

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

DESCRIPTION

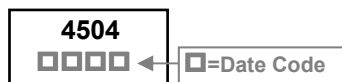
The SPRD4504-C is the highest performance trench N-Ch and P-Ch MOSFETs with extreme high cell density, which provide excellent $R_{DS(ON)}$ and gate charge for most of the synchronous buck converter applications.

The SPRD4504-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



PACKAGE INFORMATION

Package	MPQ	Leader Size
DFN5x6-8D	3K	13 inch

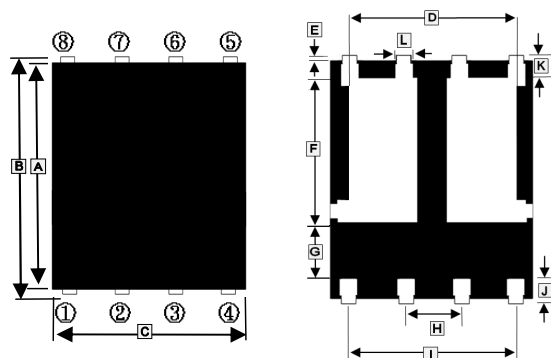
ORDER INFORMATION

Part Number	Type
SPRD4504-C	Lead (Pb)-free and Halogen-free

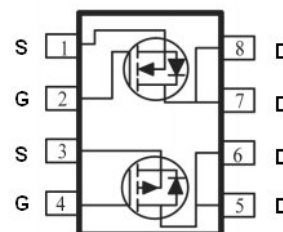
ABSOLUTE MAXIMUM RATINGS

Parameter	Symbol	Ratings		Unit	
		N-Ch	P-Ch		
Drain-Source Voltage	V_{DS}	40	-40	V	
Gate-Source Voltage	V_{GS}	±20		V	
Continuous Drain Current, @ $V_{GS}=10V$ ¹	I_D	$T_C=25^\circ C$	24	-21	A
		$T_C=100^\circ C$	15	-13	
Pulsed Drain Current ³	I_{DM}	46	-42	A	
Total Power Dissipation	P_D	$T_C=25^\circ C$		35.7	W
Operating Junction and Storage Temperature Range	T_J, T_{STG}	-55~150		°C	
Thermal Data					
Thermal Resistance Junction-Ambient ¹	$R_{\theta JA}$			°C/W	
Thermal Resistance Junction-Ambient ²		62.5			
Thermal Resistance Junction-Case ¹	$R_{\theta JC}$	3.5			

DFN5x6-8D



REF.	Millimeter		REF.	Millimeter	
	Min.	Max.		Min.	Max.
A	5.7	5.8	H	1.27 BSC.	
B	5.9	6.1	I	3.61	3.96
C	4.8	5	J	0.51	0.71
D	3.61	3.96	K	0.41	0.61
E	0.06	0.20	L	0.33	0.51
F	3.38	3.78	M	0.2	0.3
G	1.1	-	N	0.9	1.1



N-CHANNEL 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}	40	-	-	V	$V_{GS}=0, I_D=250\mu\text{A}$	
Gate Threshold Voltage	$V_{GS(th)}$	1	-	2.5	V	$V_{DS}=V_{GS}, I_D=250\mu\text{A}$	
Forward Transfer Conductance	g_{fs}	-	8	-	S	$V_{DS}=5\text{V}, I_D=12\text{A}$	
Gate-Source Leakage Current	I_{GSS}	-	-	± 100	nA	$V_{GS}=\pm 20\text{V}$	
Drain-Source Leakage Current	I_{DSS}	$T_J=25^\circ\text{C}$	-	-	1	μA	$V_{DS}=32\text{V}, V_{GS}=0$
		$T_J=55^\circ\text{C}$	-	-	5		
Static Drain-Source On-Resistance ⁴	$R_{DS(ON)}$	-	-	30	m Ω	$V_{GS}=10\text{V}, I_D=12\text{A}$	
		-	-	40		$V_{GS}=4.5\text{V}, I_D=10\text{A}$	
Total Gate Charge	Q_g	-	5.5	-	nC	$I_D=12\text{A}$ $V_{DS}=20\text{V}$ $V_{GS}=4.5\text{V}$	
Gate-Source Charge	Q_{gs}	-	1.25	-			
Gate-Drain Change	Q_{gd}	-	2.5	-			
Turn-on Delay Time	$T_{d(on)}$	-	8.9	-	nS	$V_{DD}=20\text{V}$ $I_D=1\text{A}$ $V_{GS}=10\text{V}$ $R_G=3.3\Omega$ $R_L=20\Omega$	
Rise Time	T_r	-	2.2	-			
Turn-off Delay Time	$T_{d(off)}$	-	41	-			
Fall Time	T_f	-	2.7	-			
Input Capacitance	C_{iss}	-	593	-	pF	$V_{GS}=0$ $V_{DS}=15\text{V}$ $f=1\text{MHz}$	
Output Capacitance	C_{oss}	-	76	-			
Reverse Transfer Capacitance	C_{rss}	-	56	-			
Source-Drain Diode							
Continuous Source Current ¹	I_S	-	-	24	A		
Pulsed Source Current ³	I_{SM}	-	-	46			
Forward on Voltage ⁴	V_{SD}	-	-	1.2	V	$I_S=1\text{A}, V_{GS}=0, T_J=25^\circ\text{C}$	

P-CHANNEL 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}	-40	-	-	V	$V_{GS}=0, I_D = -250\mu\text{A}$	
Gate Threshold Voltage	$V_{GS(th)}$	-1	-	-2.5	V	$V_{DS}=V_{GS}, I_D = -250\mu\text{A}$	
Forward Transfer Conductance	g_{fs}	-	12.6	-	S	$V_{DS} = -5\text{V}, I_D = -12\text{A}$	
Gate-Source Leakage Current	I_{GSS}	-	-	± 100	nA	$V_{GS} = \pm 20\text{V}$	
Drain-Source Leakage Current	I_{DSS}	$T_J=25^\circ\text{C}$	-	-	-1	μA	$V_{DS} = -32\text{V}, V_{GS}=0$
		$T_J=55^\circ\text{C}$	-	-	-5		
Static Drain-Source On-Resistance ⁴	$R_{DS(ON)}$	-	-	40	m Ω	$V_{GS} = -10\text{V}, I_D = -12\text{A}$	
		-	-	65		$V_{GS} = -4.5\text{V}, I_D = -10\text{A}$	
Total Gate Charge	Q_g	-	9	-	nC	$I_D = -12\text{A}$ $V_{DS} = -20\text{V}$ $V_{GS} = -4.5\text{V}$	
Gate-Source Charge	Q_{gs}	-	2.54	-			
Gate-Drain Change	Q_{gd}	-	3.1	-			
Turn-on Delay Time	$T_{d(on)}$	-	19.2	-	nS	$V_{DD} = -15\text{V}$ $I_D = -1\text{A}$ $V_{GS} = -10\text{V}$ $R_G = 3.3\Omega$ $R_L = 15\Omega$	
Rise Time	T_r	-	12.8	-			
Turn-off Delay Time	$T_{d(off)}$	-	48.6	-			
Fall Time	T_f	-	4.6	-			
Input Capacitance	C_{iss}	-	1004	-	pF	$V_{GS}=0$ $V_{DS} = -15\text{V}$ $f=1\text{MHz}$	
Output Capacitance	C_{oss}	-	108	-			
Reverse Transfer Capacitance	C_{rss}	-	80	-			
Source-Drain Diode							
Continuous Source Current ¹	I_S	-	-	-21	A		
Pulsed Source Current ³	I_{SM}	-	-	-42			
Forward on Voltage ⁴	V_{SD}	-	-	-1.2	V	$I_S = -1\text{A}, V_{GS}=0, T_J=25^\circ\text{C}$	

Notes:

1. Surface mounted on a 1 inch² FR-4 board with 20Z copper.
2. When mounted on Min. copper pad.
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 $\leq 2\%$.

N-CHANNEL CHARACTERISTIC CURVE

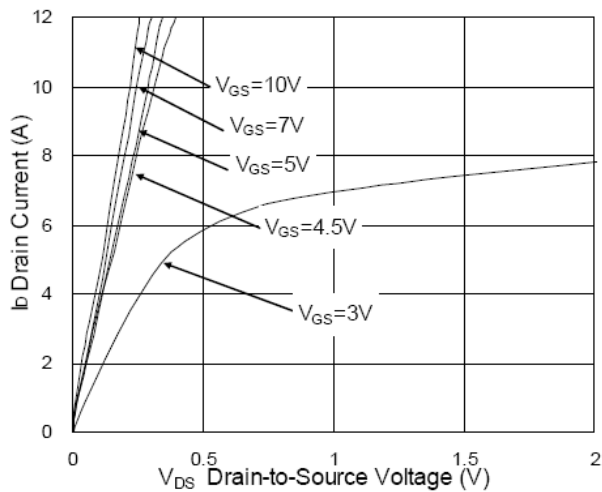


Fig.1 Typical Output Characteristics

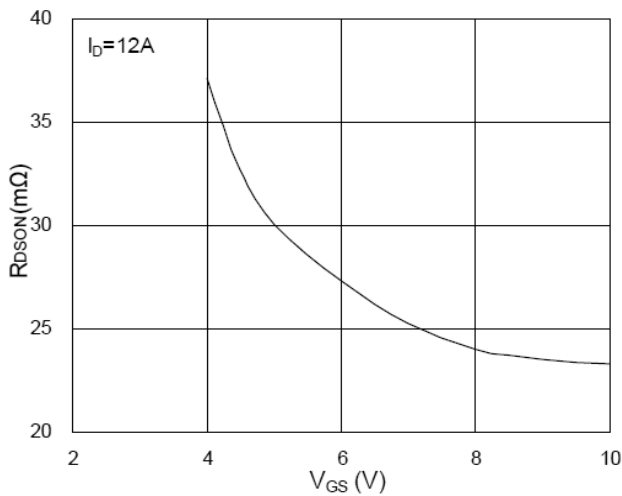


Fig.2 On-Resistance vs. G-S Voltage

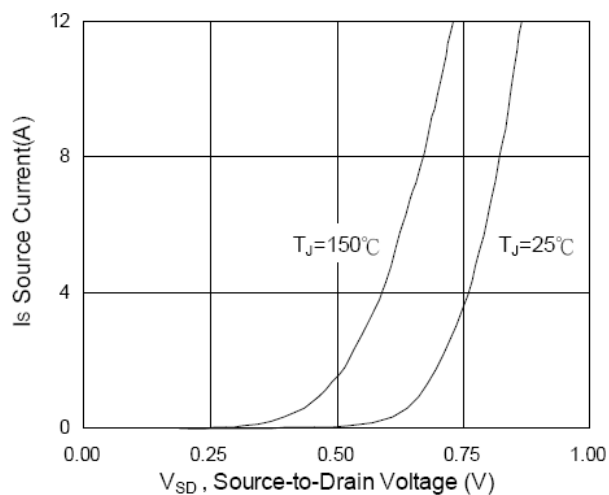


Fig.3 Forward Characteristics of Reverse

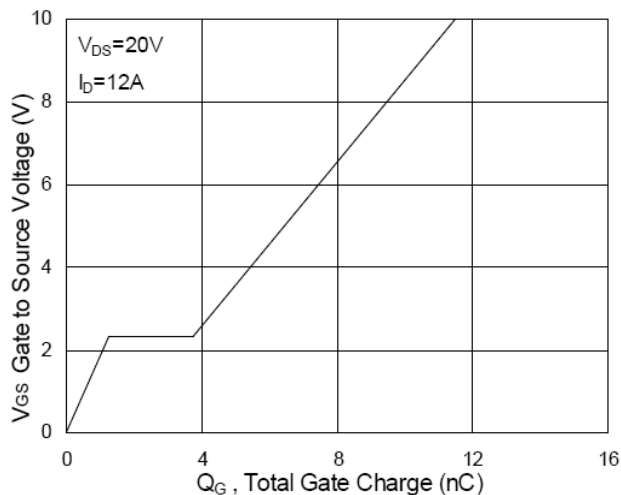


Fig.4 Gate-Charge Characteristics

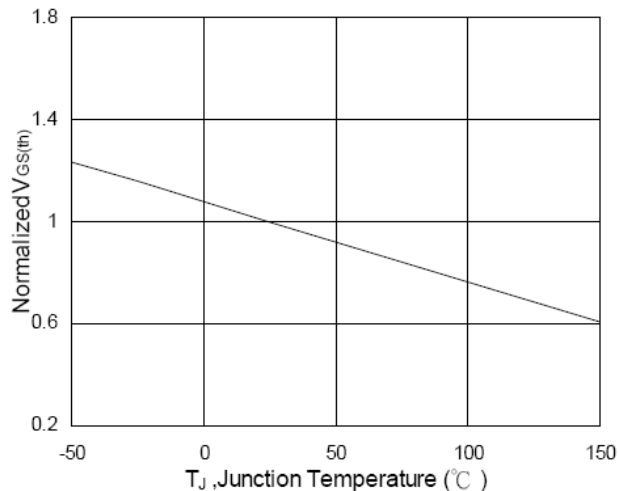


Fig.5 Normalized $V_{GS(th)}$ vs. T_J

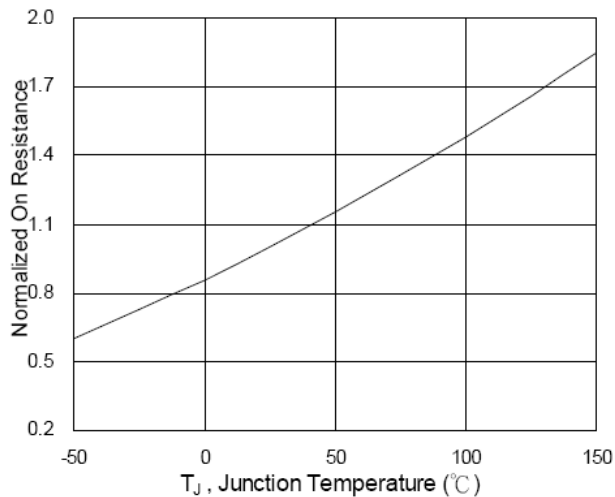


Fig.6 Normalized $R_{DS(ON)}$ vs. T_J

N-CHANNEL CHARACTERISTIC CURVE

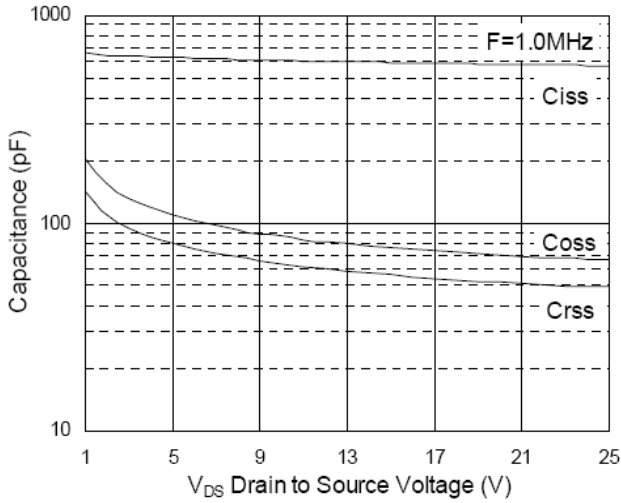


Fig.7 Capacitance

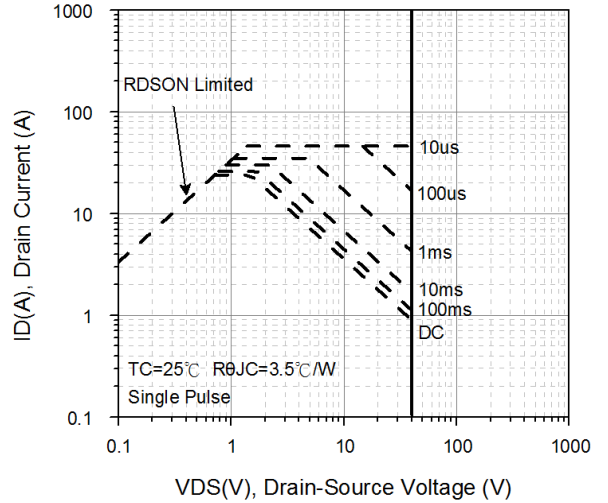


Fig.8 Safe Operating Area

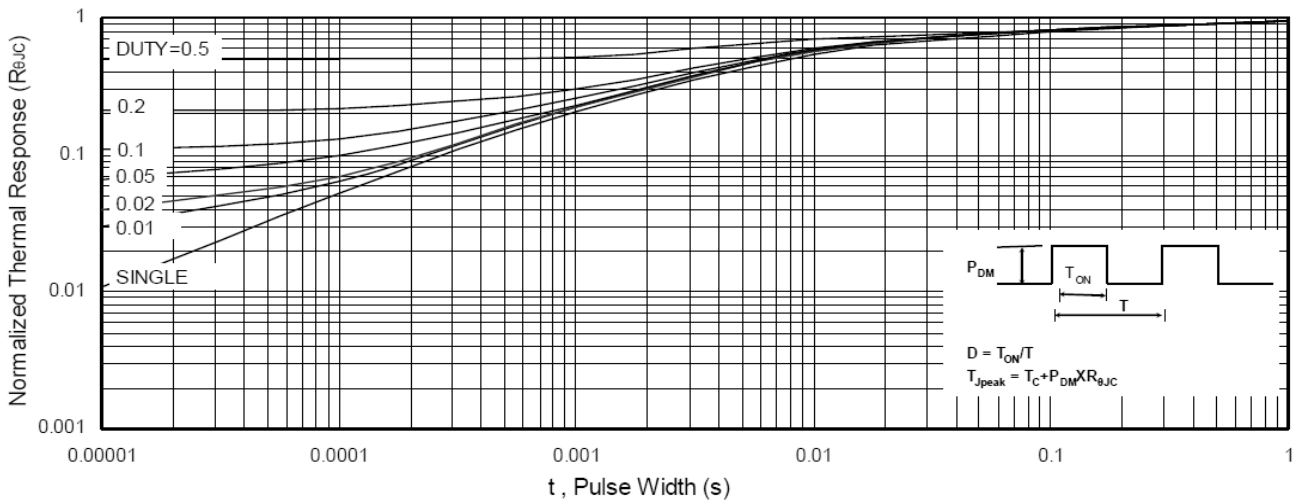


Fig.9 Normalized Maximum Transient Thermal Impedance

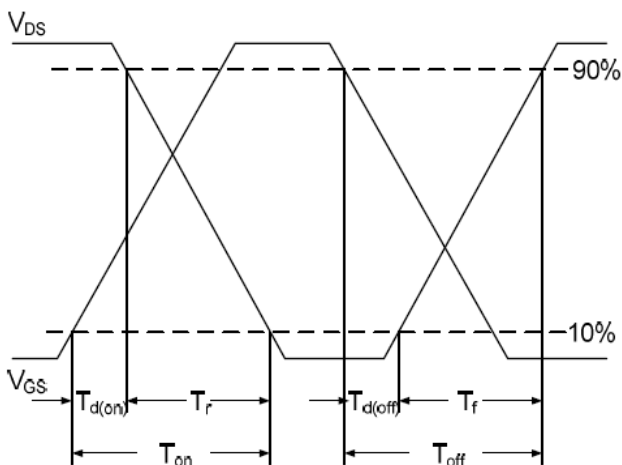


Fig.10 Switching Time Waveform

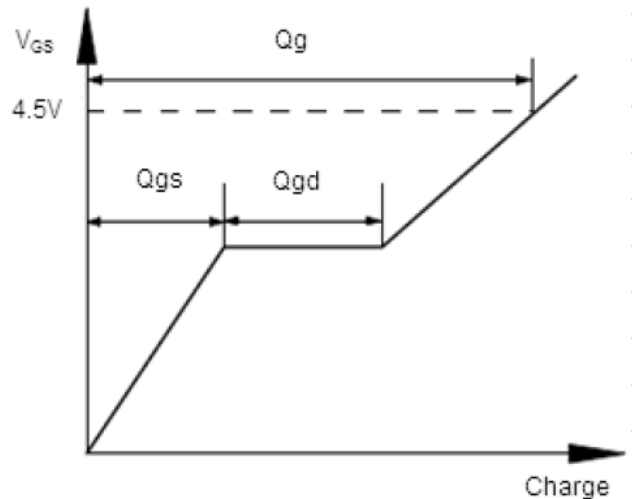


Fig.11 Gate Charge Waveform

P-CHANNEL CHARACTERISTIC CURVE

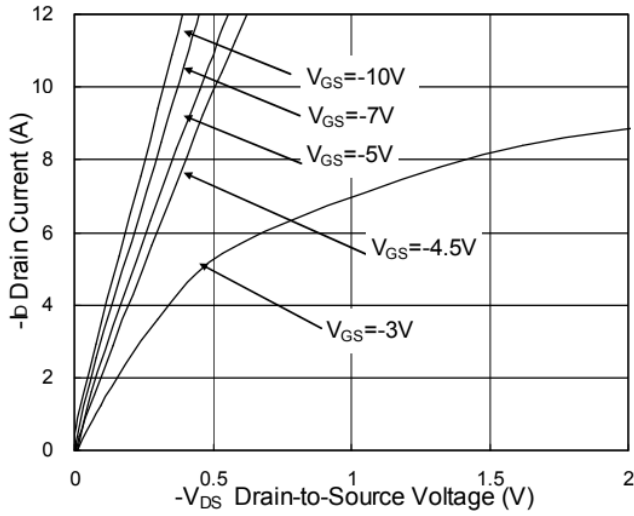


Fig.1 Typical Output Characteristics

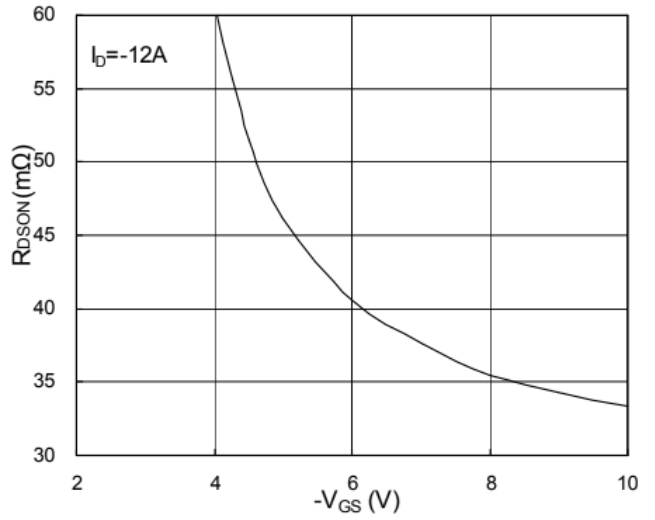


Fig.2 On-Resistance v.s Gate-Source

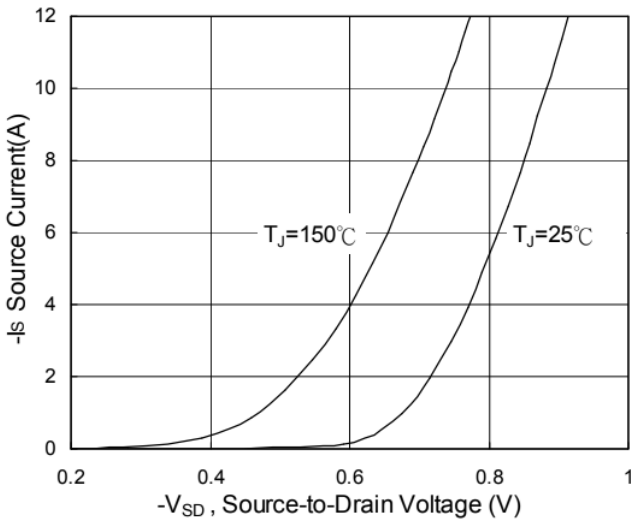


Fig.3 Forward Characteristics of Reverse

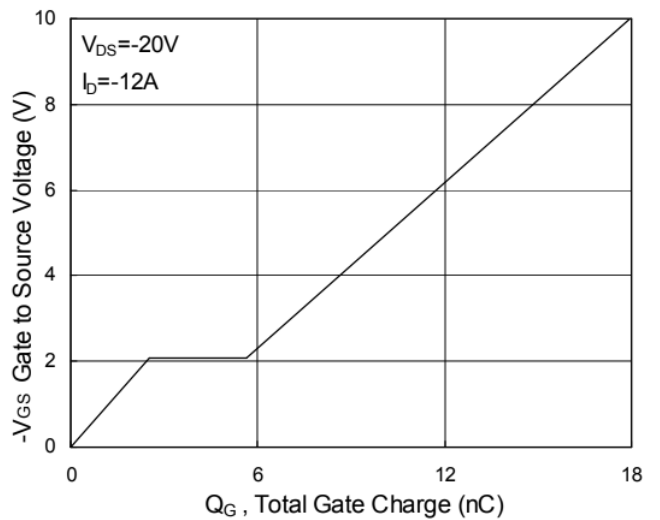


Fig.4 Gate-Charge Characteristics

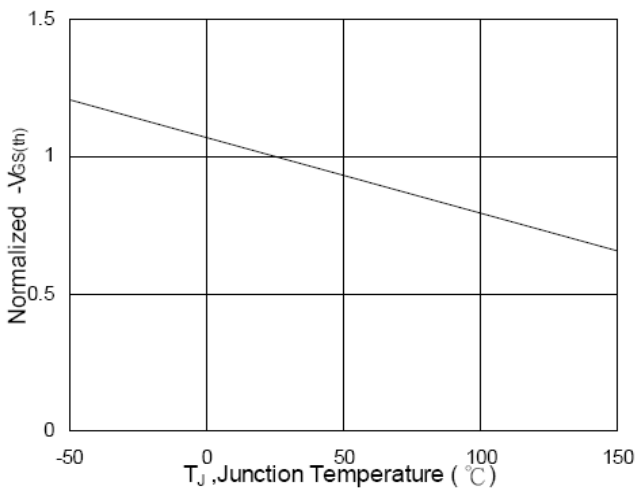


Fig.5 Normalized $V_{GS(th)}$ v.s T_J

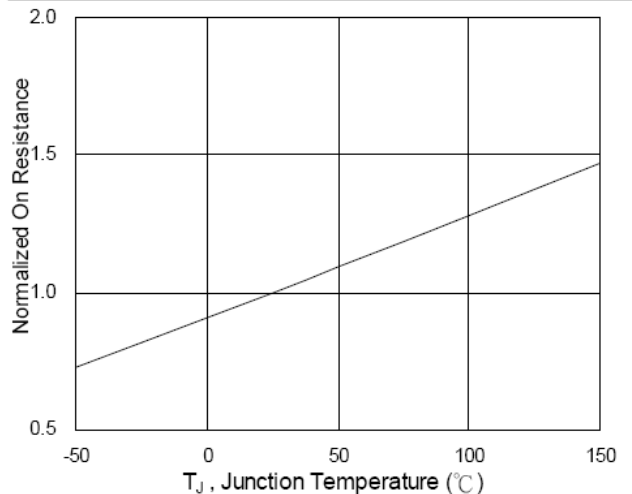


Fig.6 Normalized $R_{DS(ON)}$ v.s T_J

P-CHANNEL CHARACTERISTIC CURVE

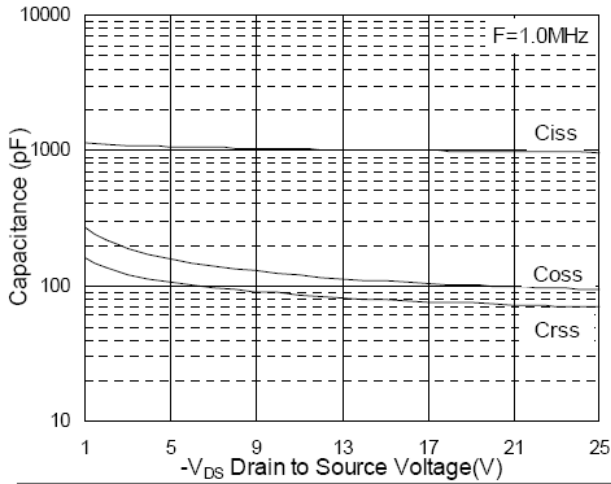


Fig.7 Capacitance

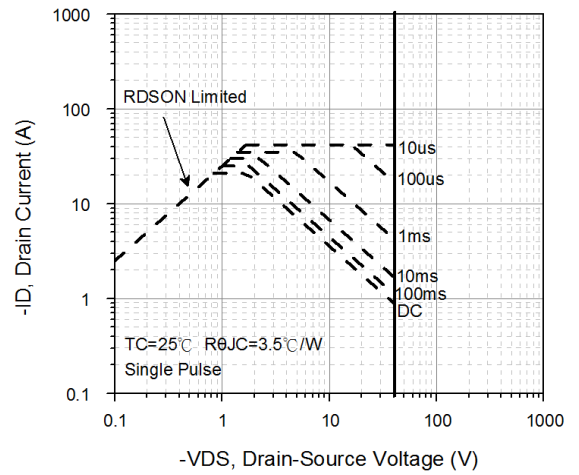


Fig.8 Safe Operating Area

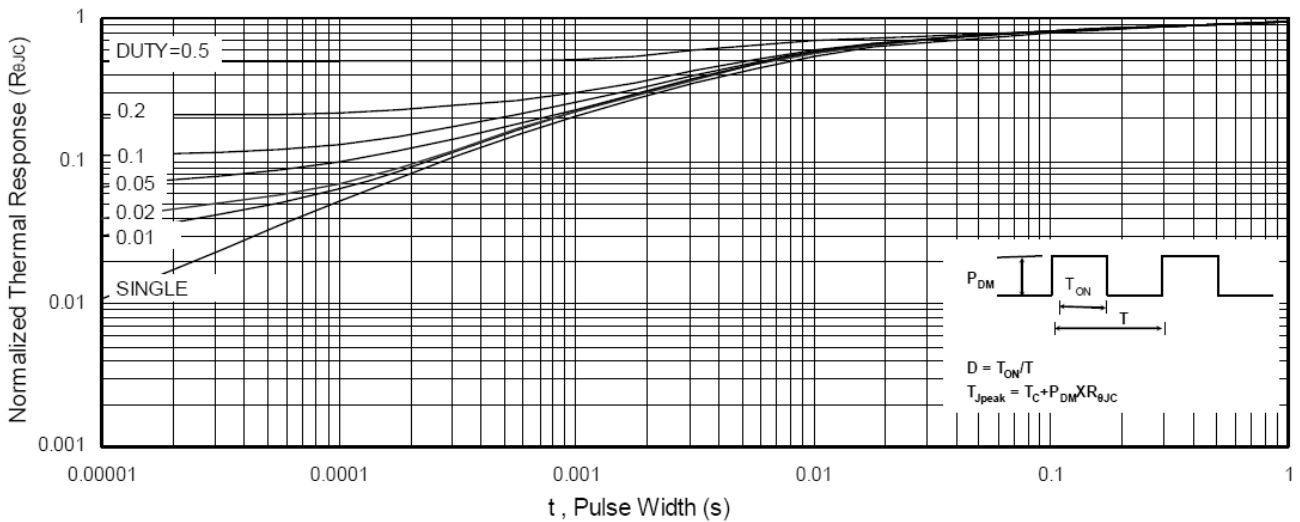


Fig.9 Normalized Maximum Transient Thermal Impedance

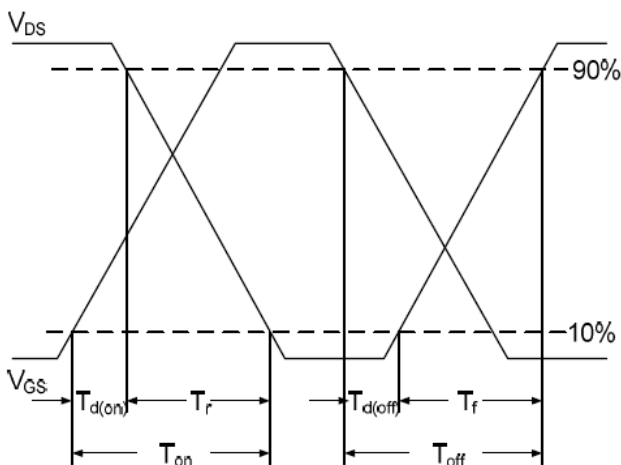


Fig.10 Switching Time Waveform

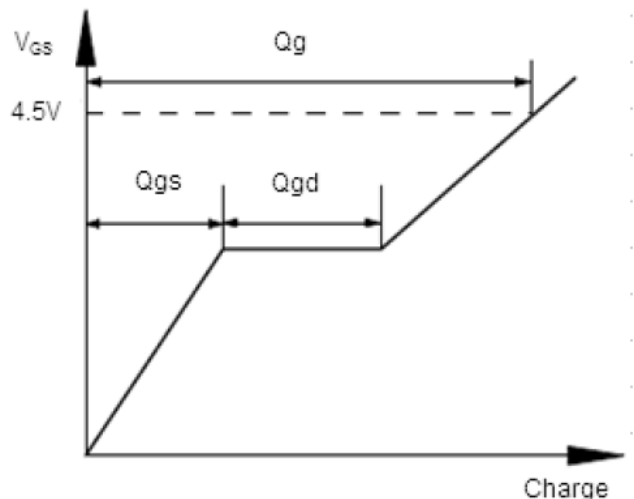


Fig.11 Gate Charge Waveform