

# GTM CORPORATION

ISSUED DATE :2005/04/27  
 REVISED DATE :2005/07/14B

## G138K

### N-CHANNEL ENHANCEMENT MODE POWER MOSFET

BVDSS	50V
RDS(ON)	2Ω
ID	640mA

#### Description

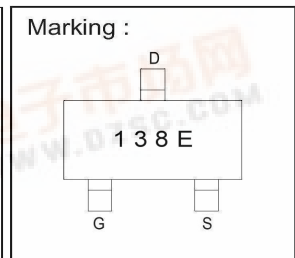
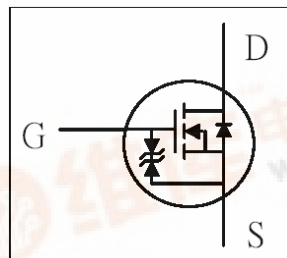
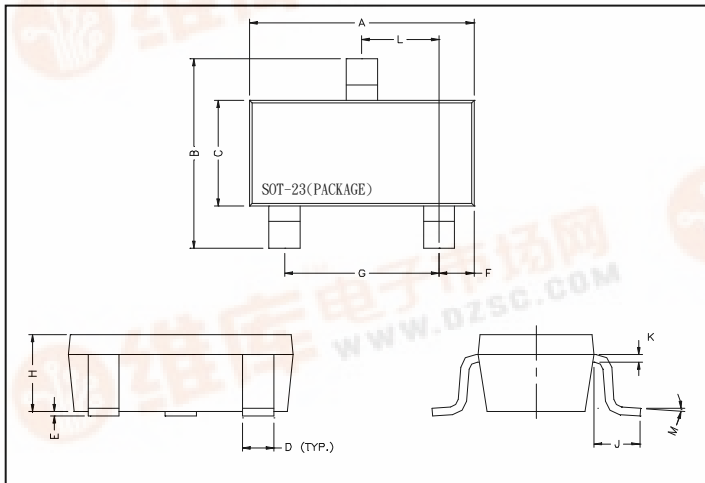
The G138K utilized advanced processing techniques to achieve the lowest possible on-resistance, extremely efficient and cost-effectiveness device.

The G138K is universally used for all commercial-industrial applications.

#### Features

- \*Simple Drive Requirement
- \*Small Package Outline
- \*RoHS Compliant

#### Package Dimensions



REF.	Millimeter		REF.	Millimeter	
	Min.	Max.		Min.	Max.
A	2.70	3.10	G	1.90	REF.
B	2.40	2.80	H	1.00	1.30
C	1.40	1.60	K	0.10	0.20
D	0.35	0.50	J	0.40	-
E	0	0.10	L	0.85	1.15
F	0.45	0.55	M	0	10°

#### Absolute Maximum Ratings

Parameter	Symbol	Ratings	Unit
Drain-Source Voltage	$V_{DS}$	50	V
Gate-Source Voltage	$V_{GS}$	±20	V
Continuous Drain Current <sup>3</sup> , $V_{GS}@10V$	$I_D @TA=25^{\circ}C$	640	mA
Continuous Drain Current <sup>3</sup> , $V_{GS}@10V$	$I_D @TA=70^{\circ}C$	500	mA
Pulsed Drain Current <sup>1,2</sup>	$I_{DM}$	950	mA
Power Dissipation	$P_D @TA=25^{\circ}C$	1.38	W
Linear Derating Factor		0.01	W/°C
Operating Junction and Storage Temperature Range	$T_j, T_{stg}$	-55 ~ +150	°C

#### Thermal Data

Parameter	Symbol	Ratings	Unit
Thermal Resistance Junction-ambient <sup>3</sup> Max.	$R_{thj-a}$	90	°C/W

**Electrical Characteristics(T<sub>j</sub> = 25°C Unless otherwise specified)**

Parameter	Symbol	Min.	Typ.	Max.	Unit	Test Conditions
Drain-Source Breakdown Voltage	BV <sub>DSS</sub>	50	-	-	V	V <sub>GS</sub> =0, I <sub>D</sub> =250uA
Breakdown Voltage Temperature Coefficient	$\Delta BV_{DSS} / \Delta T_j$	-	0.06	-	V/°C	Reference to 25°C, I <sub>D</sub> =1mA
Gate Threshold Voltage	V <sub>GS(th)</sub>	0.5	-	2.0	V	V <sub>DS</sub> =V <sub>GS</sub> , I <sub>D</sub> =1mA
Forward Transconductance	g <sub>fs</sub>	-	600	-	mS	V <sub>DS</sub> =10V, I <sub>D</sub> =600mA
Gate-Source Leakage Current	I <sub>GSS</sub>	-	-	±10	uA	V <sub>GS</sub> = ±20V
Drain-Source Leakage Current(T <sub>j</sub> =25°C)	I <sub>DSS</sub>	-	-	1	uA	V <sub>DS</sub> =50V, V <sub>GS</sub> =0
Drain-Source Leakage Current(T <sub>j</sub> =70°C)		-	-	100	uA	V <sub>DS</sub> =40V, V <sub>GS</sub> =0
Static Drain-Source On-Resistance	R <sub>DS(ON)</sub>	-	-	2	Ω	V <sub>GS</sub> =10V, I <sub>D</sub> =500mA
		-	-	4		V <sub>GS</sub> =4.5V, I <sub>D</sub> =400mA
Total Gate Charge <sup>2</sup>	Q <sub>g</sub>	-	1	1.6	nC	I <sub>D</sub> =600mA V <sub>DS</sub> =50V V <sub>GS</sub> =4.5V
Gate-Source Charge	Q <sub>gs</sub>	-	0.5	-		
Gate-Drain ("Miller") Change	Q <sub>gd</sub>	-	0.5	-		
Turn-on Delay Time <sup>2</sup>	T <sub>d(on)</sub>	-	12	-	ns	V <sub>DS</sub> =30V I <sub>D</sub> =600mA V <sub>GS</sub> =10V R <sub>G</sub> =3.3Ω R <sub>D</sub> =52Ω
Rise Time	T <sub>r</sub>	-	10	-		
Turn-off Delay Time	T <sub>d(off)</sub>	-	56	-		
Fall Time	T <sub>f</sub>	-	29	-		
Input Capacitance	C <sub>iss</sub>	-	32	50	pF	V <sub>GS</sub> =0V V <sub>DS</sub> =25V f=1.0MHz
Output Capacitance	C <sub>oss</sub>	-	8	-		
Reverse Transfer Capacitance	C <sub>rss</sub>	-	6	-		

**Source-Drain Diode**

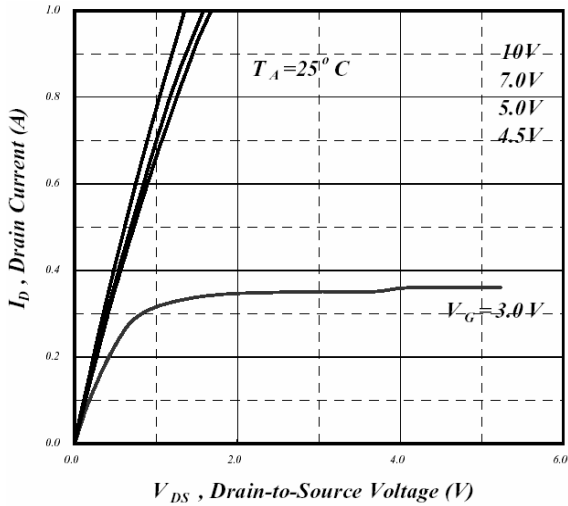
Parameter	Symbol	Min.	Typ.	Max.	Unit	Test Conditions
Forward On Voltage <sup>2</sup>	V <sub>SD</sub>	-	-	1.2	V	I <sub>S</sub> =200mA, V <sub>GS</sub> =0V

Notes: 1. Pulse width limited by Max. junction temperature.

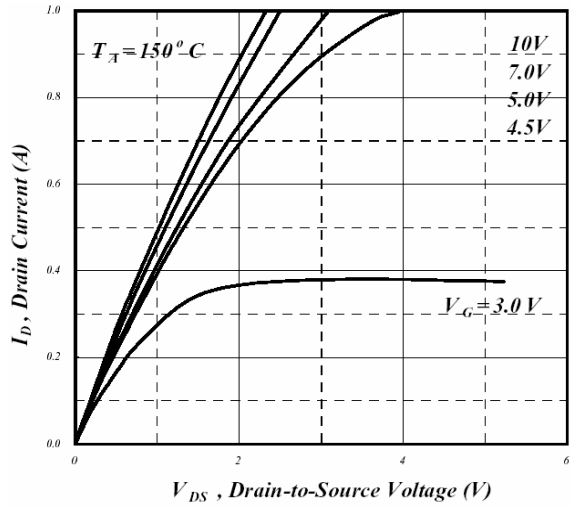
2. Pulse width ≤ 300us, duty cycle ≤ 2%.

3. Surface mounted on 1 in<sup>2</sup> copper pad of FR4 board; 270°C/W when mounted on Min. copper pad.

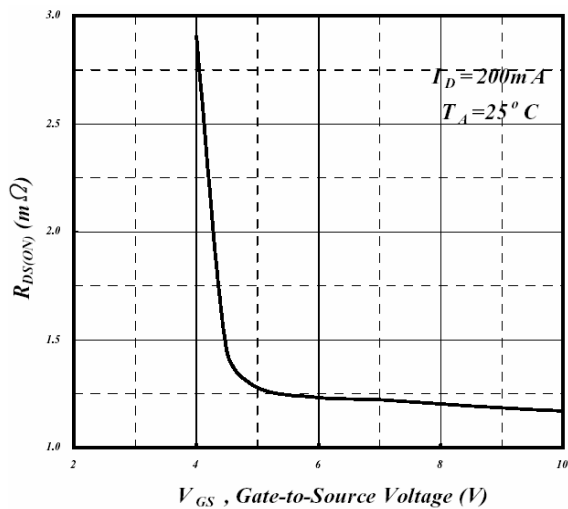
## Characteristics Curve



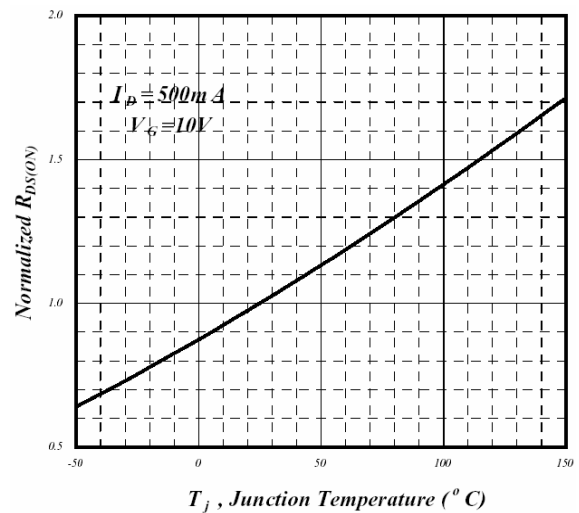
**Fig 1. Typical Output Characteristics**



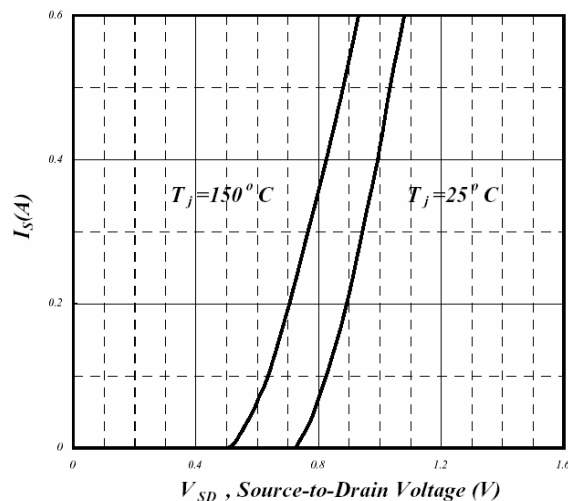
**Fig 2. Typical Output Characteristics**



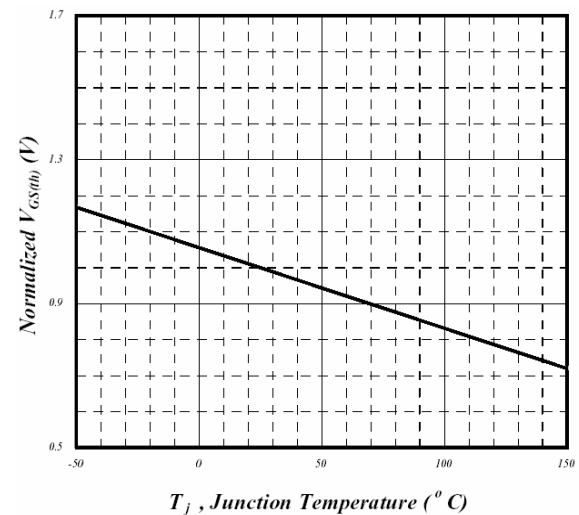
**Fig 3. On-Resistance v.s. Gate Voltage**



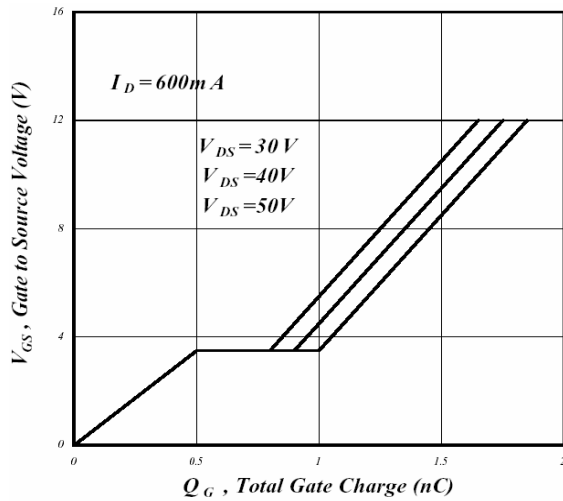
**Fig 4. Normalized On-Resistance v.s. Junction Temperature**



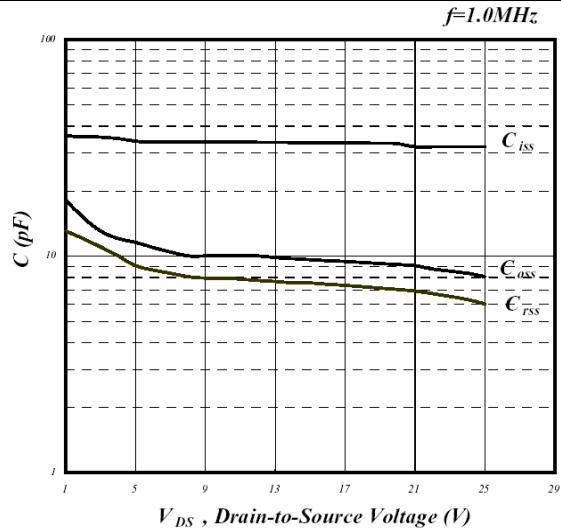
**Fig 5. Forward Characteristics of Reverse Diode**



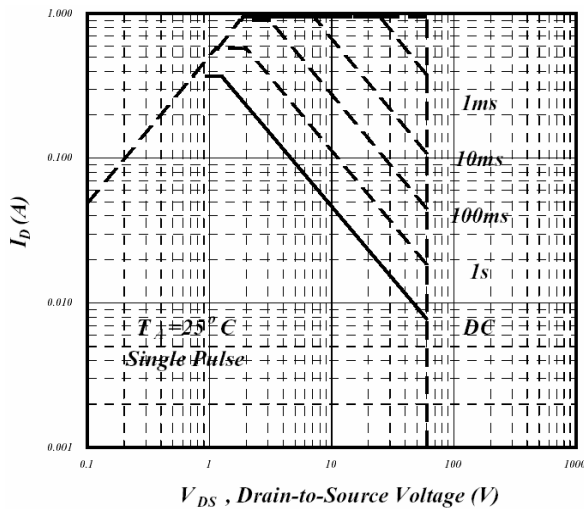
**Fig 6. Gate Threshold Voltage v.s. Junction Temperature**



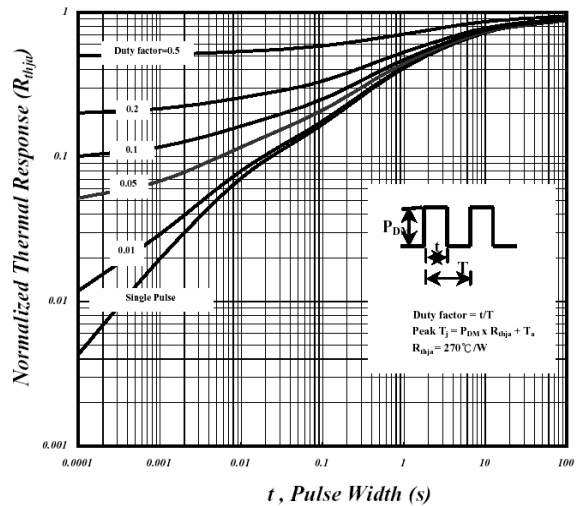
**Fig 7. Gate Charge Characteristics**



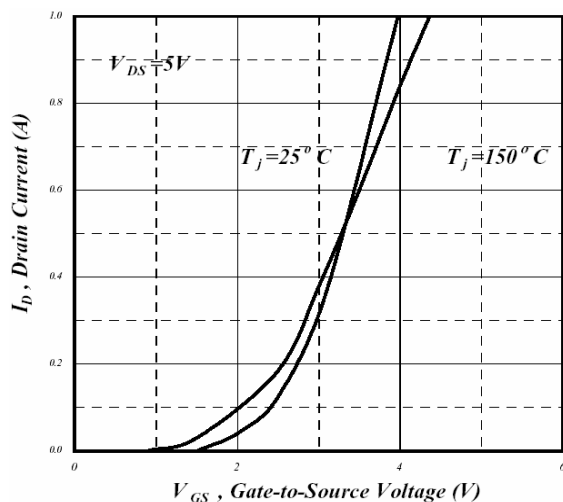
**Fig 8. Typical Capacitance Characteristics**



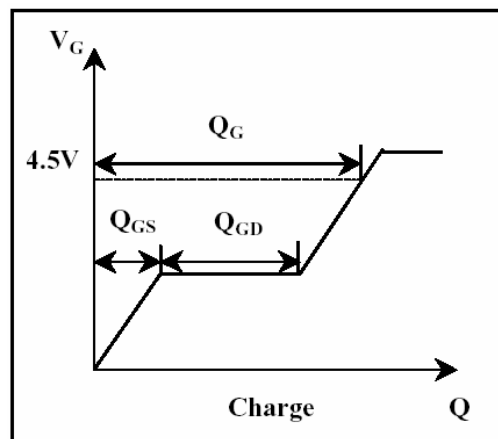
**Fig 9. Maximum Safe Operating Area**



**Fig 10. Effective Transient Thermal Impedance**



**Fig 11. Transfer Characteristics**



**Fig 12. Gate Charge Waveform**

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