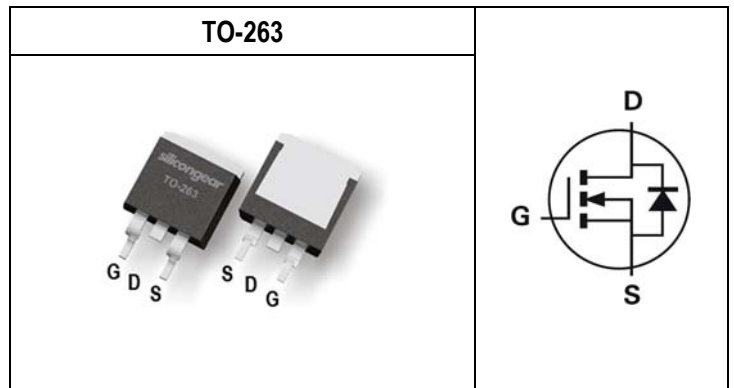


Parameter	Value	Unit
$V_{DSS}$	60	V
$R_{DS(ON) \max.} V_{GS}=10V$	2.3	m $\Omega$
$R_{DS(ON) \max.} V_{GS}=4.5V$	3.5	m $\Omega$
$I_D$	177	A
$Q_g$	89	nC
$Q_{gd}$	18.2	nC
$Q_{SW}$	27.5	nC



Features	Application
<ul style="list-style-type: none"> <li>Optimized for synchronous rectification Low Input Capacitance</li> <li>Low Switching Charge</li> <li>Low Miller Capacitance</li> <li>Fully Characterized Capacitance and Avalanche</li> <li>Pb-free lead plating; RoHS compliant</li> </ul>	<ul style="list-style-type: none"> <li>Battery powered circuits</li> <li>BLDC Motor drive applications</li> <li>Half-bridge and full-bridge topologies</li> <li>Synchronous rectifier applications</li> <li>Resonant mode power supplies</li> </ul>

## Ordering Information

Ordering Code	RoHS Status	Package	Package Code	Packing	Quantity
DG60N11G	Halogen-Free	TO-263	G	Tape & Reel	800

## Absolute Maximum Ratings ( $T_J=25^\circ\text{C}$ unless otherwise noted)

Parameter	Symbol	Value	Unit
Drain-Source Voltage	$V_{DS}$	60	V
Gate-Source Voltage	$V_{GS}$	$\pm 20$	V
Drain Current-Continuous <sup>Note 1</sup>	$I_D$	$T_C=25^\circ\text{C}$	177
		$T_C=100^\circ\text{C}$	112
Drain Current-Pulsed <sup>Note 2</sup>	$I_{DM}$	354	A
Avalanche Current	$I_{AR}$	64	A
Single Pulse Avalanche Energy <sup>Note 3</sup>	$E_{AS}$	205	mJ
Maximum Power Dissipation	$P_D$	$T_C=25^\circ\text{C}$	121
		$T_C=100^\circ\text{C}$	48
Operating and Storage Temperature Range	$T_J, T_{STG}$	-55 to 150	$^\circ\text{C}$

## Thermal Resistance Ratings

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Thermal resistance, Junction-to-Ambient <sup>Note 4</sup>	$R_{\theta JA}$	Steady State	-	-	51.62	$^\circ\text{C/W}$
Thermal resistance, Junction-to-Case <sup>Note 4</sup>	$R_{\theta JC}$	Steady State	-	-	1.03	$^\circ\text{C/W}$

### Notes:

- Limited by silicon chip capability and junction temperature.
- Must be ensure junction temperature does not exceed 150-degree C. (Pulse Width  $\leq 100\mu\text{s}$ , Duty  $\leq 2\%$ )
- Limited by  $T_{J\max}$ , starting  $T_J=25^\circ\text{C}$ ,  $L=0.1\text{mH}$ ,  $R_g=25\Omega$ ,  $I_D=64\text{A}$ ,  $V_{GS}=10\text{V}$ .
- $R_{\theta JA}$  is the sum of the junction-to-case and case-to-ambient thermal resistance where the case thermal reference is defined as the solder mounting surface of the drain pins.  $R_{\theta JC}$  is guaranteed by design while  $R_{\theta JA}$  is determined by the user's board design.  $R_{\theta JA}$  shown below for single device operation on FR-4 in still air.

**Electrical Characteristics (T<sub>J</sub>=25°C unless otherwise noted)**

STATIC CHARACTERISTICS						
Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Drain-Source Breakdown Voltage	$V_{(BR)DSS}$	$V_{GS}=0V, I_{DS}=250\mu A$	60	-	-	V
Zero Gate Voltage Drain Current	$I_{DSS}$	$V_{DS}=60V, V_{GS}=0V$	-	-	1	$\mu A$
		$V_{DS}=60V, V_{GS}=0V, T_J=125^\circ C$	-	-	100	$\mu A$
Gate-Body Leakage	$I_{GSS}$	$V_{GS}=\pm 20V, V_{DS}=0V$	-	-	$\pm 100$	nA

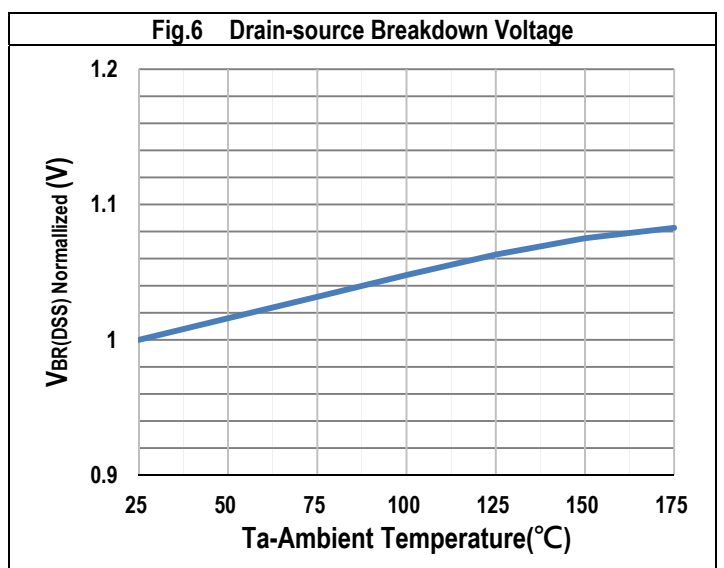
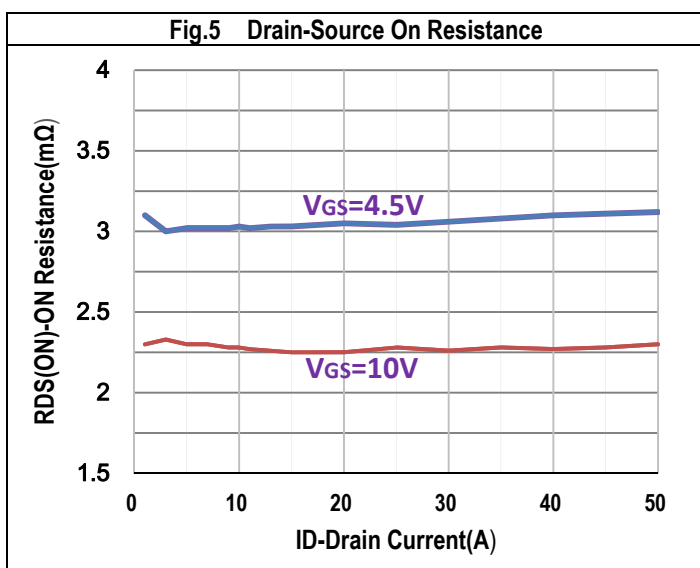
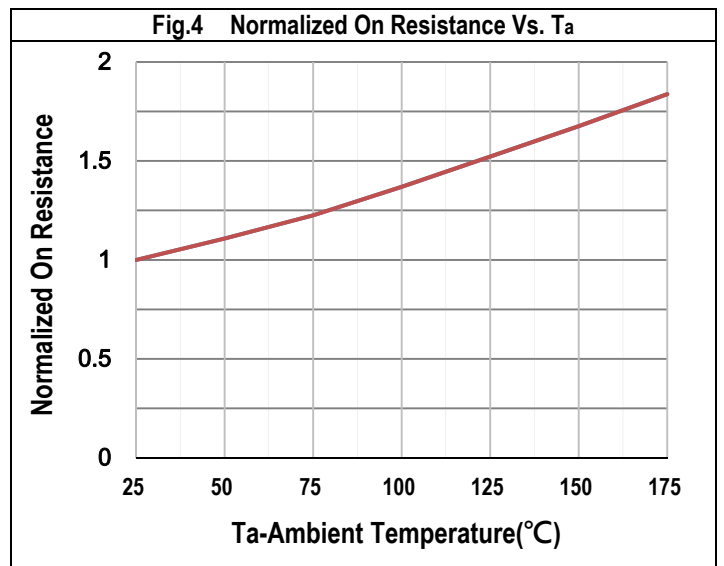
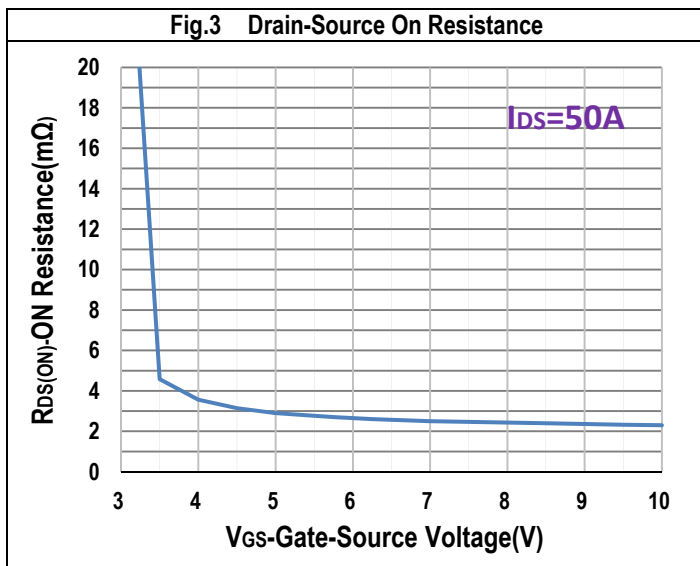
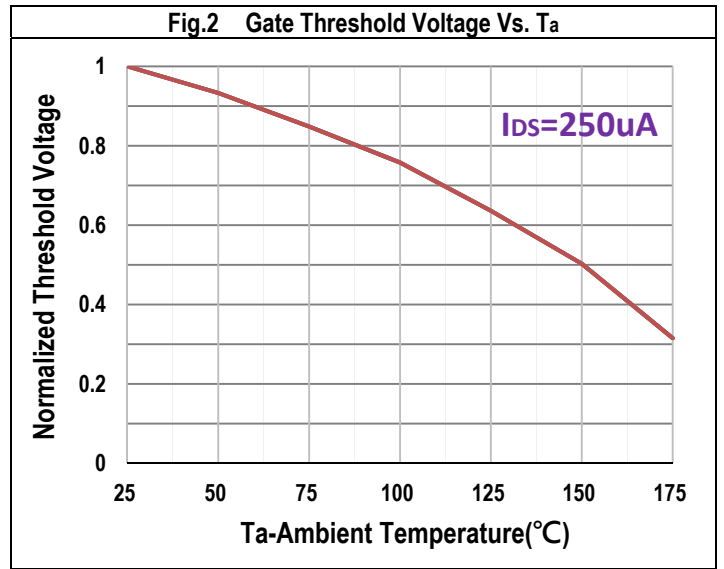
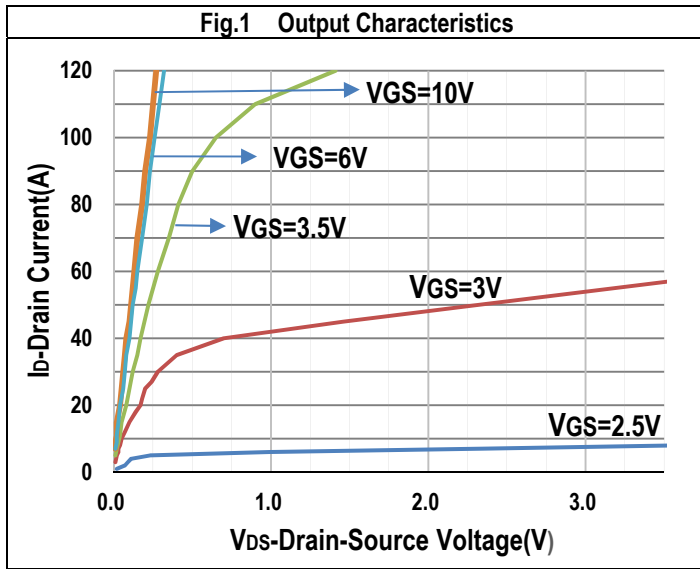
STATIC CHARACTERISTICS						
Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Gate Threshold Voltage	$V_{GS(TH)}$	$V_{DS}=V_{GS}, I_{DS}=250\mu A$	1.2	1.6	2.4	V
Drain-Source On-State Resistance	$R_{DS(ON)}$	$V_{GS}=10V, I_{DS}=50A$	-	1.8	2.3	m $\Omega$
Drain-Source On-State Resistance	$R_{DS(ON)}$	$V_{GS}=4.5V, I_{DS}=20A$	-	2.6	3.5	m $\Omega$
Gate Resistance	$R_g$	$V_{GS}=15mV, V_{DS}=0V, f=1MHz$	-	1.1	-	$\Omega$
Forward Transconductance	$g_{fs}$	$V_{DS}=5V, I_{DS}=20A$	-	55	-	S

DYNAMIC CHARACTERISTICS						
Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Input Capacitance	$C_{iss}$	$V_{DS}=30V, V_{GS}=0V, f=1MHz$	-	5271	-	pF
Output Capacitance	$C_{oss}$	$V_{DS}=30V, V_{GS}=0V, f=1MHz$	-	1457	-	pF
Reverse Transfer Capacitance	$C_{rss}$	$V_{DS}=30V, V_{GS}=0V, f=1MHz$	-	46	-	pF
Turn-On Delay Time	$T_{d(on)}$	$V_{DS}=30V, V_{GS}=4.5V, I_{DS}=50A, R_{GEN}=3\Omega$	-	28	-	ns
Rise Time	$t_r$	$V_{DS}=30V, V_{GS}=4.5V, I_{DS}=50A, R_{GEN}=3\Omega$	-	135	-	ns
Turn-Off Delay Time	$T_{d(off)}$	$V_{DS}=30V, V_{GS}=4.5V, I_{DS}=50A, R_{GEN}=3\Omega$	-	22	-	ns
Fall Time	$t_f$	$V_{DS}=30V, V_{GS}=4.5V, I_{DS}=50A, R_{GEN}=3\Omega$	-	168	-	ns

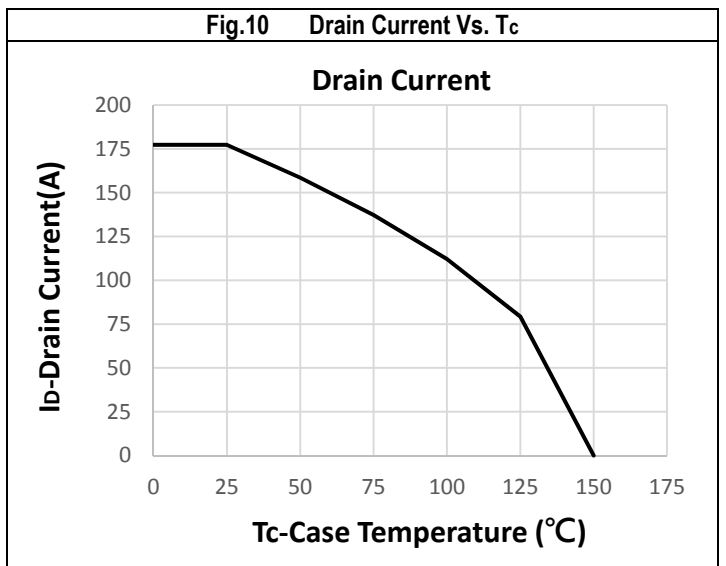
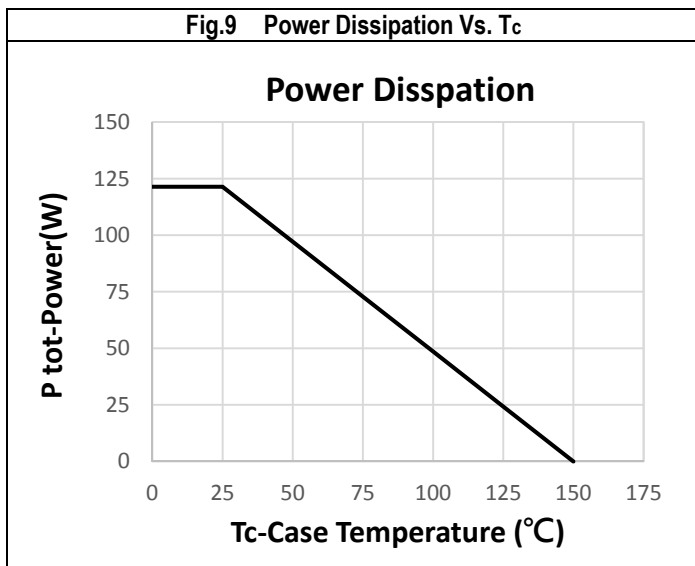
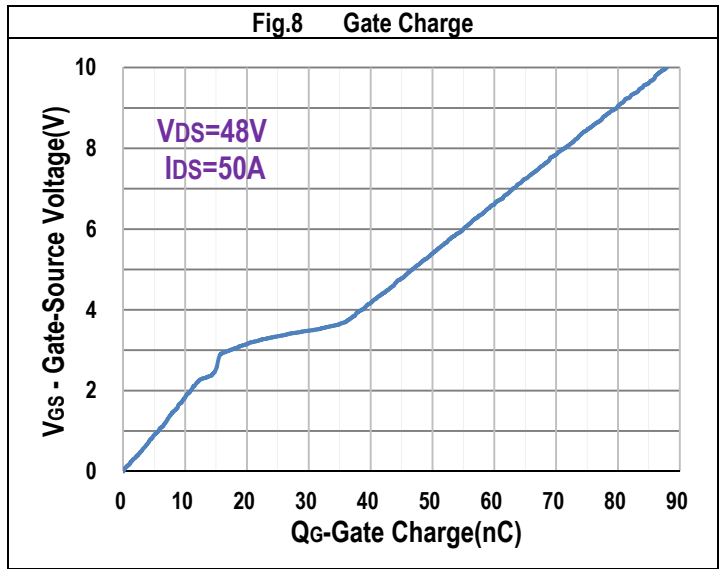
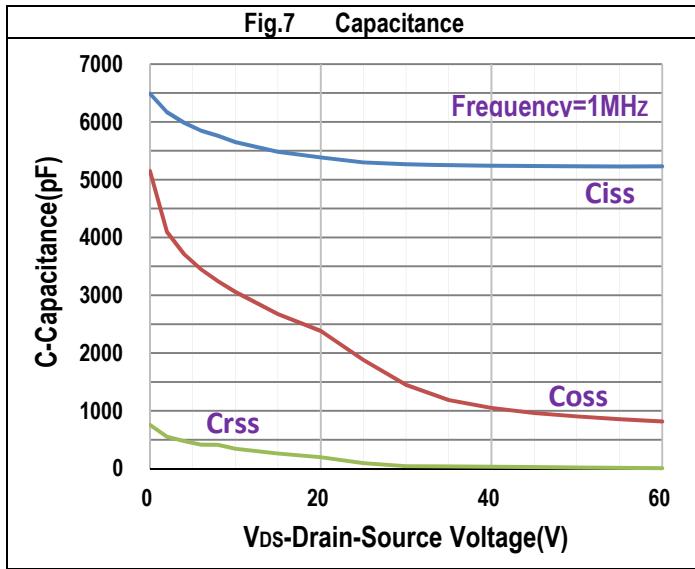
GATE CHARGE CHARACTERISTICS						
Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Gate to Source Gate Charge	$Q_{gs}$	$V_{DD}=48V, I_D=20A, V_{GS}=0$ to 10V	-	18	-	nC
Gate charge at threshold	$Q_{g(th)}$	$V_{DD}=48V, I_D=20A, V_{GS}=0$ to 10V	-	8.8	-	nC
Gate to Drain Charge	$Q_{gd}$	$V_{DD}=48V, I_D=20A, V_{GS}=0$ to 10V	-	18.2	-	nC
Switching charge	$Q_{SW}$	$V_{DD}=48V, I_D=20A, V_{GS}=0$ to 10V	-	27.5	-	nC
Gate charge total	$Q_g$	$V_{DD}=48V, I_D=20A, V_{GS}=0$ to 10V	-	89	-	nC
Gate charge total	$Q_g$	$V_{DD}=48V, I_D=20A, V_{GS}=0$ to 4.5V	-	45	-	nC
Gate plateau voltage	$V_{plateau}$	$V_{DD}=48V, I_D=20A, V_{GS}=0$ to 10V	-	3.3	-	V
Gate charge total, sync. FET ( $Q_g - Q_{gd}$ )	$Q_{g(sync)}$	$V_{DS}=0.1V, V_{GS}=0$ to 10V	-	70.8	-	nC

DRAIN-SOURCE DIODE CHARACTERISTICS AND MAXIMUM RATINGS						
Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Diode continuous forward current (Body Diode)	$I_S$	$T_C=25^\circ C$	-	-	177	A
Diode pulse current (Body Diode)	$I_{SM}$	$T_C=25^\circ C$	-	-	354	A
Diode Forward Voltage	$V_{SD}$	$V_{GS}=0V, I_S=1A$	-	0.65	1	V
Body Diode Reverse Recovery Time	$t_{rr}$	$V_{DD}=48V, I_F=50A, di/dt=200A/\mu s$	-	40	-	ns
Body Diode Reverse Recovery Charge	$Q_{rr}$	$V_{DD}=48V, I_F=50A, di/dt=200A/\mu s$	-	67	-	nC

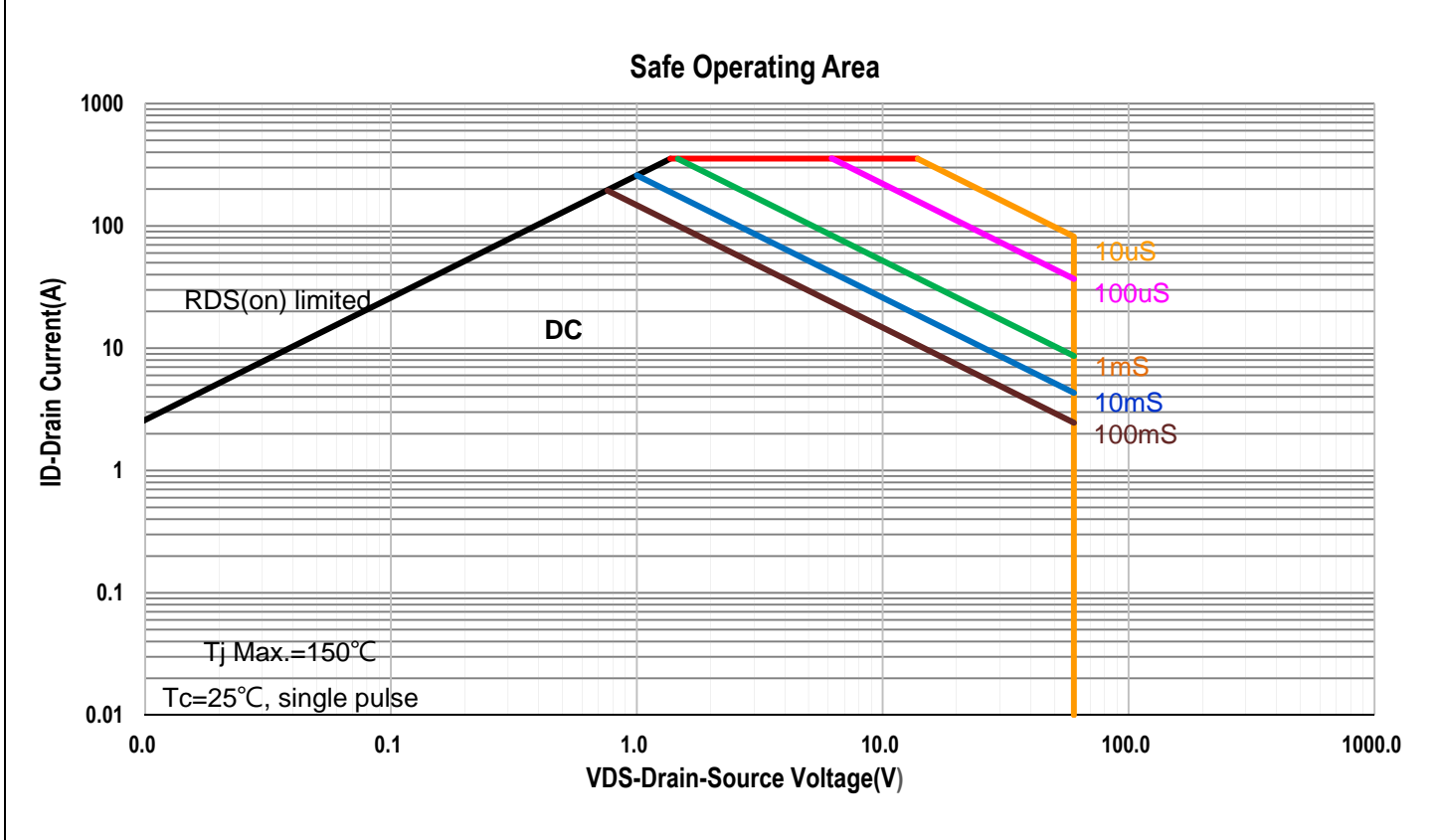
Typical Operating Characteristics



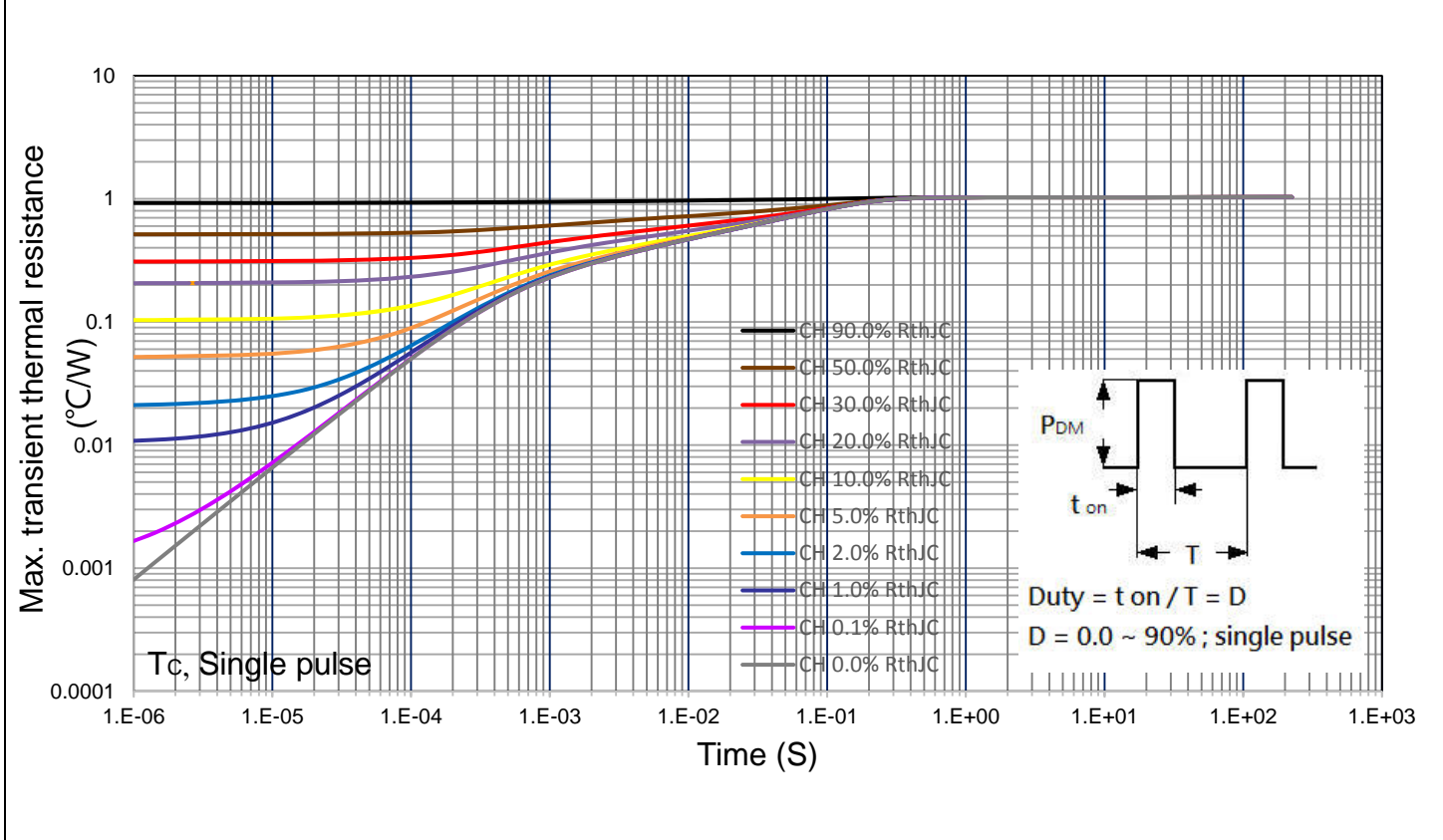
Typical Operating Characteristics (Cont.)



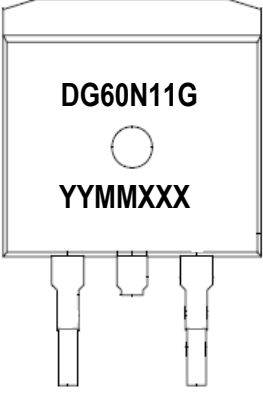
**Fig.11 Safe Operation Area**



**Fig.12 Transient Thermal Impedance**



**Marking Information**

TO-263 (G)	Marking Rule
<p>Laser Marking</p>  <p>Diagram</p>	<p><u>Line 1</u> : Device DG60N11G</p> <p><u>Line 2</u> : Date Code YYMMXXX</p> <p>YY : Year Code MM : Month Code XXX : Serial Number</p>

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