

**Features**

- Trench MOSFET Technology
- Moisture Sensitivity Level 3
- Halogen Free. "Green" Device<sup>(Note 1)</sup>
- Epoxy Meets UL 94 V-0 Flammability Rating
- Lead Free Finish/RoHS Compliant ("P" Suffix Designates RoHS Compliant. See Ordering Information)

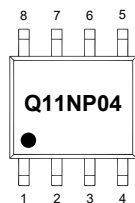
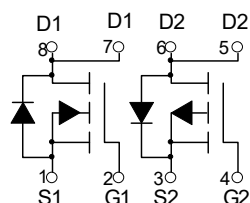
**Maximum Ratings**

- Operating Junction Temperature Range : -55°C to +150°C
- Storage Temperature Range: -55°C to +150°C
- N-Channel Thermal Resistance: 60°C/W Junction to Ambient<sup>(Note 2)</sup>
- P-Channel Thermal Resistance: 55°C/W Junction to Ambient<sup>(Note 2)</sup>

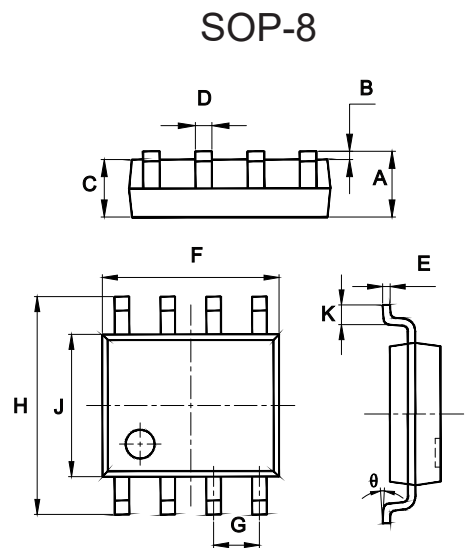
Parameter	Symbol	Rating	Unit
<b>N-Channel MOSFET</b>			
Drain-Source Voltage	V <sub>DS</sub>	40	V
Gate-Source Voltage	V <sub>GS</sub>	±20	V
Continuous Drain Current	I <sub>D</sub>	T <sub>A</sub> =25°C	11
		T <sub>A</sub> =100°C	6.9
Pulsed Drain Current <sup>(Note3)</sup>	I <sub>DM</sub>	44	A
Total Power Dissipation <sup>(Note4)</sup>	P <sub>D</sub>	2.1	W
Single Pulsed Avalanche Energy <sup>(Note5)</sup>	E <sub>AS</sub>	15	mJ
<b>P-Channel MOSFET</b>			
Drain-Source Voltage	V <sub>DS</sub>	-40	V
Gate-Source Voltage	V <sub>GS</sub>	±20	V
Continuous Drain Current	I <sub>D</sub>	T <sub>A</sub> =25°C	-11
		T <sub>A</sub> =100°C	-6.9
Pulsed Drain Current <sup>(Note3)</sup>	I <sub>DM</sub>	-44	A
Total Power Dissipation <sup>(Note4)</sup>	P <sub>D</sub>	2.3	W
Single Pulsed Avalanche Energy <sup>(Note5)</sup>	E <sub>AS</sub>	45	mJ

- Note:
1. Halogen free "Green" products are defined as those which contain <900ppm bromine, <900ppm chlorine (<1500ppm total Br + Cl) and <1000ppm antimony compounds.
  2. The value of R<sub>θJA</sub> is measured with the device mounted on 1in<sup>2</sup> FR-4 board with 2oz. Copper, in a still air environment with T<sub>A</sub> =25°C.
  3. Repetitive rating; pulse width limited by max. junction temperature.
  4. P<sub>D</sub> is based on max. junction temperature, using junction-ambient thermal resistance.
  5. NMOS:V<sub>DD</sub>=40V, V<sub>GS</sub>=10V, L=1mH.  
PMOS:V<sub>DD</sub>=-40V, V<sub>GS</sub>=-10V, L=1mH.

**Internal Structure and Marking Code**

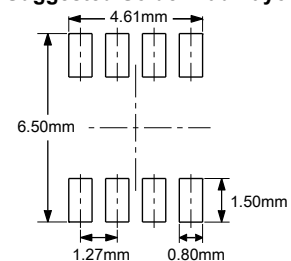


**Dual  
N&P Channel  
Power MOSFET**



DIM	INCHES		MM		NOTE
	MIN	MAX	MIN	MAX	
A	0.053	0.069	1.35	1.75	
B	0.004	0.010	0.10	0.25	
C	0.053	0.061	1.35	1.55	
D	0.013	0.020	0.33	0.51	
E	0.007	0.010	0.17	0.25	
F	0.185	0.200	4.70	5.10	
G	0.050		1.270		TYP.
H	0.228	0.244	5.80	6.20	
J	0.150	0.157	3.80	4.00	
K	0.016	0.050	0.40	1.27	
θ	0°	8°	0°	8°	

**Suggested Solder Pad Layout**



**N-Channel Electrical Characteristics @ 25°C (Unless Otherwise Specified)**

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
<b>Static Characteristics</b>						
Drain-Source Breakdown Voltage	$V_{(BR)DSS}$	$V_{GS}=0V, I_D=250\mu A$	40			V
Gate-Source Leakage Current	$I_{GSS}$	$V_{DS}=0V, V_{GS}=\pm 20V$			$\pm 100$	nA
Zero Gate Voltage Drain Current	$I_{DSS}$	$V_{DS}=40V, V_{GS}=0V$			1	$\mu A$
Gate-Threshold Voltage	$V_{GS(th)}$	$V_{DS}=V_{GS}, I_D=250\mu A$	1	1.6	2.5	V
Drain-Source On-Resistance	$R_{DS(on)}$	$V_{GS}=10V, I_D=7A$		24	32	m $\Omega$
		$V_{GS}=4.5V, I_D=5A$		33	50	
Gate Resistance	$R_g$	f=1 MHz, Open drain		2		$\Omega$
Forward Transconductance	$g_{fs}$	$V_{DS}=5V, I_D=3.5A$		9		S
<b>Diode Characteristics</b>						
Continuous Body Diode Current	$I_S$				11	A
Diode Forward Voltage	$V_{SD}$	$V_{GS}=0V, I_S=11A$			1.2	V
Reverse Recovery Time	$t_{rr}$	$I_F=7A, di/dt=100A/us$		26		ns
Reverse Recovery Charge	$Q_{rr}$			19		nC
<b>Dynamic Characteristics</b>						
Input Capacitance	$C_{iss}$	$V_{DS}=20V, V_{GS}=0V, f=1MHz$		390		pF
Output Capacitance	$C_{oss}$			50		
Reverse Transfer Capacitance	$C_{rss}$			40		
Total Gate Charge	$Q_g$	$V_{DS}=20V, V_{GS}=10V, I_D=7A$		11		nC
Gate-Source Charge	$Q_{gs}$			3.1		
Gate-Drain Charge	$Q_{gd}$			3		
Turn-On Delay Time	$t_{d(on)}$	$V_{GS}=10V, V_{DD}=20V, I_D=7A, R_{GEN}=2.2\Omega$		6		ns
Turn-On Rise Time	$t_r$			20		
Turn-Off Delay Time	$t_{d(off)}$			12		
Turn-Off Fall Time	$t_f$			2		

**P-Channel Electrical Characteristics @ 25°C (Unless Otherwise Specified)**

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
<b>Static Characteristics</b>						
Drain-Source Breakdown Voltage	$V_{(BR)DSS}$	$V_{GS}=0V, I_D=-250\mu A$	-40			V
Gate-Source Leakage Current	$I_{GSS}$	$V_{DS}=0V, V_{GS}=\pm 20V$			$\pm 100$	nA
Zero Gate Voltage Drain Current	$I_{DSS}$	$V_{DS}=-40V, V_{GS}=0V$			-1	$\mu A$
Gate-Threshold Voltage	$V_{GS(th)}$	$V_{DS}=V_{GS}, I_D=-250\mu A$	-1	-1.6	-2.5	V
Drain-Source On-Resistance	$R_{DS(on)}$	$V_{GS}=-10V, I_D=-7A$		25	33	m $\Omega$
		$V_{GS}=-4.5V, I_D=-5A$		35	50	
Gate Resistance	$R_g$	f=1MHz, Open drain		15		$\Omega$
Forward Transconductance	$g_{fs}$	$V_{DS}=-5V, I_D=-5A$		12		S
<b>Diode Characteristics</b>						
Continuous Body Diode Current	$I_S$				-11	A
Diode Forward Voltage	$V_{SD}$	$V_{GS}=0V, I_S=-11A$			-1.2	V
Reverse Recovery Time	$t_{rr}$	$I_S=-10A, dI_F/dt=100A/\mu s$		19		ns
Reverse Recovery Charge	$Q_{rr}$			9		nC
<b>Dynamic Characteristics</b>						
Input Capacitance	$C_{iss}$	$V_{DS}=-20V, V_{GS}=0V, f=1MHz$		1080		pF
Output Capacitance	$C_{oss}$			120		
Reverse Transfer Capacitance	$C_{rss}$			110		
Total Gate Charge	$Q_g$	$V_{DS}=-20V, V_{GS}=-10V, I_D=-10A$		17		nC
Gate-Source Charge	$Q_{gs}$			4.5		
Gate-Drain Charge	$Q_{gd}$			4		
Turn-On Delay Time	$t_{d(on)}$	$V_{DD}=-20V, V_{GEN}=-10V, R_G=3\Omega, I_{DS}=-10A$		7		ns
Turn-On Rise Time	$t_r$			24		
Turn-Off Delay Time	$t_{d(off)}$			20		
Turn-Off Fall Time	$t_f$			16		

**Curve Characteristics (N-Channel)**

Fig. 1 - Typical Output Characteristics

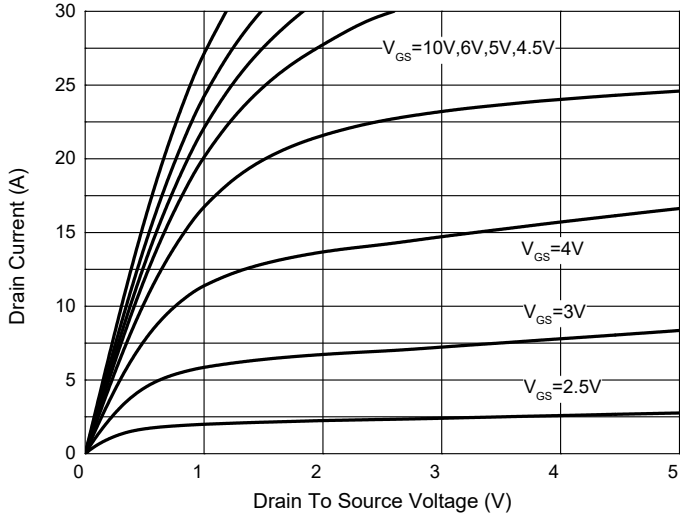


Fig. 2 - Transfer Characteristics

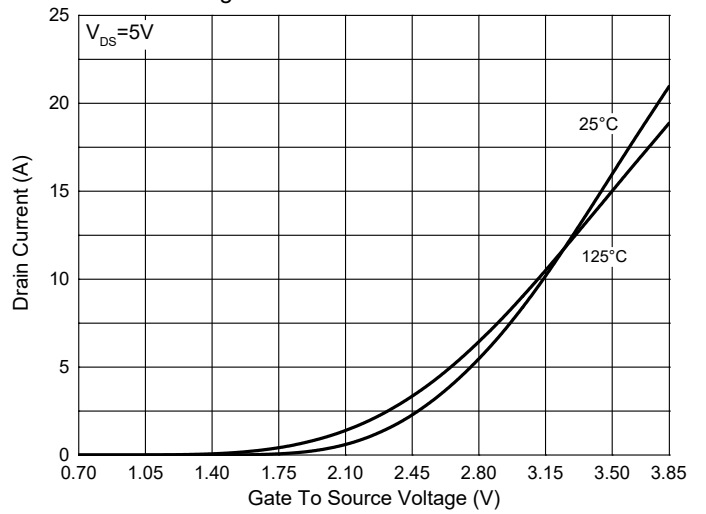


Fig. 3 -  $R_{DS(ON)} - V_{GS}$

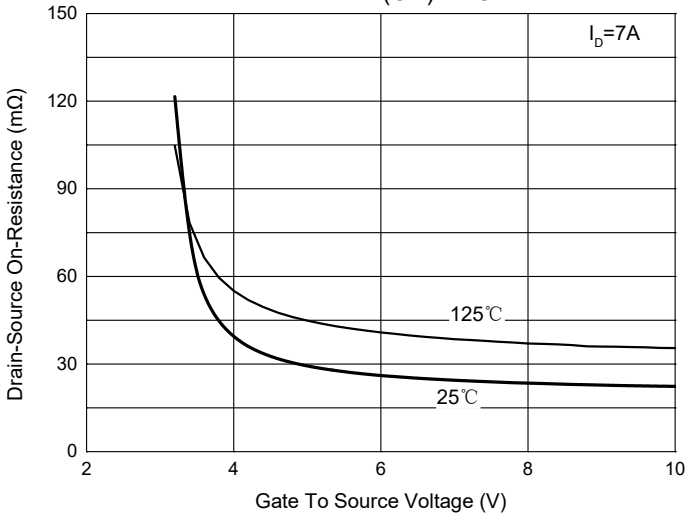


Fig. 4 -  $R_{DS(ON)} - I_D$

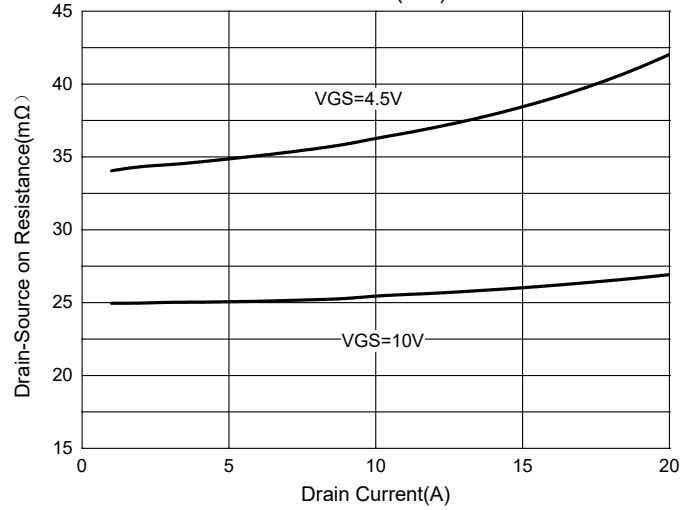


Fig. 5 - Capacitance Characteristics

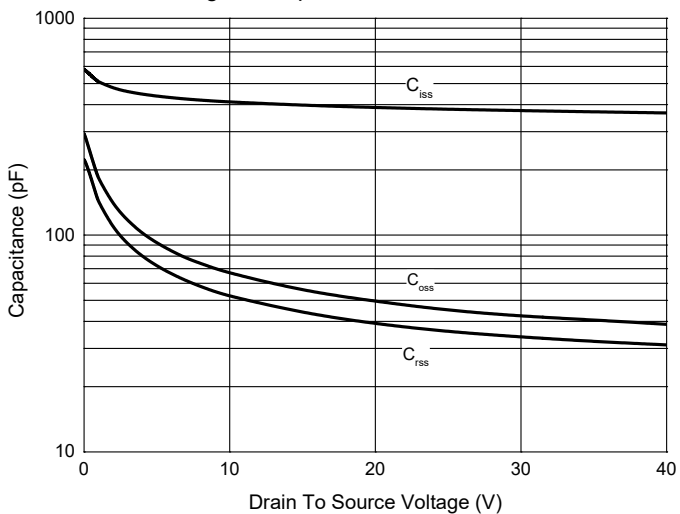
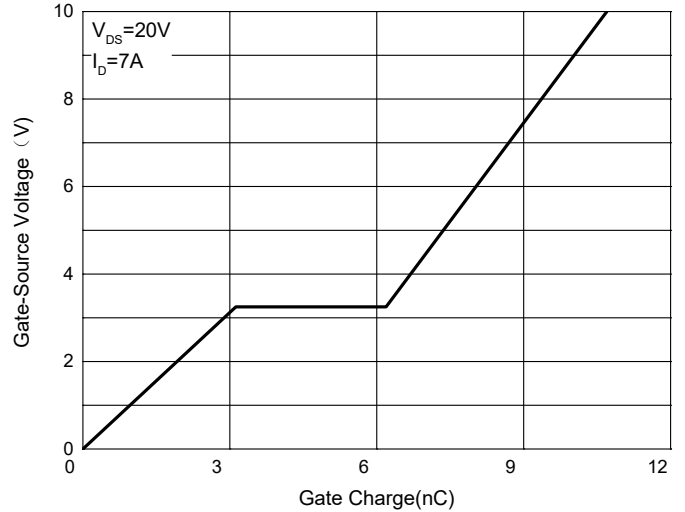


Fig. 6 - Gate Charge



**Curve Characteristics (N-Channel)**

Fig. 7 - Normalized Threshold Voltage

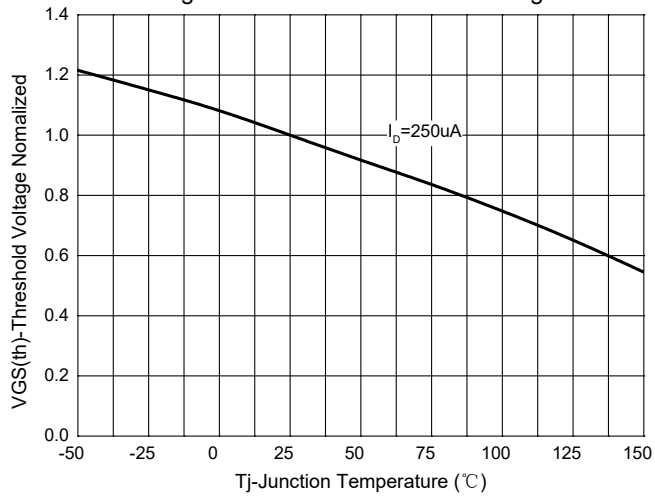


Fig.8-Normalized On Resistance Characteristics

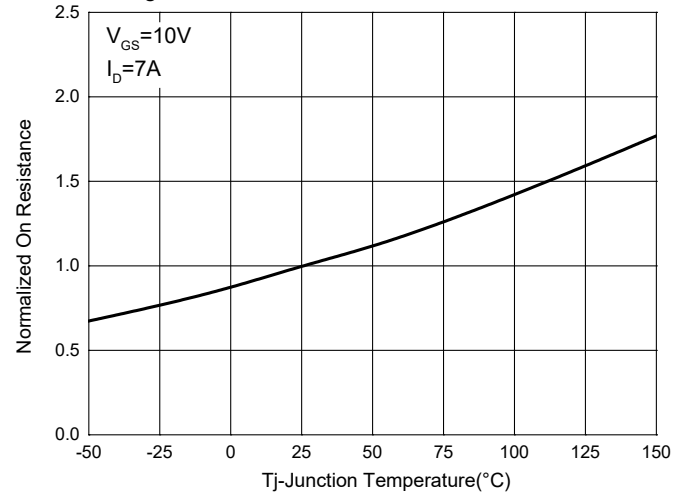


Fig.9 - IS—VSD

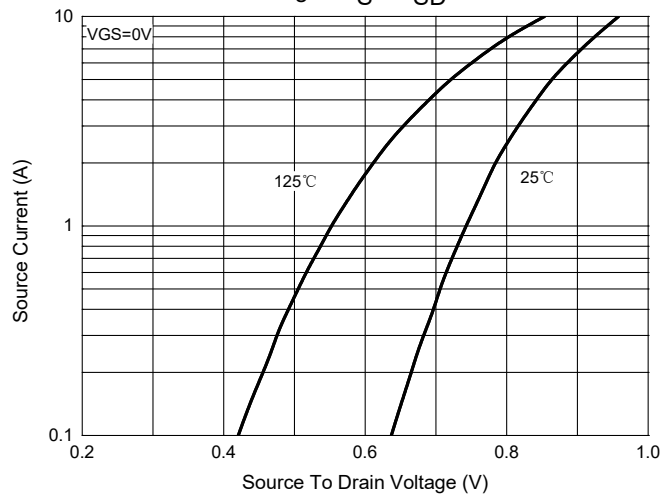


Fig. 10 - Drain Current

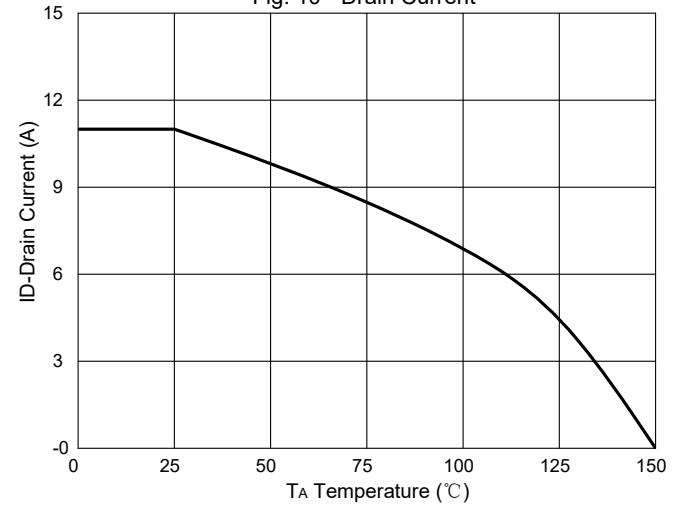
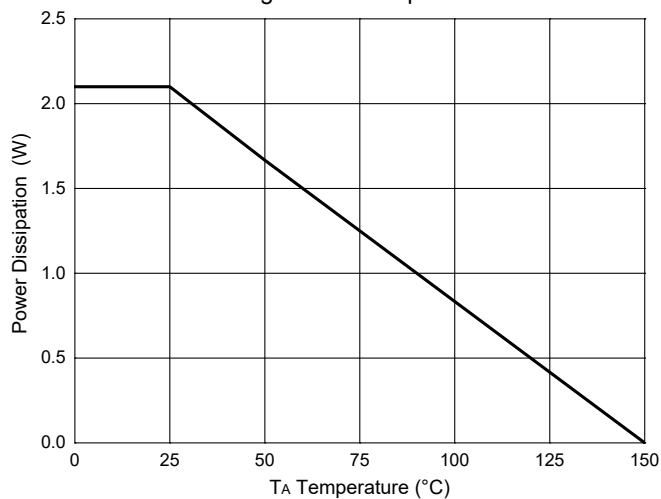


Fig.11-PD Dissipation



Curve Characteristics (N-Channel)

Fig. 12 - Safe Operation Area

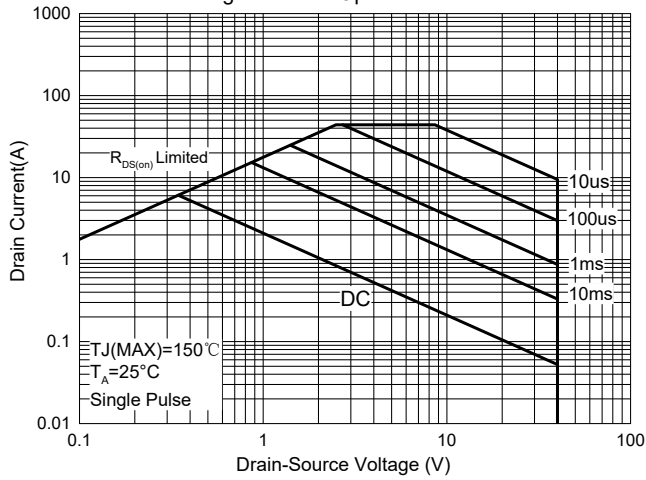
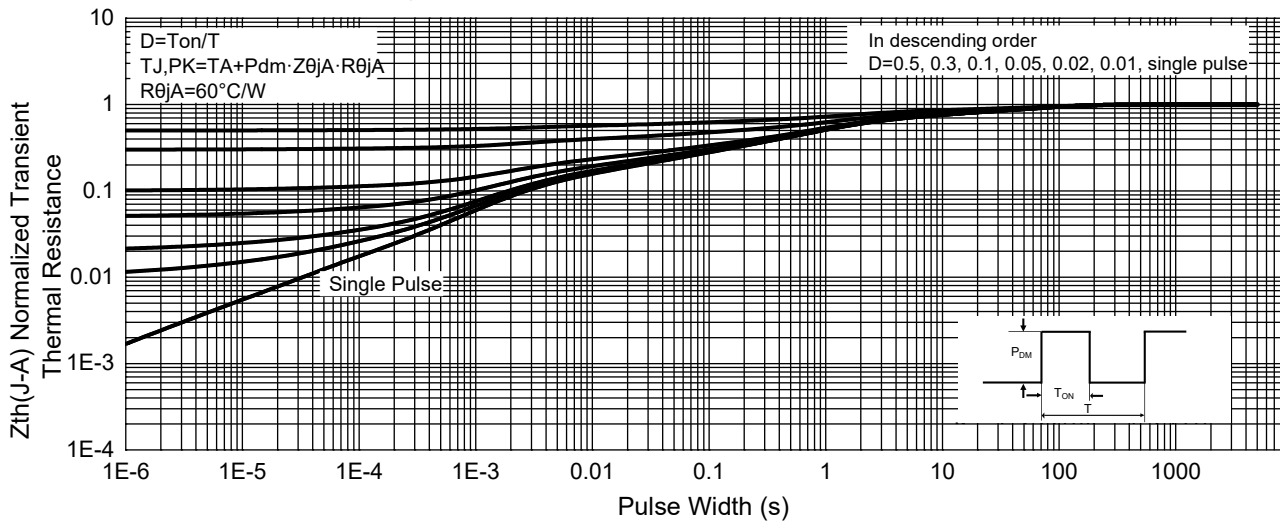


Fig. 13 - Normalized Transient Thermal Impedance



### Curve Characteristics (P-Channel)

Fig. 1 - Typical Output Characteristics

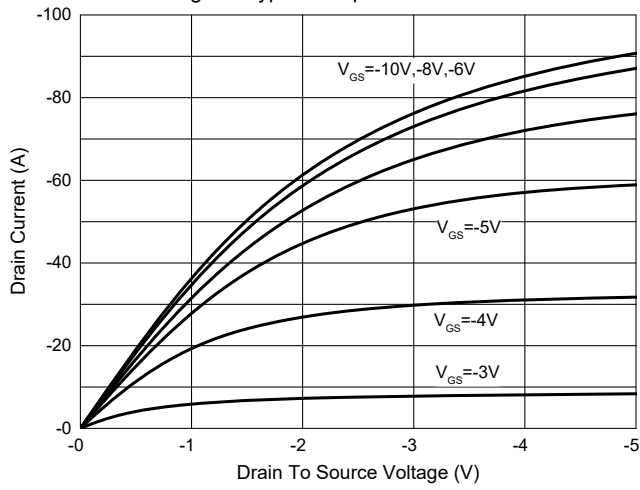


Fig. 2 - Transfer Characteristics

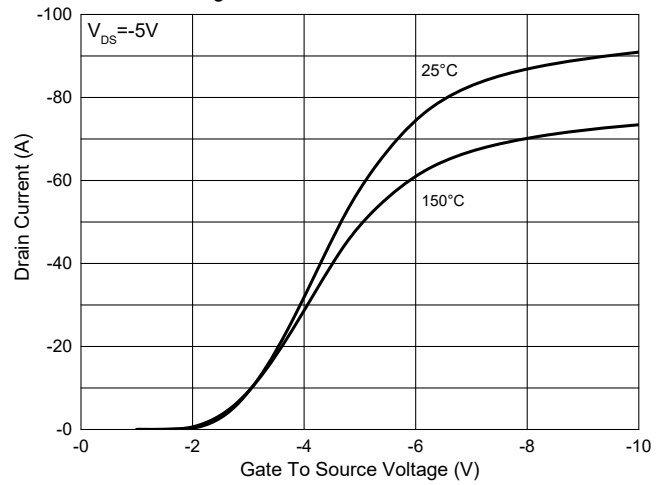


Fig. 3 -  $R_{DS(ON)} - V_{GS}$

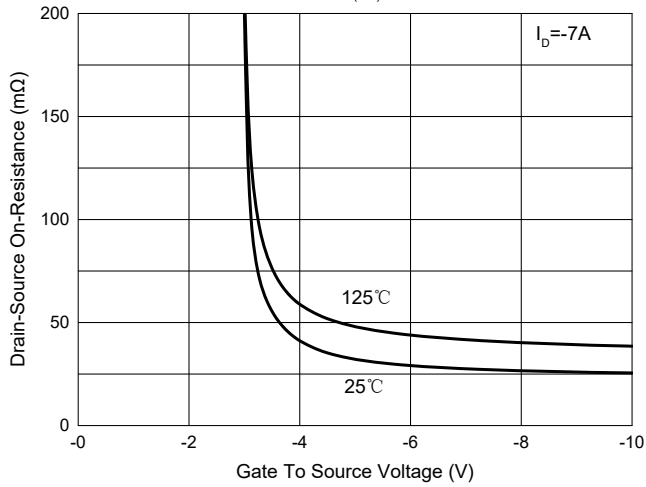


Fig. 4 -  $R_{DS(ON)} - I_D$

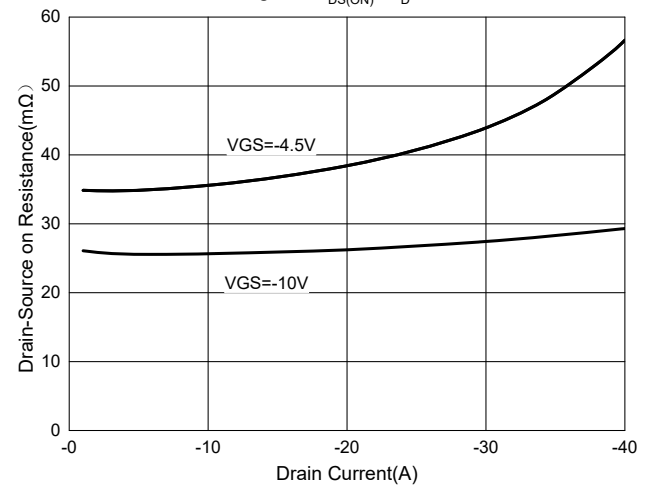


Fig. 5 - Capacitance Characteristics

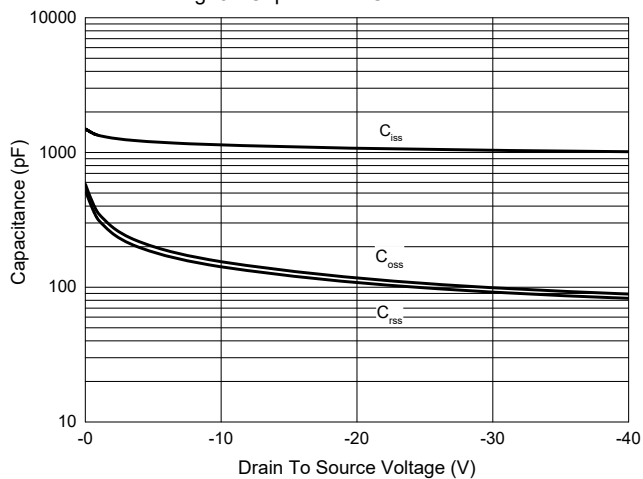
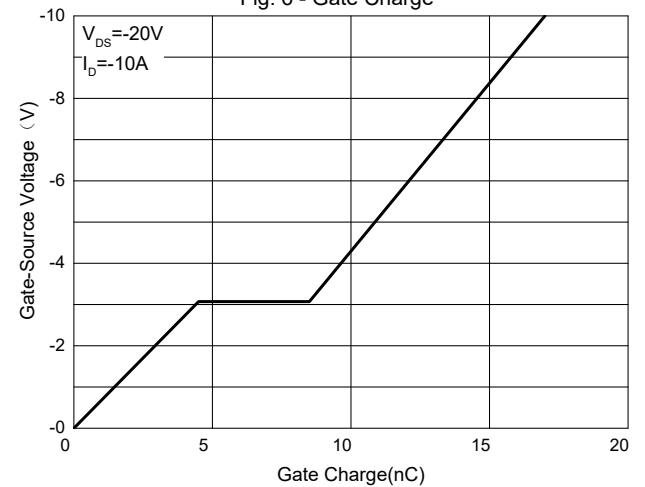


Fig. 6 - Gate Charge



**Curve Characteristics (P-Channel)**

Fig. 7 - Normalized Threshold Voltage

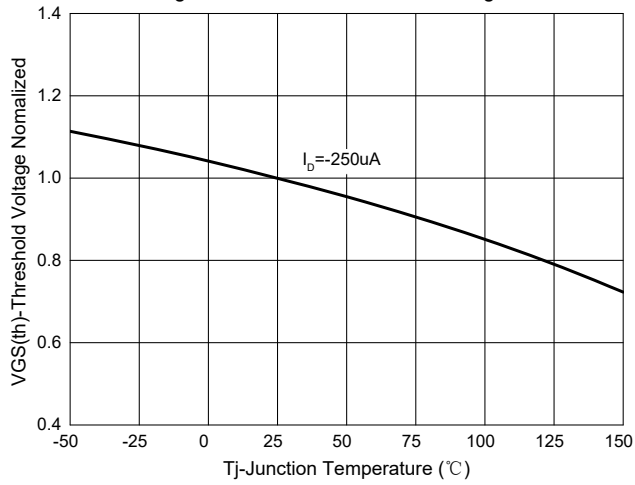


Fig.8-Normalized On Resistance Characteristics

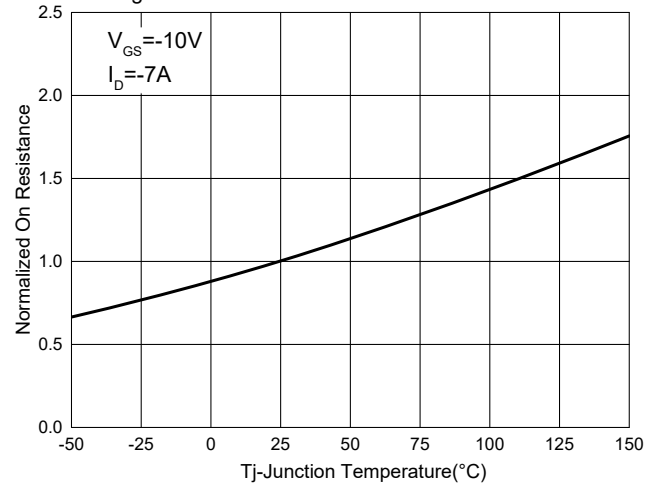


Fig.9 -  $I_S - V_{SD}$

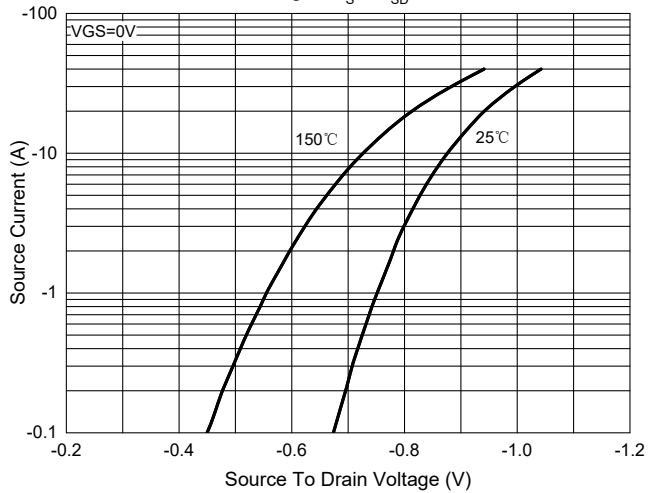


Fig. 10 - Drain Current

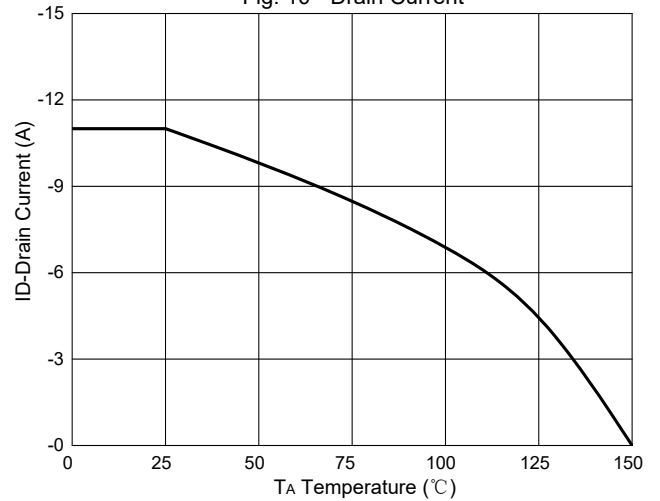
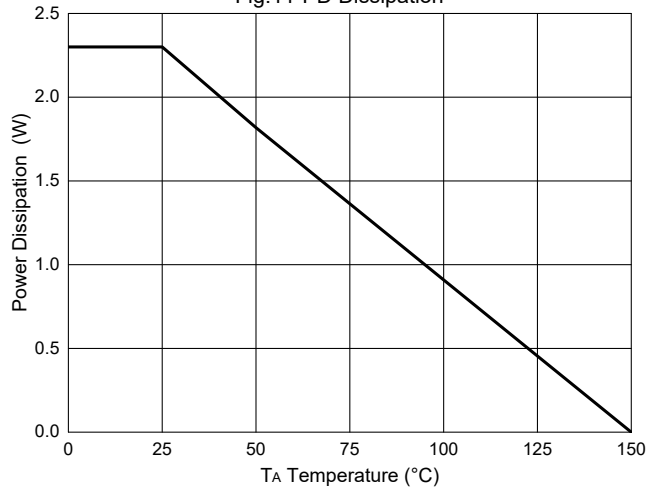


Fig.11-PD Dissipation





### Curve Characteristics (P-Channel)

Fig. 12 - Safe Operation Area

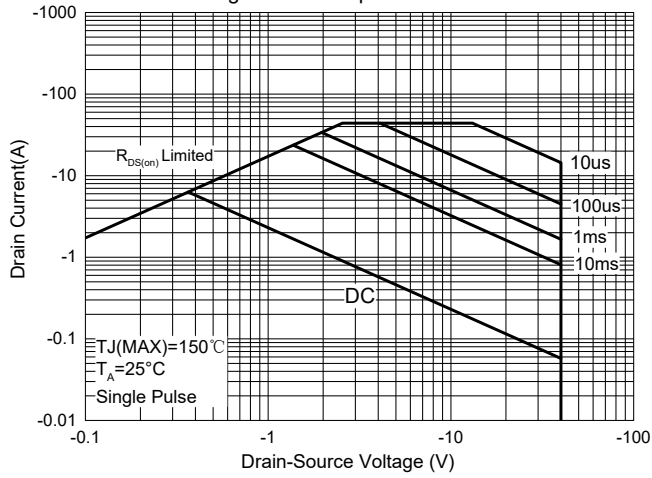
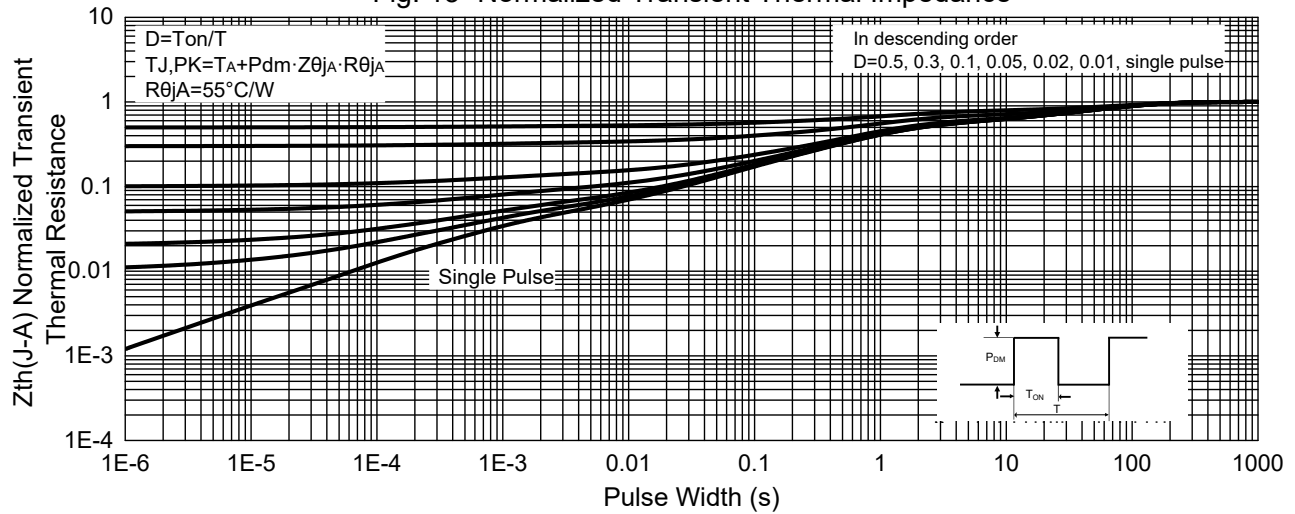


Fig. 13 - Normalized Transient Thermal Impedance



## Ordering Information

Device	Packing
Part Number-TP	Tape&Reel: 4Kpcs/Reel

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