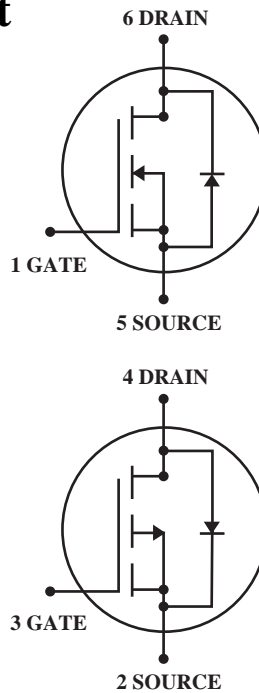


## N AND P-Channel Enhancement Mode POWER MOSFET

**(P/b)** Lead(Pb)-Free

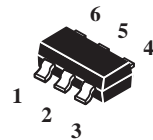
### Features:

- \* Low Gate charge
- \* Low On-Resistance  
 N-CH  $R_{DS(ON)} < 75\text{m}\Omega @ V_{GS} = 4.5\text{V}$   
 P-CH  $R_{DS(ON)} < 160\text{m}\Omega @ V_{GS} = -4.5\text{V}$
- \* SOT-8 Package



**N-CHANNEL**  
**DRAIN SOURCE VOLTAGE**  
**20 VOLTAGE**  
**DRAIN CURRENT**  
**3.5 AMPERES**

**P-CHANNEL**  
**DRAIN SOURCE VOLTAGE**  
**-20 VOLTAGE**  
**DRAIN CURRENT**  
**-2.5 AMPERES**



**TSOP-6**

### Maximum Ratings ( $T_A=25^\circ\text{C}$ Unless Otherwise Specified)

Rating	Symbol	Value		Unit	
		N-Channl	P-Channl		
Drain-Source Voltage	$V_{DS}$	20	-20	V	
Gate-Source Voltage	$V_{GS}$	$\pm 12$	$\pm 12$	V	
Continuous Drain Current <sup>3</sup>	$I_D$	$T_A=25^\circ\text{C}$	3.5	-2.5	A
		$T_A=75^\circ\text{C}$	2.8	-1.97	
Pulsed Drain Current <sup>1</sup>	$I_{DM}$	10	-10	A	
Total Power Dissipation	$P_D$	$T_A=25^\circ\text{C}$ 1.14		W	
Maximum Junction-ambient <sup>3</sup>	$R_{\theta JA}$	110		$^\circ\text{C}/\text{W}$	
Operating Junction Temperature Range	$T_J$	+150		$^\circ\text{C}$	
Storage Temperature Range	$T_{stg}$	-55~+150		$^\circ\text{C}$	

### Device Marking

WTV3585=3585

**N-Channel Electrical Characteristics** ( $T_A = 25^\circ\text{C}$  Unless otherwise noted)

Characteristic	Symbol	Min	Typ	Max	Unit
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**OFF Characteristics**

Drain-Source Breakdown Voltage $V_{GS}=0, I_D=250\mu\text{A}$	$BV_{DSS}$	20	-	-	V
Drain-Source Leakage Current $T_j=25^\circ\text{C}, V_{DS}=20\text{V}, V_{GS}=0\text{V}$ $T_j=70^\circ\text{C}, V_{DS}=16\text{V}, V_{GS}=0\text{V}$	$I_{DSS}$	-	-	1 10	$\mu\text{A}$
Gate-Source Leakage current $V_{GS}=\pm 12\text{V}$	$I_{GSS}$	-	-	$\pm 100$	nA

**ON Characteristics**

Gate-Source Threshold Voltage $V_{DS}=V_{GS}, I_D=250\mu\text{A}$	$V_{GS(Th)}$	0.5	-	1.2	V
Drain-Source On-Resistance $V_{GS}=4.5\text{V}, I_D=3.5\text{A}$ $V_{GS}=2.5\text{V}, I_D=1.2\text{A}$	$R_{DS(on)}$	-	-	75 125	m $\Omega$
Forward Transconductance $V_{DS}=5\text{V}, I_D=3\text{A}$	$g_{fs}$	-	7	-	S

**Dynamic Characteristics**

Input Capacitance $V_{GS}=0\text{V}, V_{DS}=20\text{V}, f=1.0\text{MHz}$	$C_{iss}$	-	230	370	pF
Output Capacitance $V_{GS}=0\text{V}, V_{DS}=20\text{V}, f=1.0\text{MHz}$	$C_{oss}$	-	55	-	
Reverse Transfer Capacitance $V_{GS}=0\text{V}, V_{DS}=20\text{V}, f=1.0\text{MHz}$	$C_{rss}$	-	40	-	
Gate Resistance $f=1.0\text{MHz}$	$R_g$	-	1.1	1.7	$\Omega$

**Switching Characteristics**

Turn-on Delay Time $V_{DS}=15\text{V}, V_{GS}=5\text{V}, I_D=1\text{A}, R_G=3.3\Omega, R_D=15\Omega$	$t_{d(on)}$	-	6	-	ns
Rise Time $V_{DS}=15\text{V}, V_{GS}=5\text{V}, I_D=1\text{A}, R_G=3.3\Omega, R_D=15\Omega$	$t_r$	-	8	-	
Turn-off Delay Time $V_{DS}=15\text{V}, V_{GS}=5\text{V}, I_D=1\text{A}, R_G=3.3\Omega, R_D=15\Omega$	$t_{d(off)}$	-	10	-	
Fall Time $V_{DS}=15\text{V}, V_{GS}=5\text{V}, I_D=1\text{A}, R_G=3.3\Omega, R_D=15\Omega$	$t_f$	-	3	-	
Total Gate Charge $V_{DS}=16\text{V}, V_{GS}=4.5\text{V}, I_D=3\text{A}$	$Q_g$	-	4	7	nC
Gate-Source Charge $V_{DS}=16\text{V}, V_{GS}=4.5\text{V}, I_D=3\text{A}$	$Q_{gs}$	-	0.7	-	
Gate-Source Change $V_{DS}=16\text{V}, V_{GS}=4.5\text{V}, I_D=3\text{A}$	$Q_{gd}$	-	2	-	

**Source-Drain Diode Characteristics**

Forward On Voltage $I_S=1.2\text{A}, V_{GS}=0\text{V}$	$V_{SD}$	-	-	1.2	V
Reverse Recovery Time $I_S=3\text{A}, V_{GS}=0\text{V}, di/dt=100\text{A}/\mu\text{s}$	$T_{rr}$	-	16	-	nS
Reverse Recovery Charge $I_S=3\text{A}, V_{GS}=0\text{V}, di/dt=100\text{A}/\mu\text{s}$	$Q_{rr}$	-	8	-	nC

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

2. Pulse width  $\leq 300\mu\text{s}$ , duty cycle  $\leq 2\%$ .

3. Surface mounted on 1 in<sup>2</sup> copper pad of FR4 board,  $t_s \leq 5\text{sec}$ ;  $180^\circ\text{C}/\text{W}$  when mounted on Min. copper pad.

## P-Channel Electrical Characteristics (T<sub>A</sub> = 25°C Unless otherwise noted)

Characteristic	Symbol	Min	Typ	Max	Unit
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### OFF Characteristics

Drain-Source Breakdown Voltage V <sub>GS</sub> =0, I <sub>D</sub> =-250μA	BV <sub>DSS</sub>	-20	-	-	V
Drain-Source Leakage Current T <sub>j</sub> =25°C, V <sub>DS</sub> =-20V, V <sub>GS</sub> =0V T <sub>j</sub> =70°C, V <sub>DS</sub> =-16V, V <sub>GS</sub> =0V	I <sub>DSS</sub>	-	-	-1 -25	μA
Gate-Source Leakage current V <sub>GS</sub> =±12V	I <sub>GSS</sub>	-	-	±100	nA

### ON Characteristics

Gate-Source Threshold Voltage V <sub>DS</sub> =V <sub>GS</sub> , I <sub>D</sub> =-250μA	V <sub>GS(Th)</sub>	-	-	-1.2	V
Drain-Source On-Resistance <sup>2</sup> V <sub>GS</sub> =-10V, I <sub>D</sub> =-2.8A V <sub>GS</sub> =-4.5V, I <sub>D</sub> =-2.5A V <sub>GS</sub> =-2.5V, I <sub>D</sub> =-2A	R <sub>DS(on)</sub>	-	-	120 160 300	mΩ
Forward Transconductance V <sub>DS</sub> =-5V, I <sub>D</sub> =-2A	g <sub>fs</sub>	-	4.0	-	S

### Dynamic Characteristics

Input Capacitance V <sub>GS</sub> =0V, V <sub>DS</sub> =-20V, f=1.0MHz	C <sub>iss</sub>	-	270	430	pF
Output Capacitance V <sub>GS</sub> =0V, V <sub>DS</sub> =-20V, f=1.0MHz	C <sub>oss</sub>	-	70	-	
Reverse Transfer Capacitance V <sub>GS</sub> =0V, V <sub>DS</sub> =-20V, f=1.0MHz	C <sub>rss</sub>	-	55	-	

### Switching Characteristics

Turn-on Delay Time V <sub>DS</sub> =-10V, V <sub>GS</sub> =-10V, I <sub>D</sub> =-1A, R <sub>G</sub> =3.3Ω, R <sub>D</sub> =10Ω	t <sub>d(on)</sub>	-	6	-	ns
Rise Time V <sub>DS</sub> =-10V, V <sub>GS</sub> =-10V, I <sub>D</sub> =-1A, R <sub>G</sub> =3.3Ω, R <sub>D</sub> =10Ω	t <sub>r</sub>	-	17	-	
Turn-off Delay Time V <sub>DS</sub> =-10V, V <sub>GS</sub> =-10V, I <sub>D</sub> =-1A, R <sub>G</sub> =3.3Ω, R <sub>D</sub> =10Ω	t <sub>d(off)</sub>	-	16	-	
Fall Time V <sub>DS</sub> =-10V, V <sub>GS</sub> =-10V, I <sub>D</sub> =-1A, R <sub>G</sub> =3.3Ω, R <sub>D</sub> =10Ω	t <sub>f</sub>	-	5	-	
Total Gate Charge <sup>2</sup> V <sub>DS</sub> =-16V, V <sub>GS</sub> =-4.5V, I <sub>D</sub> =-2A	Q <sub>g</sub>	-	5	8	nC
Gate-Source Charge V <sub>DS</sub> =-16V, V <sub>GS</sub> =-4.5V, I <sub>D</sub> =-2A	Q <sub>gs</sub>	-	1	-	
Gate-Source Change V <sub>DS</sub> =-16V, V <sub>GS</sub> =-4.5V, I <sub>D</sub> =-2A	Q <sub>gd</sub>	-	2	-	

### Source-Drain Diode Characteristics

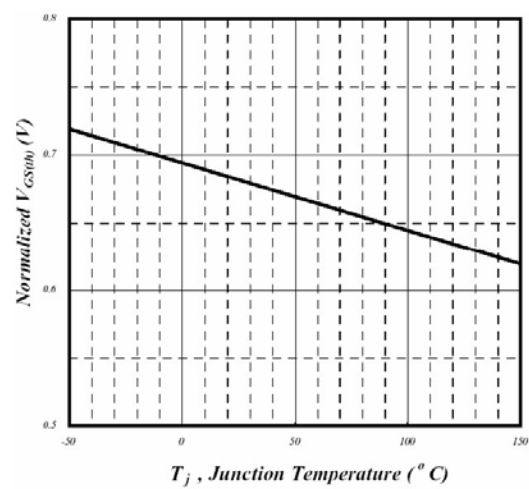
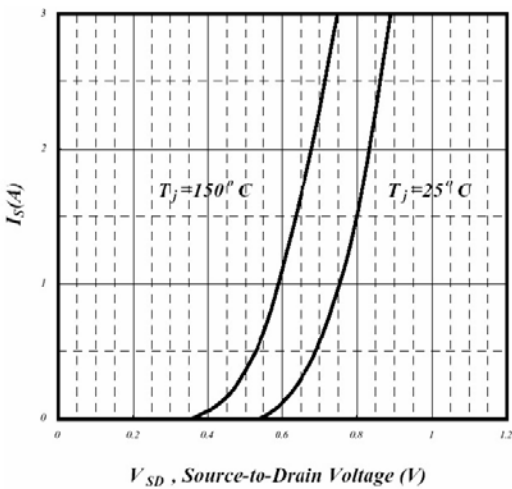
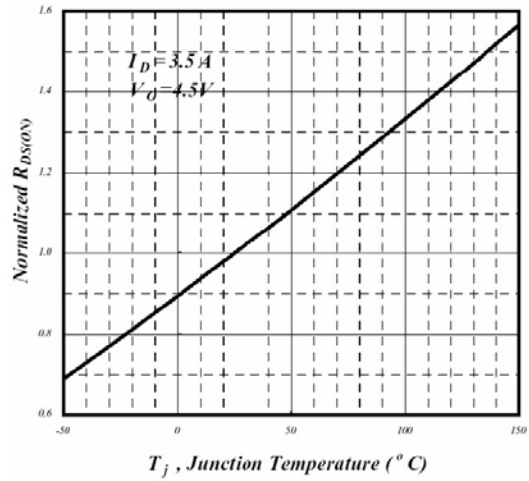
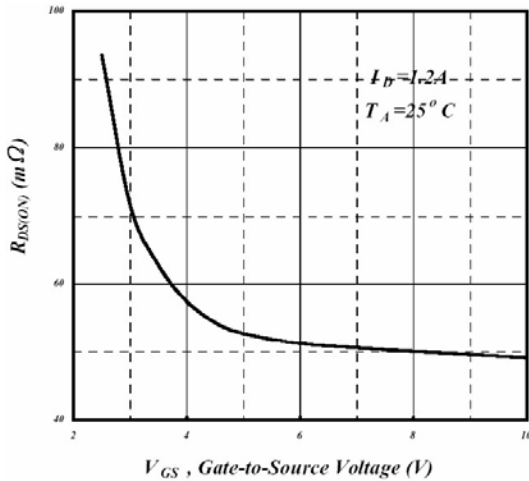
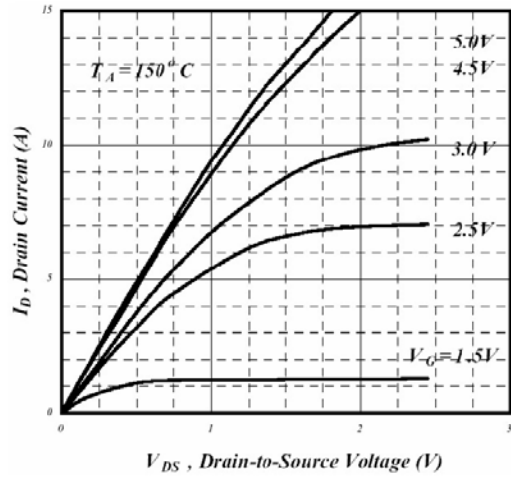
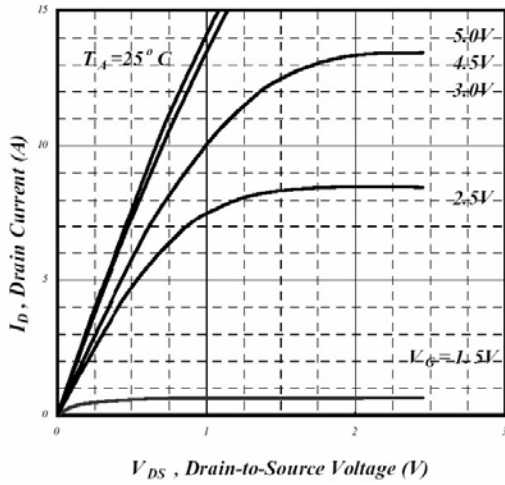
Forward On Voltage <sup>2</sup> I <sub>S</sub> =-1.2A, V <sub>GS</sub> =0V	V <sub>SD</sub>	-	-	-1.2	V
Reverse Recovery Time <sup>2</sup> I <sub>S</sub> =-2A, V <sub>GS</sub> =0V, di/dt=100A/μs	T <sub>rr</sub>	-	20	-	nS
Reverse Recovery Charge I <sub>S</sub> =-2A, V <sub>GS</sub> =0V, di/dt=100A/μs	Q <sub>rr</sub>	-	15	-	nC

Note: 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, t<sub>s</sub>≤5sec; 180°C/W when mounted on Min. copper pad.

## Characteristics Curve N-Channel



## N-Channel

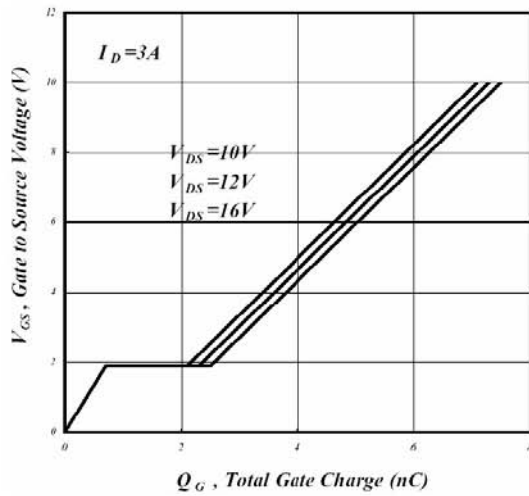


Fig 7. Gate Charge Characteristics

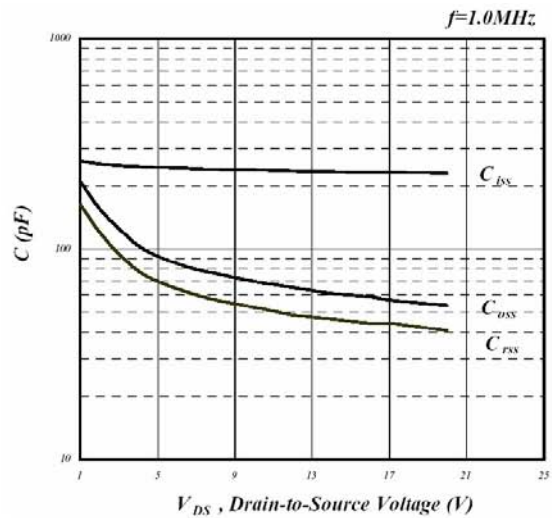


Fig 8. Typical Capacitance Characteristics

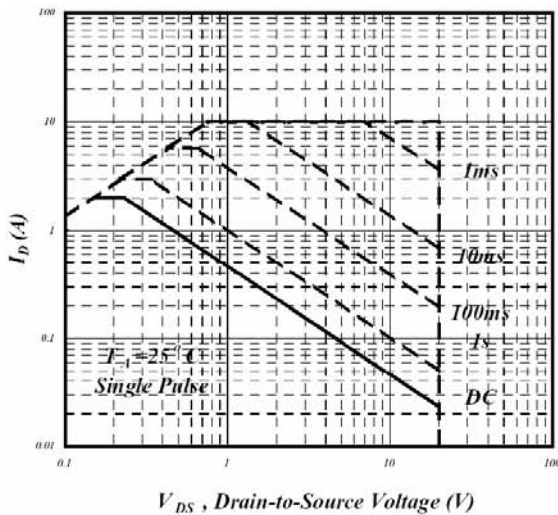


Fig 9. Maximum Safe Operating Area

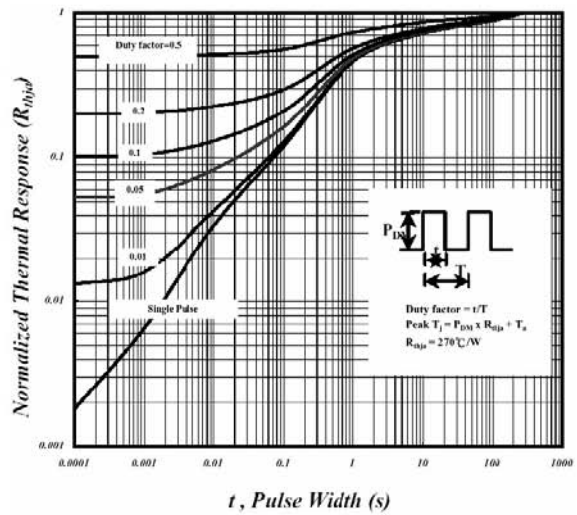


Fig 10. Effective Transient Thermal Impedance

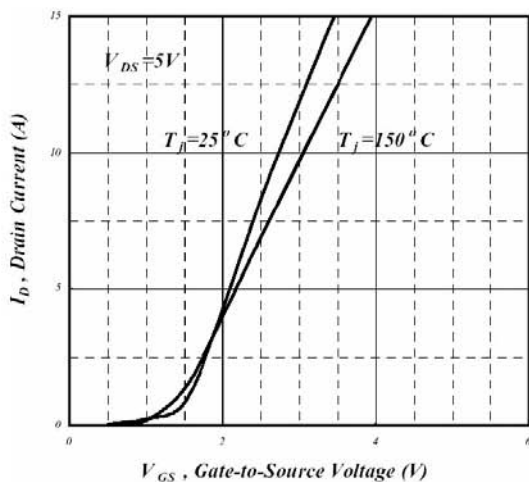


Fig 11. Transfer Characteristics

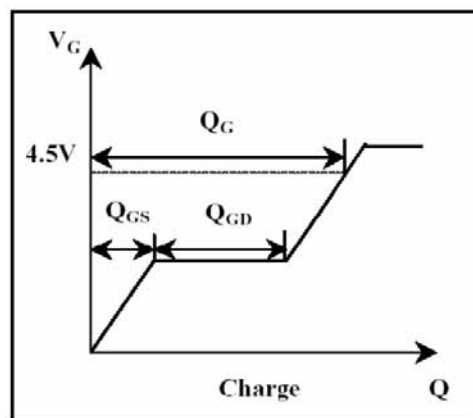
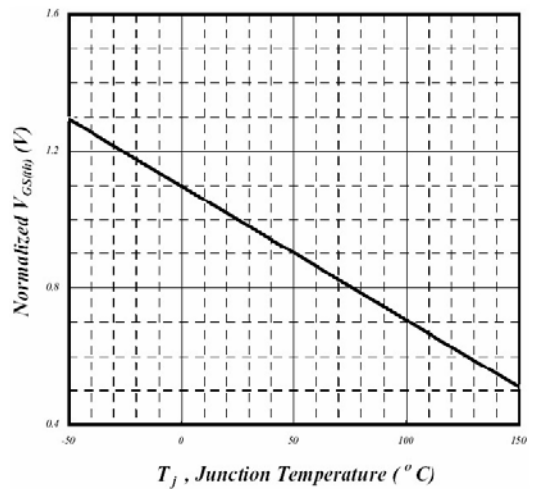
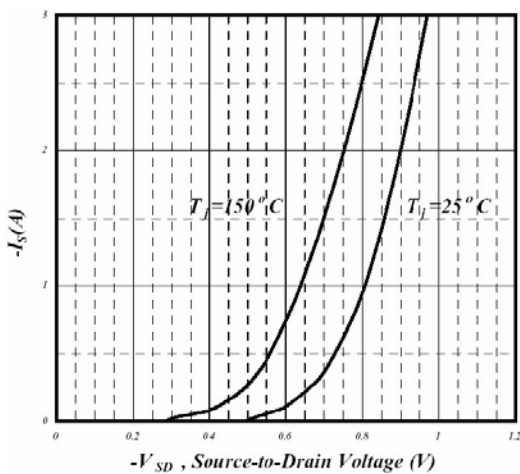
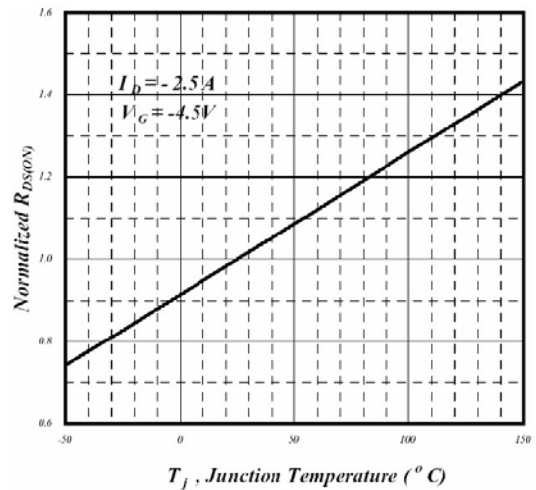
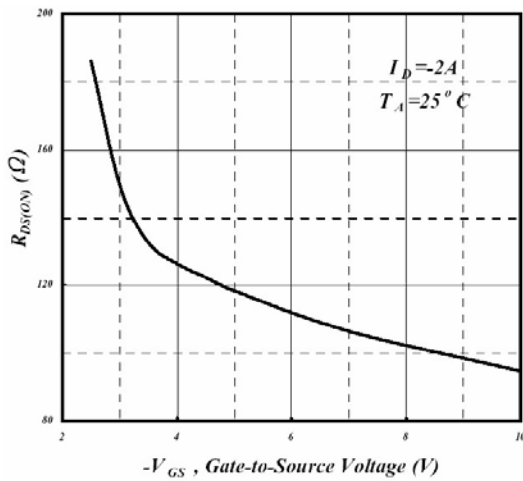
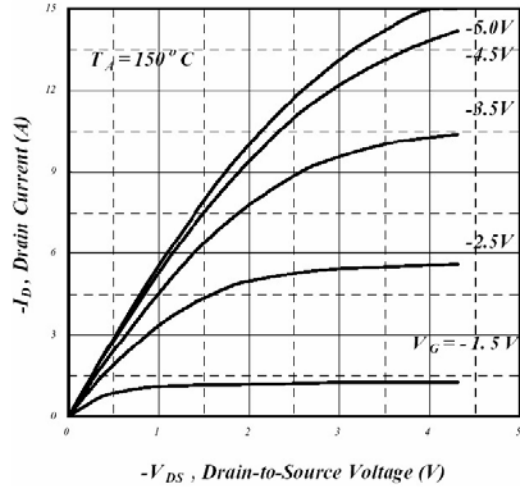
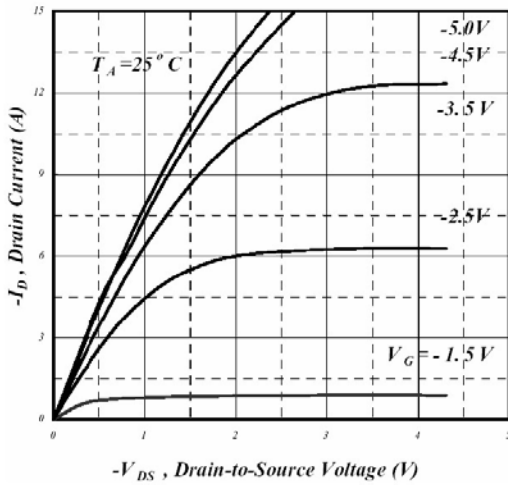


Fig 12. Gate Charge Waveform

## Characteristics Curve P-Channel



## P-Channel

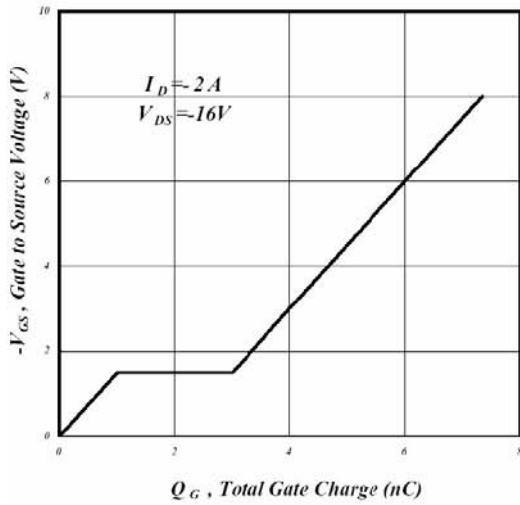


Fig 7. Gate Charge Characteristics

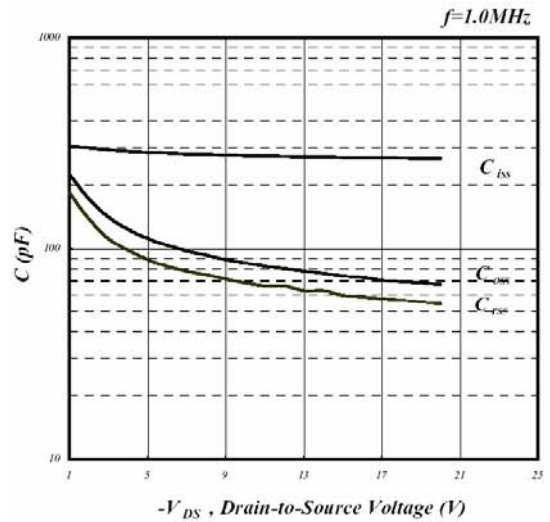


Fig 8. Typical Capacitance Characteristics

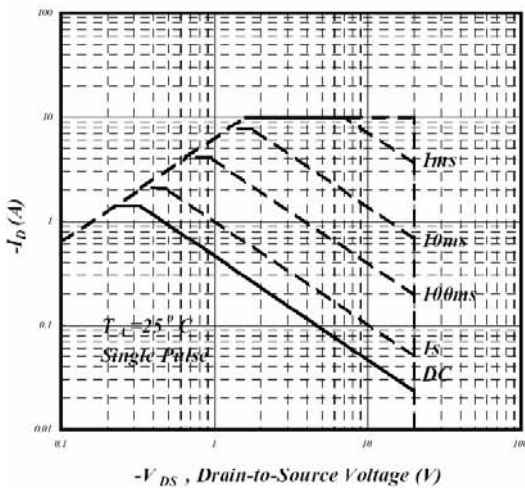


Fig 9. Maximum Safe Operating Area

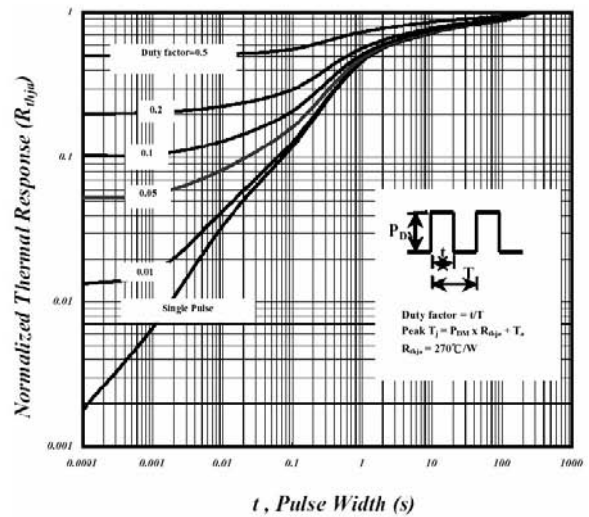


Fig 10. Effective Transient Thermal Impedance

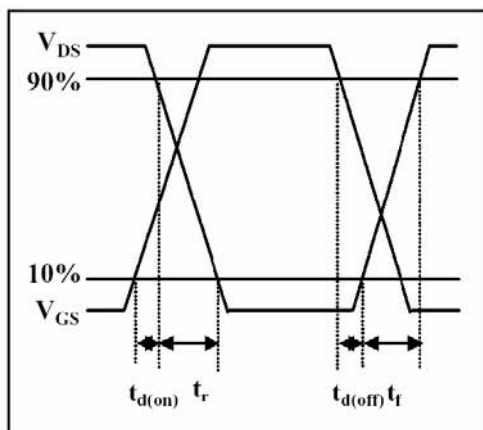


Fig 11. Transfer Characteristics

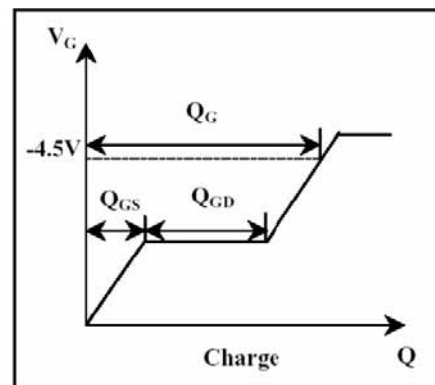
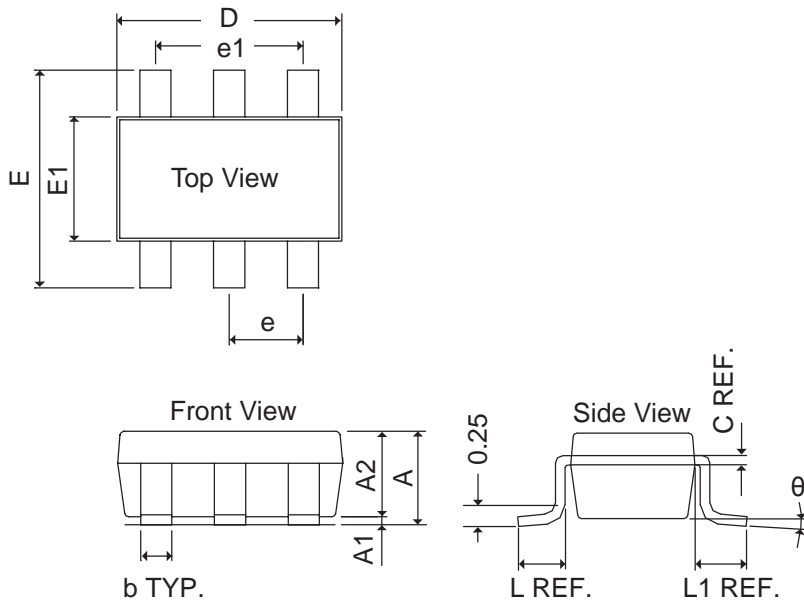


Fig 12. Gate Charge Waveform

**TSOP-6 Outline Dimension**

Unit:mm



TSOP-6		
Dim	Min	Max
A	-	1.10
A1	0	0.10
A2	0.70	1.00
C	0.12 REF.	
D	2.70	3.10
E	2.60	3.00
E1	1.40	1.80
L	0.45 REF.	
L1	0.60 REF.	
$\theta$	0°	10°
b	0.30	0.50
e	0.95 REF.	
e1	1.90 REF.	