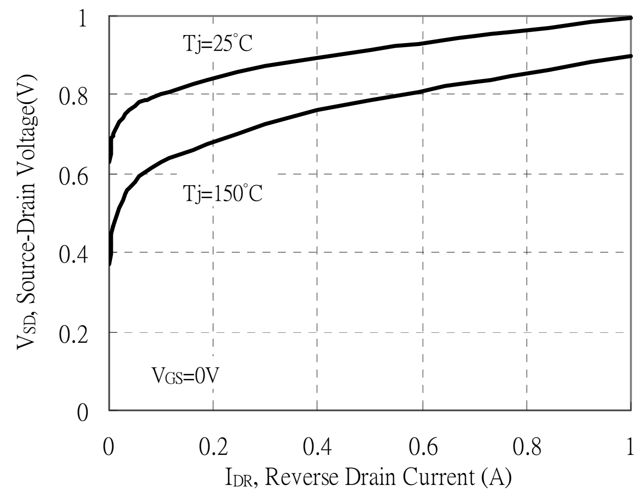


Typical Characteristics, NMOS (Q1)

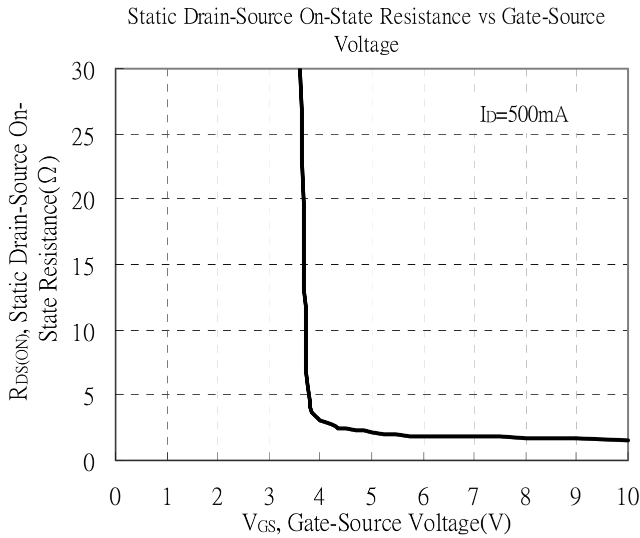


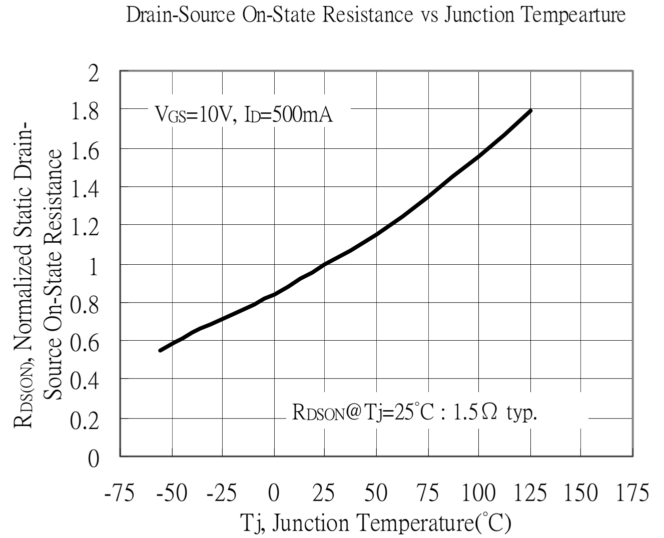


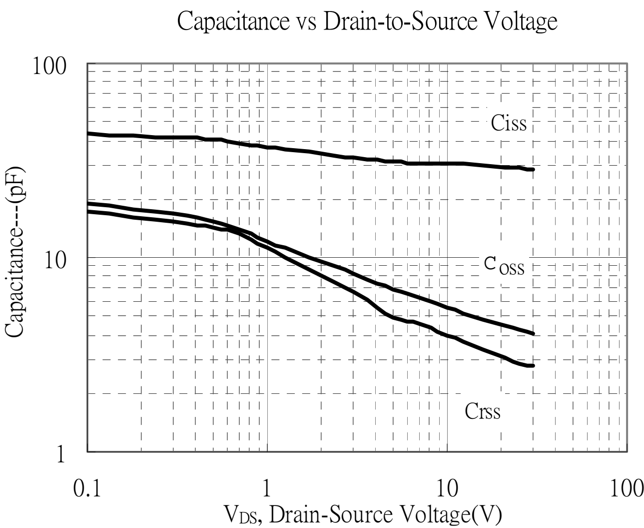


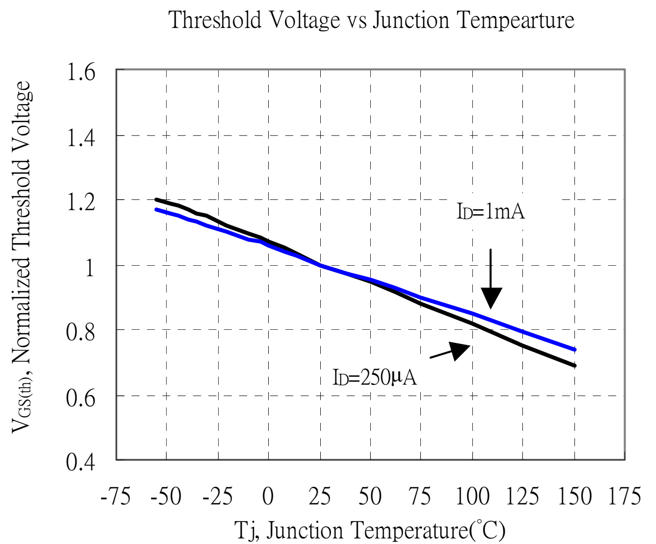


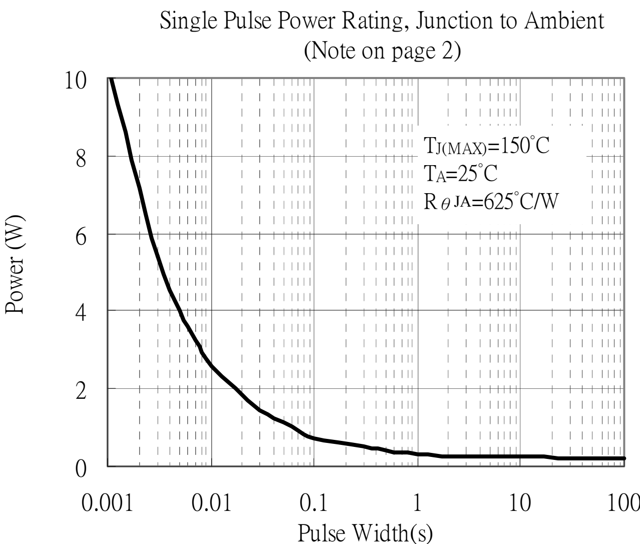
Typical Characteristics(Cont.), NMOS (Q1)

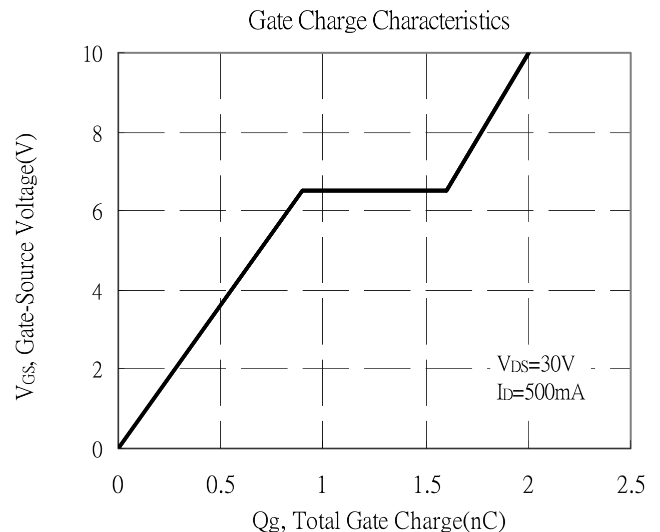




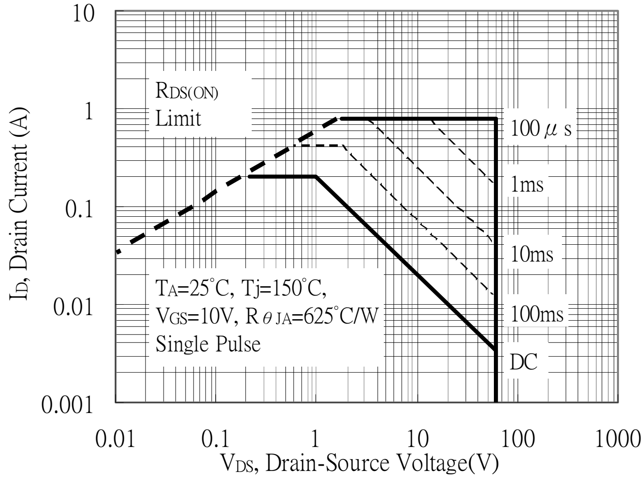


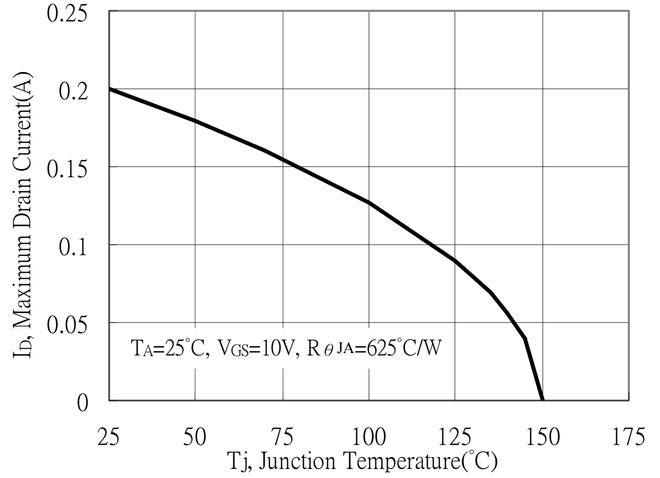


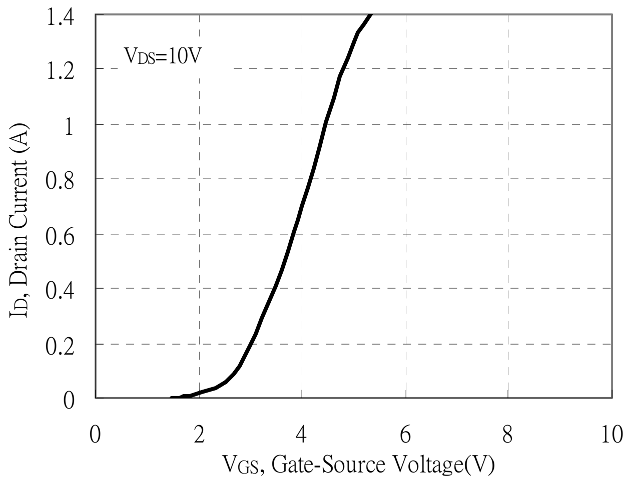


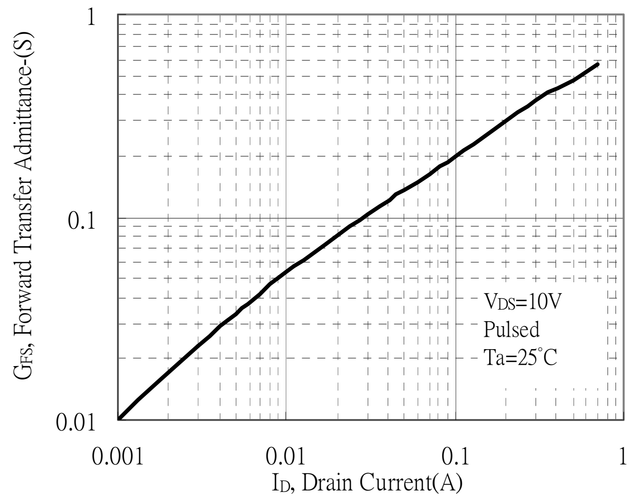


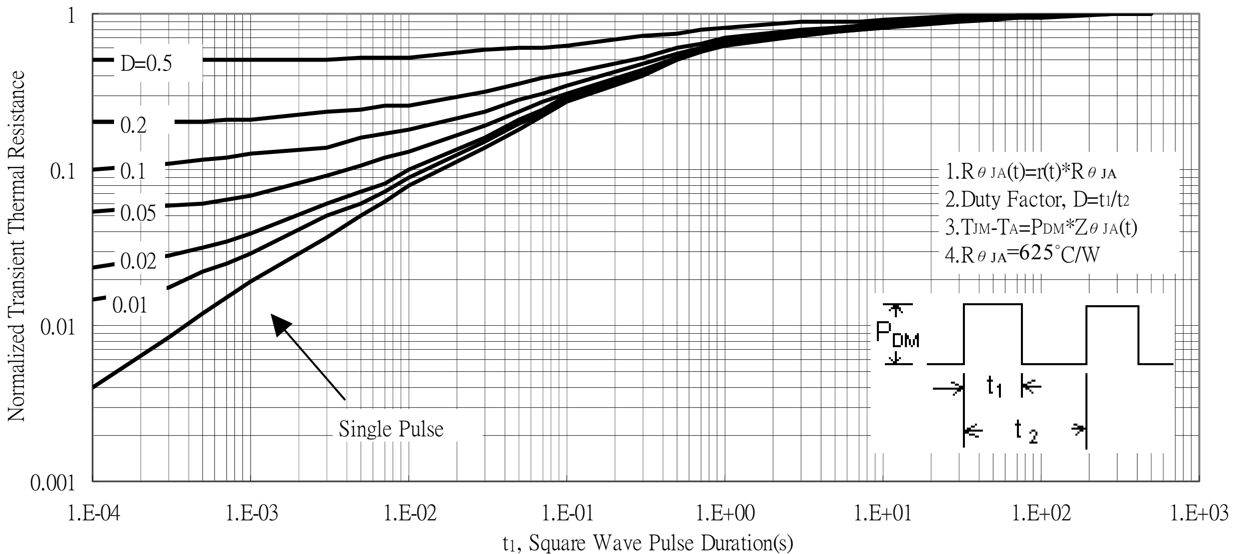
Typical Characteristics(Cont.), NMOS (Q1)



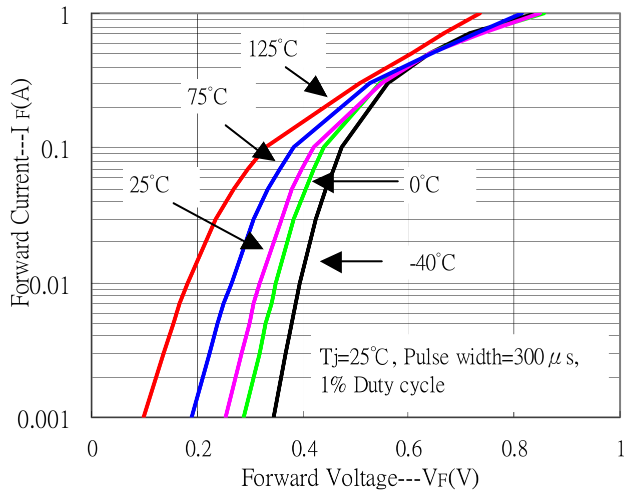


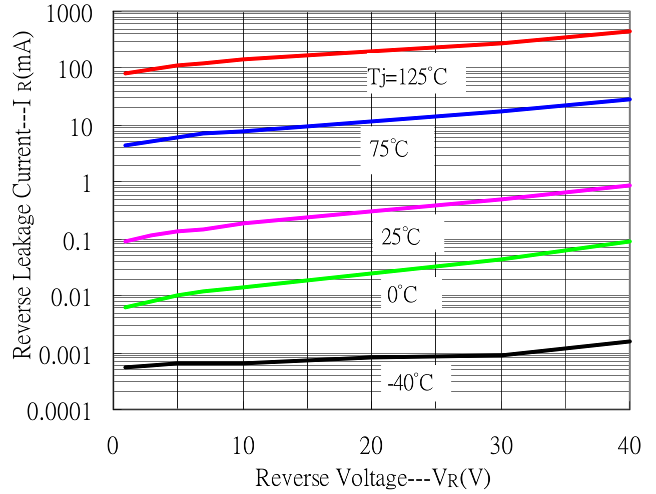


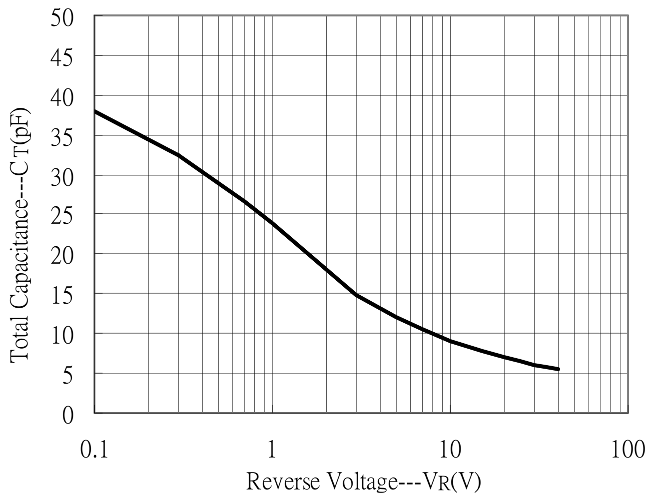




Typical Characteristics, Schottky Barrier Diode (D1)







Reel Dimension

Carrier Tape Dimension

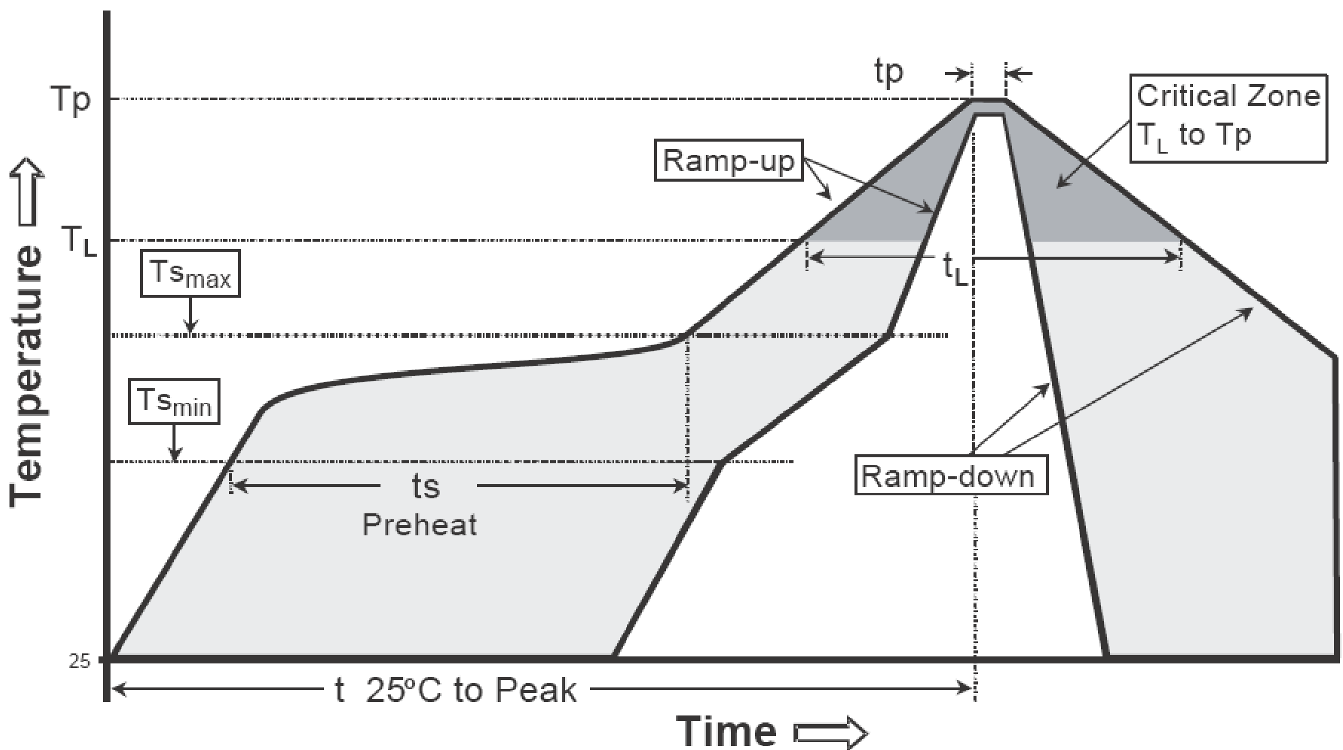
Notes:
1. 10 sprocket hole pitch cumulative tolerace ±0.2.
2. Camber not to exceed 1mm in 100mm.
3. Material: Conductive Black Polystyrene.
4. Ao & Bo measured on a plane 0.3mm above the bottom of the pocket.
5. Ko measured from a plane on the inside bottom of the pocket to the top surface of the carrier.
6. Pocket position relative to sprocket hole measured as true position of pocket, not pocket hole.

Unit : millimeter

Recommended wave soldering condition

Product	Peak Temperature	Soldering Time
Pb-free devices	260 +0/-5 °C	5 +1/-1 seconds

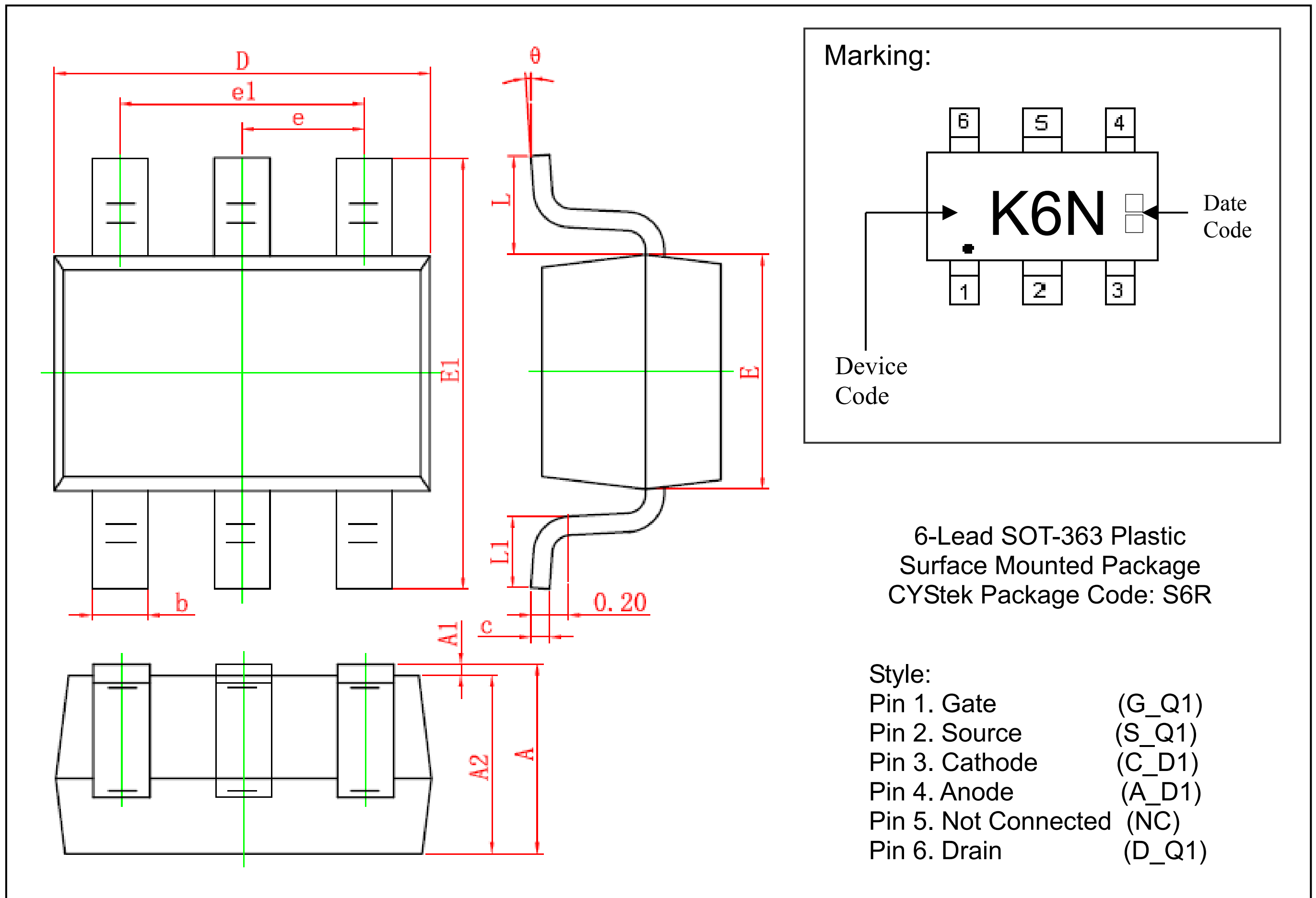
Recommended temperature profile for IR reflow



Profile feature	Sn-Pb eutectic Assembly	Pb-free Assembly
Average ramp-up rate (Tsmax to Tp)	3°C/second max.	3°C/second max.
Preheat −Temperature Min(T_S min) −Temperature Max(T_S max) −Time(ts min to ts max)	 100°C 150°C 60-120 seconds	 150°C 200°C 60-180 seconds
Time maintained above: −Temperature (T_L) − Time (t_L)	 183°C 60-150 seconds	 217°C 60-150 seconds
Peak Temperature(T_P)	240 +0/-5 °C	260 +0/-5 °C
Time within 5°C of actual peak temperature(tp)	10-30 seconds	20-40 seconds
Ramp down rate	6°C/second max.	6°C/second max.
Time 25 °C to peak temperature	6 minutes max.	8 minutes max.

Note : All temperatures refer to topside of the package, measured on the package body surface.

SOT-363 Dimension



6-Lead SOT-363 Plastic
Surface Mounted Package
CYStek Package Code: S6R

Style:
Pin 1. Gate (G_Q1)
Pin 2. Source (S_Q1)
Pin 3. Cathode (C_D1)
Pin 4. Anode (A_D1)
Pin 5. Not Connected (NC)
Pin 6. Drain (D_Q1)

DIM	Millimeters		Inches		DIM	Millimeters		Inches	
	Min.	Max.	Min.	Max.		Min.	Max.	Min.	Max.
A	0.900	1.100	0.035	0.043	E1	2.150	2.450	0.085	0.096
A1	0.000	0.100	0.000	0.004	e	0.650 TYP		0.026 TYP	
A2	0.900	1.000	0.035	0.039	e1	1.200	1.400	0.047	0.055
b	0.150	0.350	0.006	0.014	L	0.525 REF		0.021 REF	
c	0.080	0.150	0.003	0.006	L1	0.260	0.460	0.010	0.018
D	2.000	2.200	0.079	0.087	θ	0°	8°	0°	8°
E	1.150	1.350	0.045	0.053					

Notes : 1.Controlling dimension : millimeters.
2.Maximum lead thickness includes lead finish thickness, and minimum lead thickness is the minimum thickness of base material.
3.If there is any question with packing specification or packing method, please contact your local CYStek sales office.

Material :

- Lead : Pure tin plated.
- Mold Compound : Epoxy resin family, flammability solid burning class:UL94V-0.

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