MSQ40C04D

N & P-Channel 40-V (D-S) MOSFET

Description

The device is the highest performance trench N-ch and P-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 device meets the RoHS and Green Product requirement, 100% EAS guaranteed with full function reliability approved.

Features

- Suit for 4.5V Gate Drive Applications
- Super Low Gate Charge
- Excellent CdV/dt effect decline
- 100% EAS Guaranteed
- Green Device Available

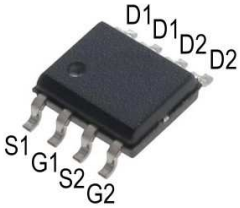
Typical Applications

- DC Fan
- Motor Drive Applications
- Networking
- Half / Full Bridge Topology

Package type：SOP-8

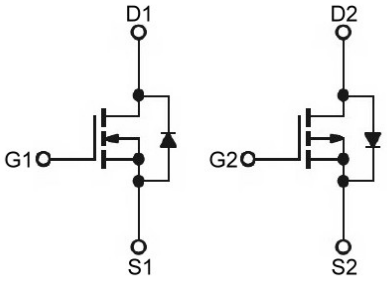
Packing & Order Information

3,000/Reel

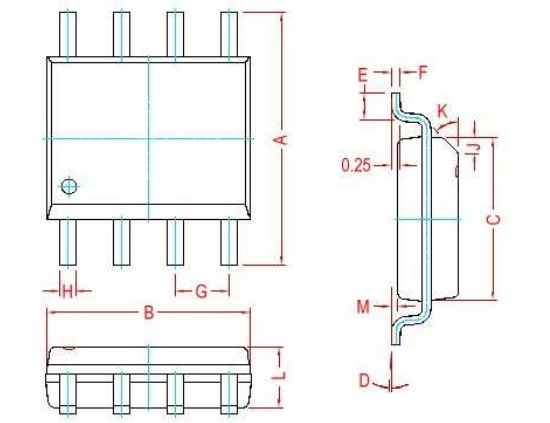


RoHS Compliant

Graphic Symbol

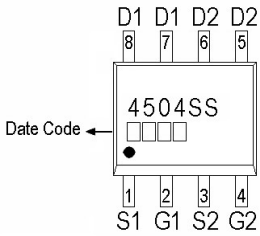


Package Dimension



REF.	Millimeter		REF.	Millimeter	
	Min.	Max.		Min.	Max.
A	5.80	6.20	M	0.10	0.25
B	4.80	5.00	H	0.35	0.51
C	3.80	4.00	L	1.35	1.75
D	0°	8°	J	0.40 Ref.	
E	0.40	0.90	K	45° Ref.	
F	0.19	0.26	G	1.27 Typ.	

Marking



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MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Absolute Maximum Ratings (unless otherwise specified)

Symbol	Parameter	Value		Units
		N-ch	P-ch	
V_{DS}	Drain-Source Voltage	40	-40	V
V_{GS}	Gate-Source Voltage	±20	±20	V
I_D	Continuous Drain Current[1] (T_A=25°C)	7.2	-6.5	A
	Continuous Drain Current[1] (T_A=70°C)	5.6	-5.1	A
I_{DM}	Pulsed Drain Current[2] (T_A=25°C)	14.5	-13	A
I_{AS}	Single Pulse Avalanche Current, L =0.1mH[3]	17.8	-27.2	A
E_{AS}	Single Pulse Avalanche Energy, L =0.1mH[3]	15.8	37	mJ
P_D	Power Dissipation[3] (T_C=25°C)	2.5		W
T_J/T_{STG}	Operating Junction and Storage Temperature	-55 to +150		°C

Thermal Resistance Ratings

Symbol	Parameter	Maximum	Units
$R_{\theta JA}$	Maximum Junction-to-Ambient[1]	85	°C/W
$R_{\theta JC}$	Maximum Junction-to-Case[1]	50	°C/W

Electrical Characteristics(T_J=25°C unless otherwise specified)

Symbol	Parameter	Test Conditions	Ch	Min.	Typ.	Max.	Units
$V_{GS\ (th)}$	Gate Threshold Voltage	V_{DS}=V_{GS}, I_D=250μA V_{DS}=V_{GS}, I_D=-250μA	N P	1.0 -1.0	-	2.5 -2.5	V
BV_{DSS}	Drain-Source Breakdown Voltage	V_{GS}=0V, I_D=250μA V_{GS}=0V, I_D=-250μA	N P	40 -40	-	-	V
g_{fs}	Forward Transconductance	V_{DS}=5V, I_D=6A V_{DS}=-5V, I_D=-6A	N P	-	14 12	-	S
I_{GSS}	Gate-Source Leakage Current	V_{DS}=0V, V_{GS}=±20V	N P	-	-	±100	nA
I_{DSS}	Drain-Source Leakage Current	V_{DS}=32V, V_{GS}=0V, T_J=25°C V_{DS}=32V, V_{GS}=0V, T_J=55°C V_{DS}=-32V, V_{GS}=0V, T_J=55°C V_{DS}=-32V, V_{GS}=0V, T_J=55°C	N P	-	-	1 5 -1 -5	μA
$R_{DS\ (on)}$	Static Drain-Source On-Resistance[2]	V_{GS}=10V, I_D=6A V_{GS}=4.5V, I_D=4A V_{GS}=-10V, I_D=-6A V_{GS}=-4.5V, I_D=-4A	N P	-	-	28 42 40 65	mΩ
EAS	Single Pulse Avalanche Energy[5]	V_{DD}=25V, L =0.1mH, I_{AS}=10A V_{DD}=-25V, L =0.1mH, I_{AS}=-10A	N P	5 5	-	-	mJ
V_{SD}	Diode Forward Voltage[2]	I_S=6A, V_{GS}=0V, T_J=25°C I_S=-6A, V_{GS}=0V, T_J=25°C	N P	-	-	1.2 -1.2	V
I_S	Continuous Source Current[14] **(Diode)**	V_G=V_D=0V, Force Current	N P	-	-	7.2 -6.5	A

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Dynamic and switching Characteristics

Symbol	Parameter	Test Conditions	Ch	Min.	Typ.	Max.	Units
Q_g	Total Gate Charge[2]	N-Ch V_{DS}=20V, I_D=6A, V_{GS}=4.5V P-Ch V_{DS}=-20V, I_D=-6A, V_{GS}=-4.5V	N P	--	5.5 9	--	nC
Q_{gs}	Gate-Source Charge		N P	--	1.25 2.54	--	
Q_{gd}	Gate-Drain Charge		N P	--	2.5 3.1	--	
$t_{d(on)}$	Turn-On Delay Time[2]	N-Ch V_{DS}=20V, I_D=1A, V_{GS}=10V, R_G=3.3Ω P-Ch V_{DS}=-15V, I_D=-1A, V_{GS}=-10V R_G=3.3Ω	N P	--	8.9 19.2	-- --	ns
t_r	Rise Time		N P	--	2.2 12.8	-- --	
$t_{d(off)}$	Turn-Off Delay Time		N P	--	41 48.6	-- --	
t_f	Fall Time		N P	--	2.7 4.6	-- --	
C_{ISS}	Input Capacitance	N-Ch V_{DS}=15V, V_{GS}=0V, f=1.0MHz P-Ch V_{DS}=-15V, V_{GS}=0V, f=1.0MHz	N P	-- --	593 1004	-- --	pF
C_{OSS}	Output Capacitance		N P	-- --	75 108	-- --	
C_{RSS}	Reverse Transfer Capacitance		N P	-- --	56 80	--	

Notes

1. The data tested by surface mounted on a 1 inch^2 FR-4 board with 2OZ copper.
2. The data tested by pulsed, pulse width ≤ 300us, duty cycle ≤ 2%.
3. The EAS data shows maximum rating. The test condition is N-ch V_{DD}=25V, V_{GS}=10V, L=0.1mH, I_{AS}=17.8A, P-ch V_{DD}=-25V, V_{GS}=-10V, L=0.1mH, I_{AS}=-27.2A.
4. The power dissipation is limited by 150℃ junction temperature.
5. The Min. value is 100% EAS tested guarantee.
6. The data is theoretically the same as I_D and I_{DM}, in real applications, should be limited by total power dissipation.

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- **Typical Electrical Characteristics N-Channel**

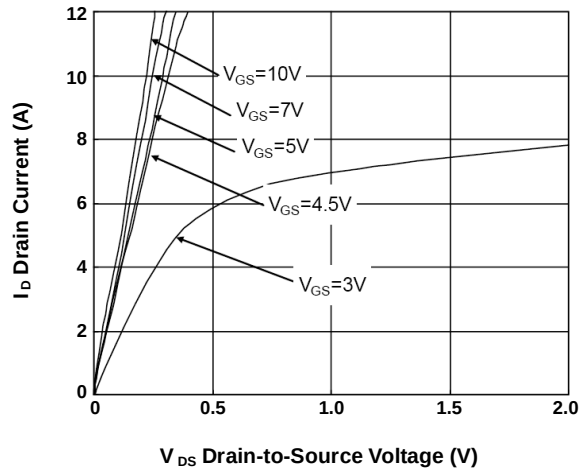

FIG.1-Typical Output Characteristics

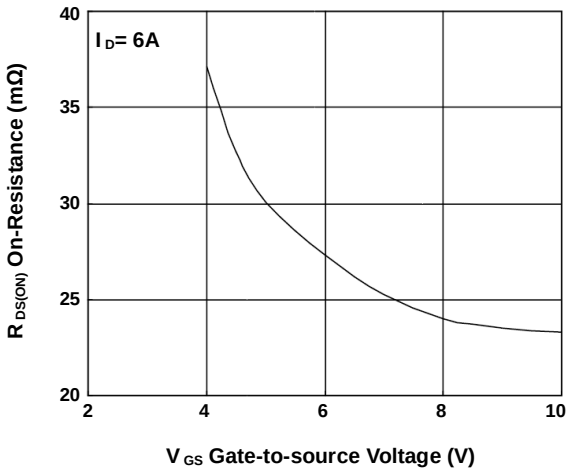

FIG.2-On-Resistance vs. G-S Voltage

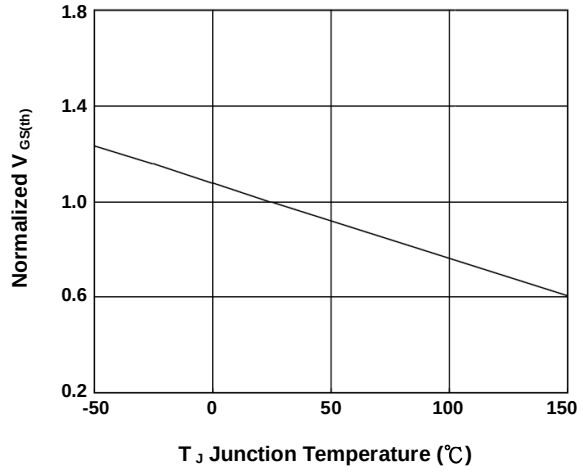

FIG.3-Normalized $V_{GS(th)}$ vs. T_J

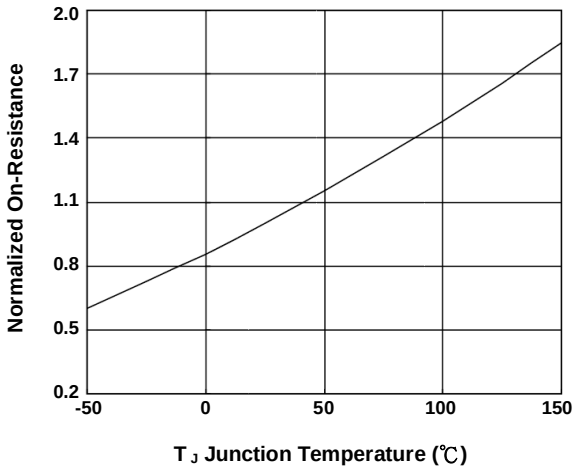

FIG.4-Normalized R_{DSON} vs. T_J

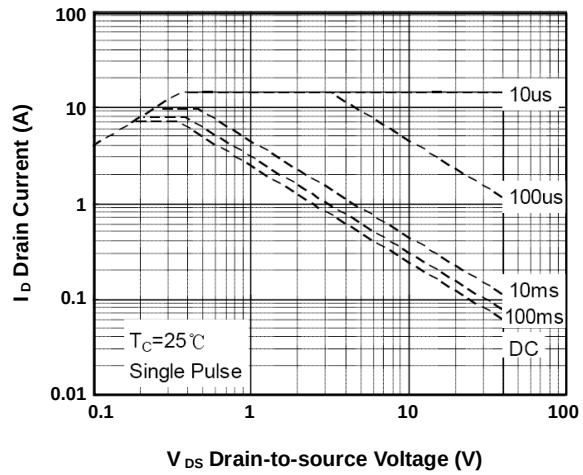

FIG.5-Safe Operating Area

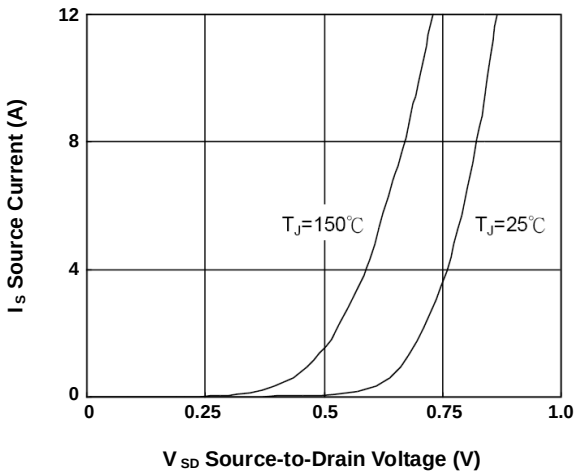

FIG.6-Forward Characteristics of Reverse

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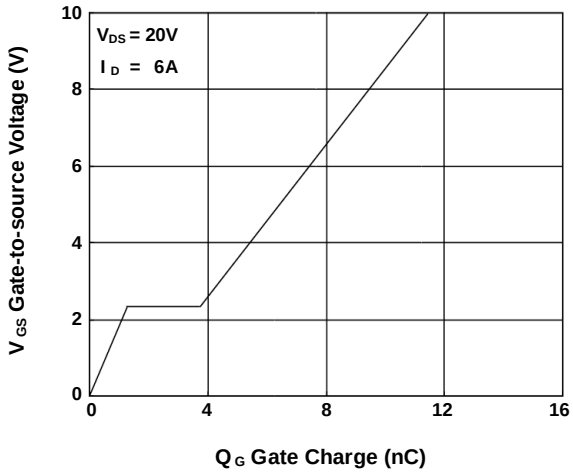

FIG.7-Gate Charge Characteristics

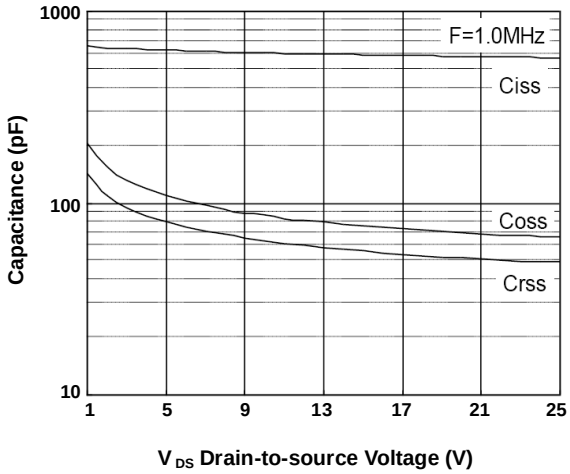

FIG.8-Capacitance Characteristics

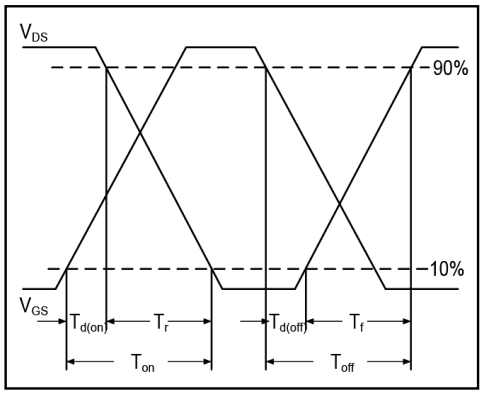

FIG.9-Switching Time Waveform

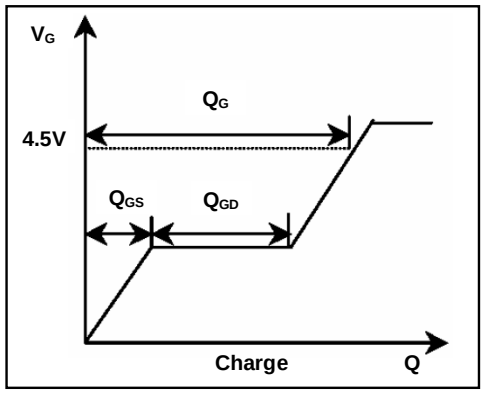

FIG.10-Gate Charge Waveform

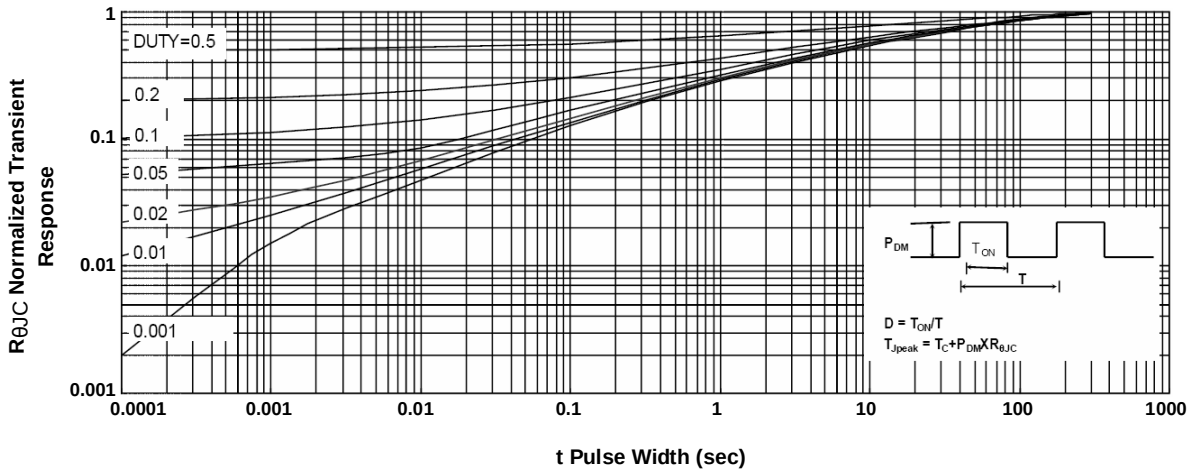

FIG.11-Normalized Maximum Transient Thermal Impedance

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Typical Electrical Characteristics P-Channel

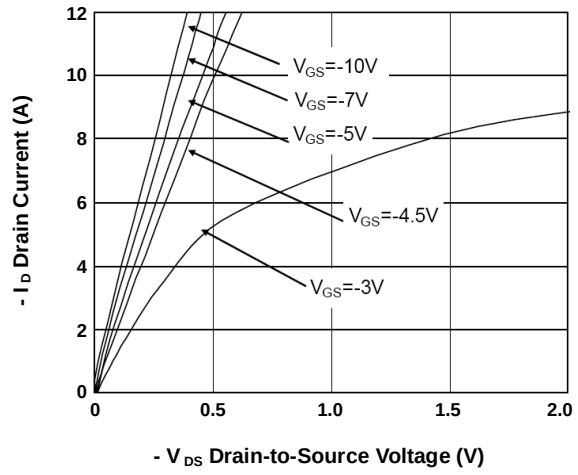

FIG.1-Typical Output Characteristics

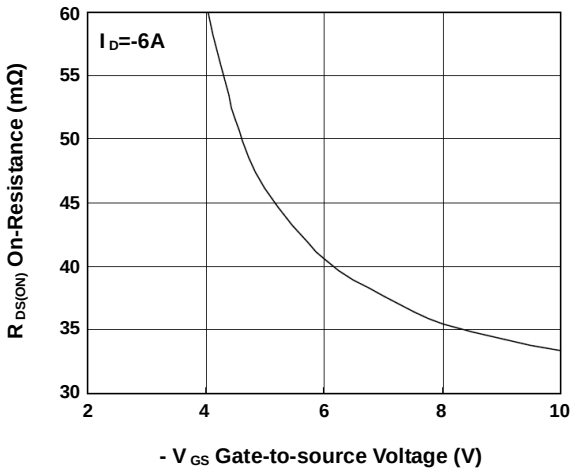

FIG.2-On-Resistance vs. G-S Voltage

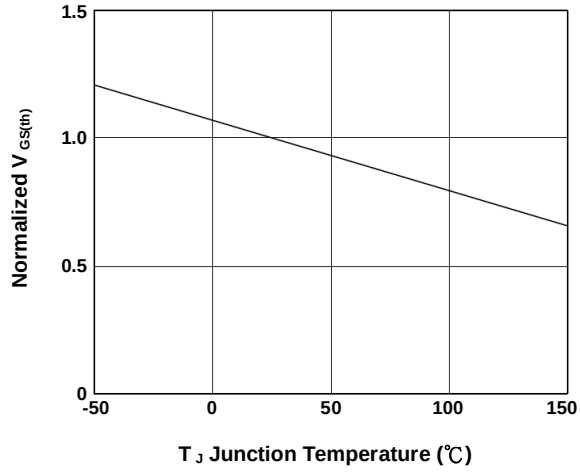

FIG.3-Normalized $V_{GS(th)}$ vs. T_J

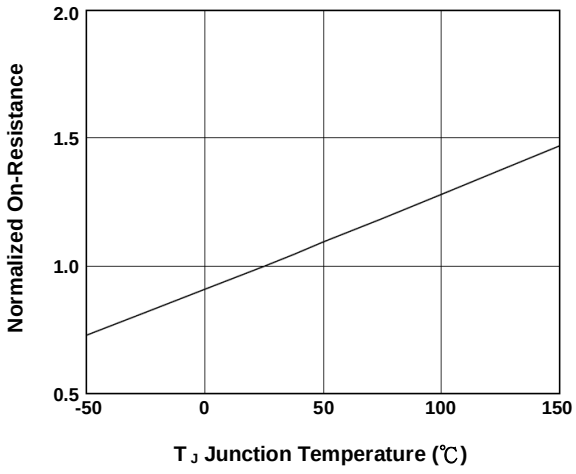

FIG.4-Normalized R_{DSON} vs. T_J

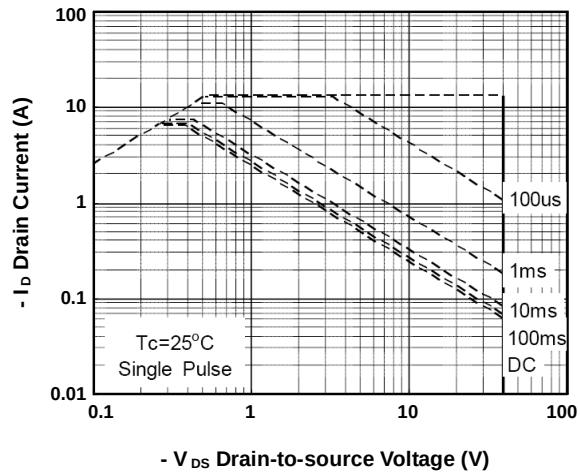

FIG.5-Safe Operating Area

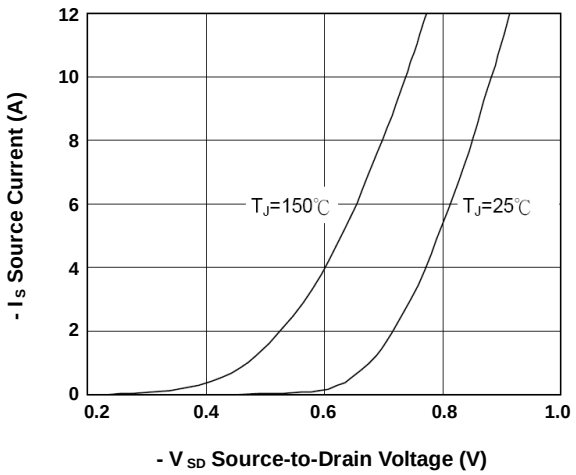

FIG.6-Forward Characteristics of Reverse

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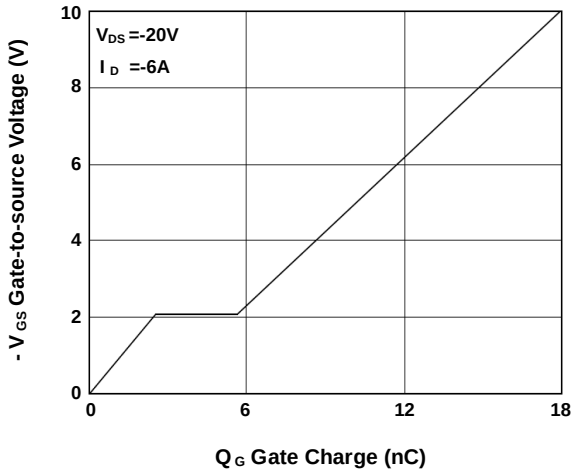
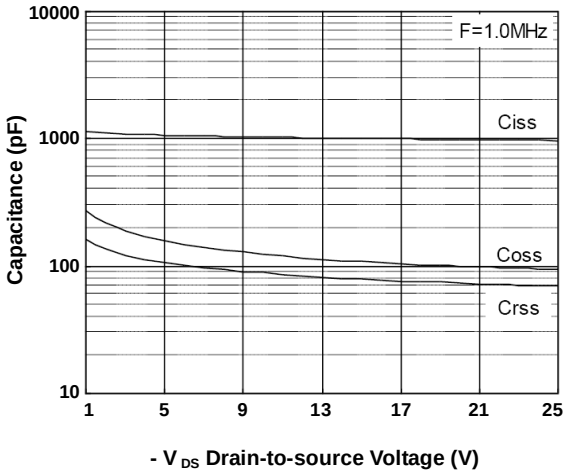


FIG.7-Gate Charge Characteristics



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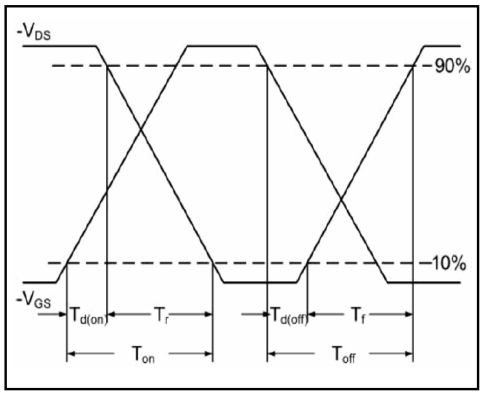

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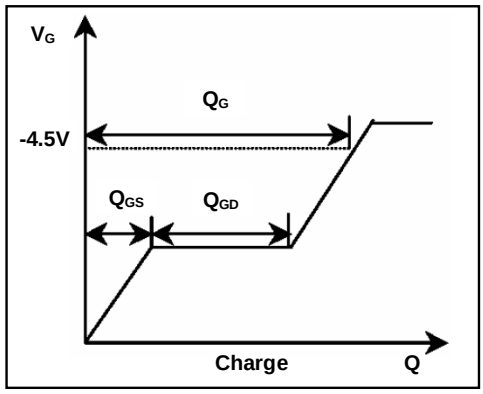

FIG.10-Gate Charge Waveform

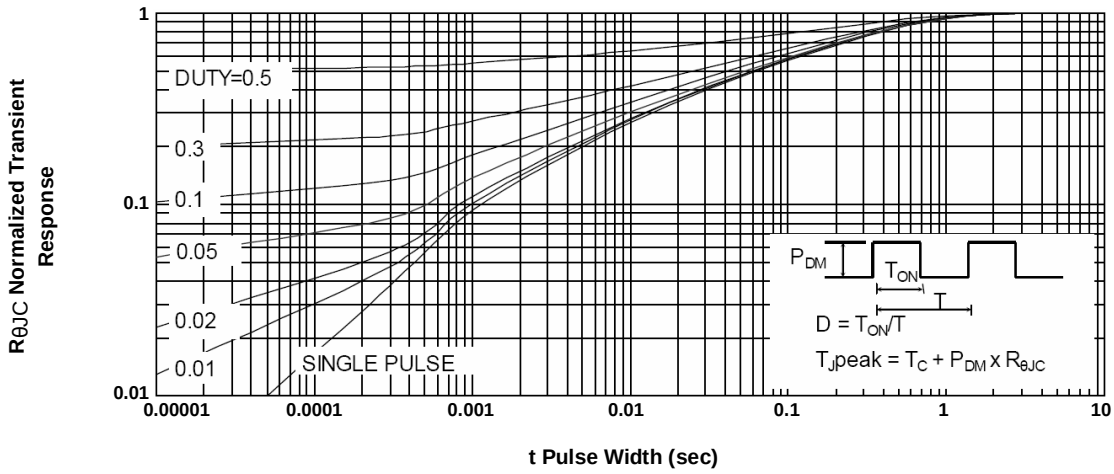

FIG.11-Normalized Maximum Transient Thermal Impedance

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