

RoHS Compliant Product  
A suffix of "-C" specifies halogen and lead-free

## DESCRIPTION

The SUM138K-C is the highest performance trench Dual N-Ch MOSFETs with extreme high cell density, which provide excellent  $R_{DS(ON)}$  and gate charge for most of the synchronous buck converter applications.

The SUM138K-C meet the RoHS and Green Product requirement with full function reliability approved.

## FEATURES

- Advanced High Cell Density Trench Technology
- Super Low Gate Charge
- Green Device Available

## MARKING

138K

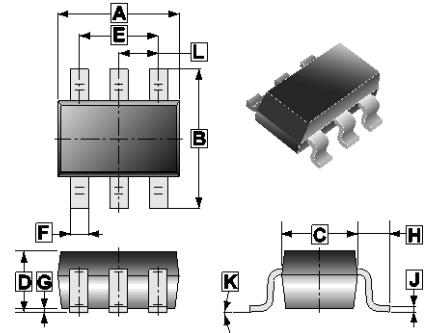
## PACKAGE INFORMATION

Package	MPQ	Leader Size
SOT-363	3K	7 inch

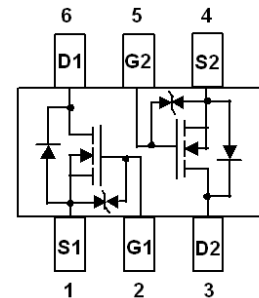
## ORDER INFORMATION

Part Number	Type
SUM138K-C	Lead (Pb)-free and Halogen-free

### SOT-363



REF.	Millimeter		REF.	Millimeter	
	Min.	Max.		Min.	Max.
A	1.80	2.20	G	0.100 REF.	
B	1.80	2.45	H	0.525 REF.	
C	1.15	1.35	J	0.08	0.25
D	0.80	1.10	K	8°	
E	1.10	1.50	L	0.650 TYP.	
F	0.10	0.35			



## ABSOLUTE MAXIMUM RATINGS

Parameter	Symbol	Ratings	Unit
Drain-Source Voltage	$V_{DS}$	60	V
Gate-Source Voltage	$V_{GS}$	$\pm 20$	V
Continuous Drain Current <sup>1</sup> , @ $V_{GS}=10V$	$I_D$	$T_A=25^\circ C$	0.4
		$T_A=70^\circ C$	0.28
Pulsed Drain Current <sup>3</sup>	$I_{DM}$	1	A
Total Power Dissipation	$P_D$	0.3	W
Operating Junction and Storage Temperature Range	$T_J, T_{STG}$	-55~150	$^\circ C$
<b>Thermal Data</b>			
Thermal Resistance Junction-Ambient <sup>1</sup>	$R_{\theta JA}$	417	$^\circ C/W$
Thermal Resistance Junction-Ambient <sup>2</sup>		625	
Thermal Resistance Junction-Case <sup>1</sup>	$R_{\theta JC}$	300	

**ELECTRICAL CHARACTERISTICS** ( $T_J=25^\circ\text{C}$  unless otherwise specified)

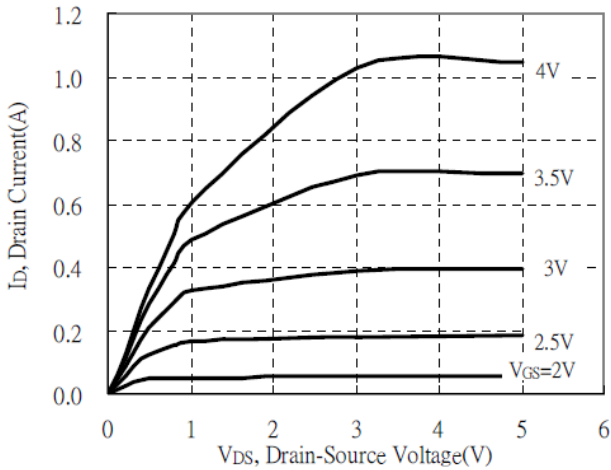
Parameter	Symbol	Min.	Typ.	Max.	Unit	Test Conditions	
Drain-Source Breakdown Voltage	$BV_{DSS}$	60	-	-	V	$V_{GS}=0, I_D=250\mu\text{A}$	
Gate Threshold Voltage	$V_{GS(th)}$	0.5	-	1.5	V	$V_{DS}=V_{GS}, I_D=1\text{mA}$	
Forward Transconductance	$g_{fs}$	-	0.36	-	S	$V_{DS}=10\text{V}, I_D=220\text{mA}$	
Gate-Source Leakage Current	$I_{GSS}$	-	-	$\pm 10$	$\mu\text{A}$	$V_{GS}=\pm 16\text{V}$	
Drain-Source Leakage Current	$I_{DSS}$	$T_J=25^\circ\text{C}$	-	-	1	$\mu\text{A}$	$V_{DS}=48\text{V}, V_{GS}=0$
		$T_J=55^\circ\text{C}$	-	-	5		$V_{DS}=48\text{V}, V_{GS}=0$
Static Drain-Source On-Resistance <sup>4</sup>	$R_{DS(ON)}$	-	-	1.6	$\Omega$	$V_{GS}=10\text{V}, I_D=220\text{mA}$	
		-	-	2		$V_{GS}=4.5\text{V}, I_D=220\text{mA}$	
		-	-	4.5		$V_{GS}=2.5\text{V}, I_D=120\text{mA}$	
Diode Forward Voltage <sup>4</sup>	$V_{SD}$	-	-	1.2	V	$V_{GS}=0, I_S=200\text{mA}, T_J=25^\circ\text{C}$	
Total Gate Charge	$Q_g$	-	0.69	-	nC	$I_D=100\text{mA}$ $V_{DS}=30\text{V}$ $V_{GS}=4.5\text{V}$	
Gate-Source Charge	$Q_{gs}$	-	0.3	-			
Gate-Drain Charge	$Q_{gd}$	-	0.18	-			
Turn-on Delay Time	$T_{d(on)}$	-	7	-	nS	$V_{DD}=30\text{V}$ $I_D=100\text{mA}$ $V_{GS}=4.5\text{V}$ $R_G=10\Omega$	
Rise Time	$T_r$	-	6.6	-			
Turn-off Delay Time	$T_{d(off)}$	-	20	-			
Fall Time	$T_f$	-	80	-			
Input Capacitance	$C_{iss}$	-	27	-	pF	$V_{GS}=0$ $V_{DS}=25\text{V}$ $f=1\text{MHz}$	
Output Capacitance	$C_{oss}$	-	13	-			
Reverse Transfer Capacitance	$C_{rss}$	-	6	-			

Notes:

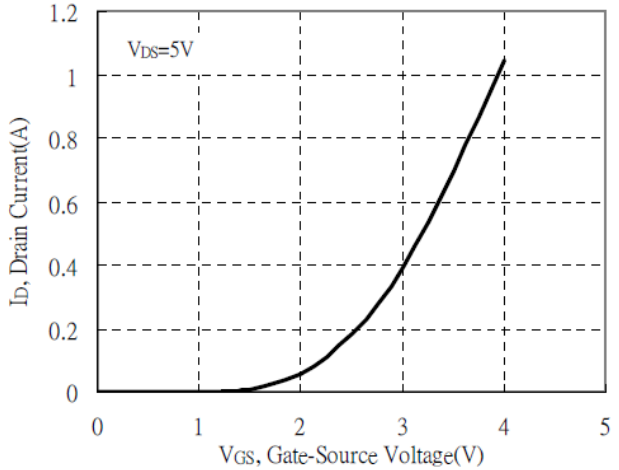
1. Surface mounted on a 1 inch<sup>2</sup> FR-4 board with 20Z copper.
2. Surface mounted on FR4 Board using the minimum recommended pad size.
3. Pulse width limited by maximum junction temperature, Pulse Width  $\leq 300\mu\text{s}$ , Duty Cycle  $\leq 2\%$ .
4. The data tested by pulsed, pulse width  $\leq 300\mu\text{s}$ , duty cycle  $\leq 2\%$ .

**CHARACTERISTIC CURVES**

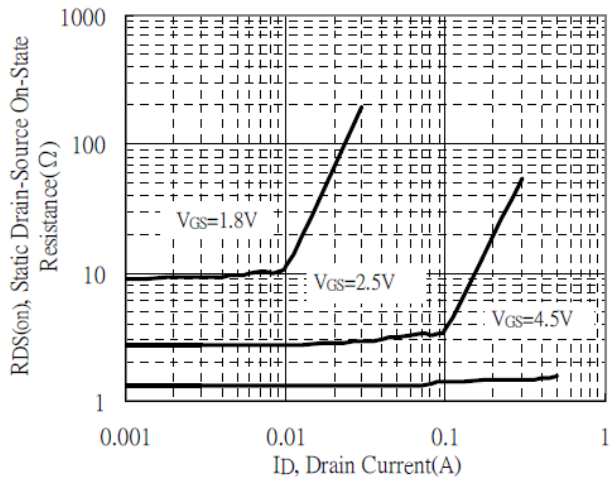
Typical Output Characteristics



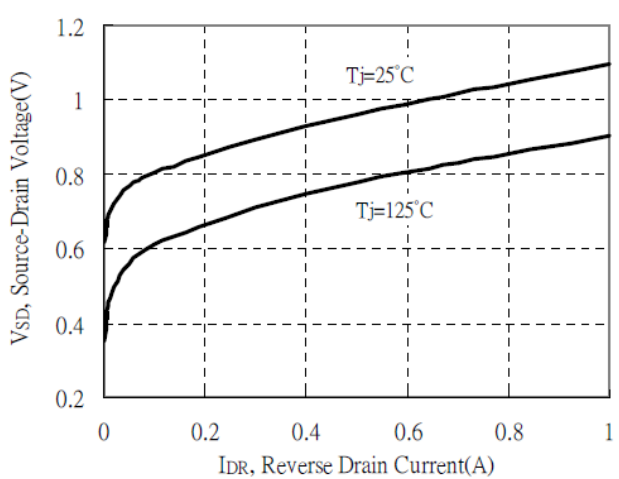
Typical Transfer Characteristics



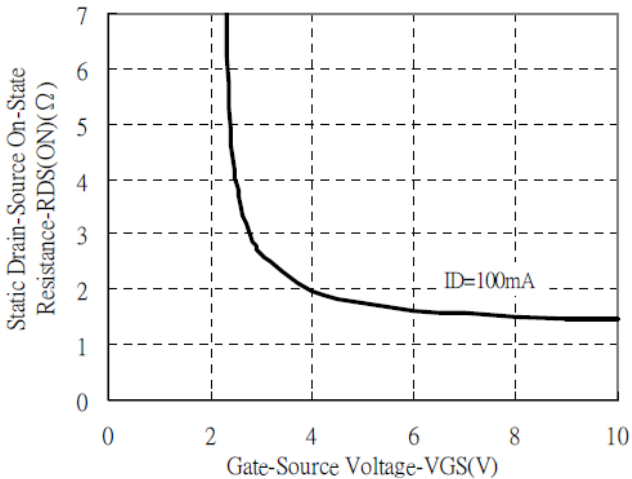
Static Drain-Source On-State resistance vs Drain Current



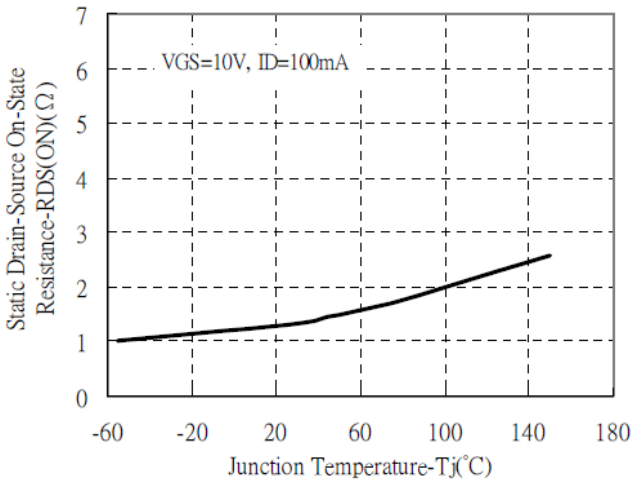
Reverse Drain Current vs Source-Drain Voltage



Static Drain-Source On-State Resistance vs Gate-Source Voltage

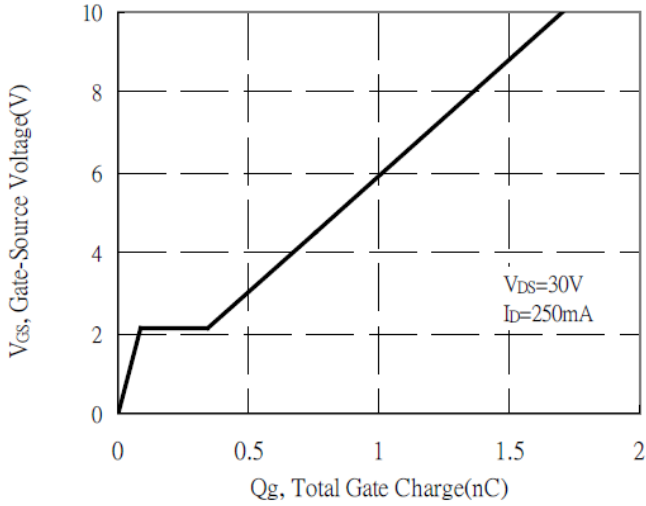


Drain-Source On-State Resistance vs Junction Temperature

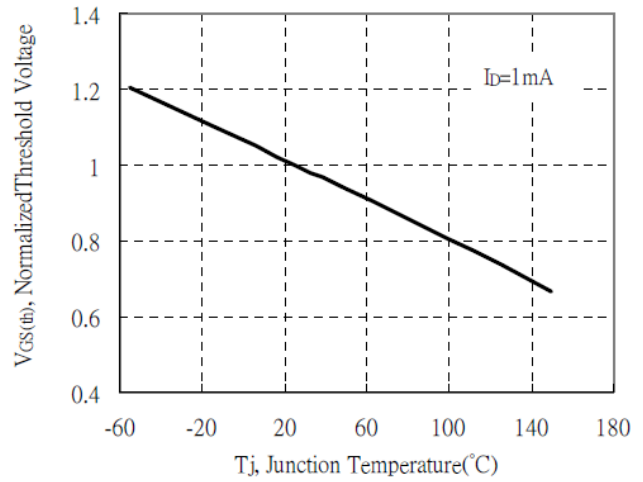


**CHARACTERISTIC CURVES**

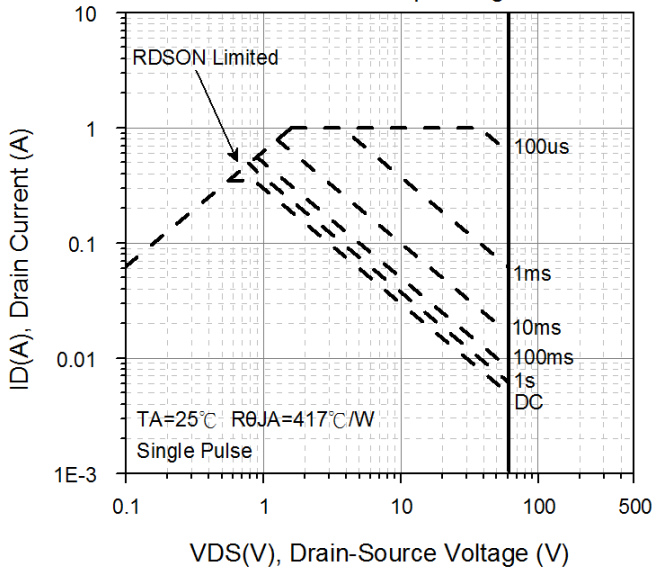
Gate Charge Characteristics



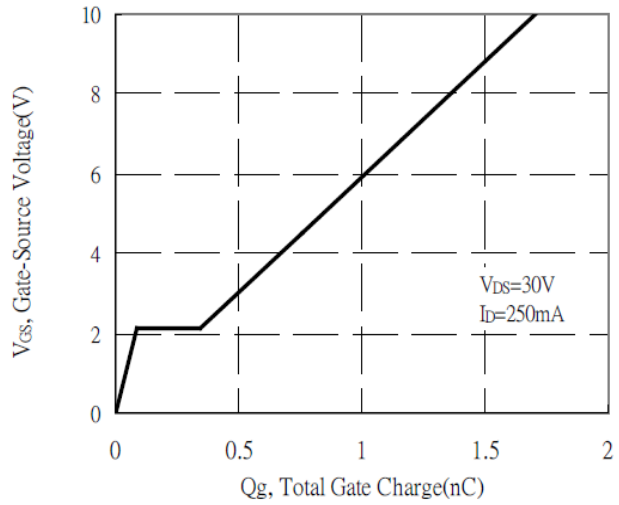
Threshold Voltage vs Junction Temperature



Maximum Safe Operating Area



Gate Charge Characteristics



Transient Thermal Response Curves

