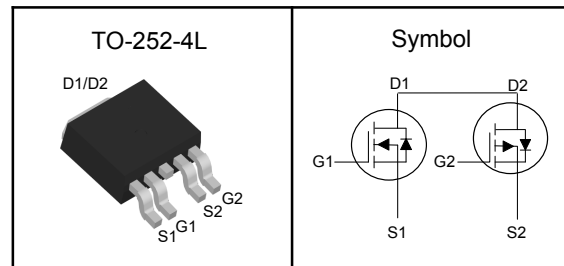


**Dual N+P Channel Enhancement Mode MOSFET**
**Features**

- Low Rdson for low conduction loss
- Reliable and Rugged
- ROHS Compliant & Halogen-Free

**Applications**

- Power Management in Desktop Computer
- DC/DC Converters

**Pin Description**


V <sub>DSS</sub>	40	-40	V
R <sub>Ds(ON)-Typ</sub>	14	32	mΩ
I <sub>D</sub>	28	-25	A

**Absolute Maximum Ratings**(T<sub>C</sub>=25°C, Unless Otherwise Noted)

Symbol	Parameter	N-Channel	P-Channel	Unit
V <sub>DSS</sub>	Drain-Source Voltage	40	-40	V
V <sub>GSS</sub>	Gate-Source Voltage	±20	±20	V
T <sub>J</sub>	Maximum Junction Temperature	-55 to 150	-55 to 150	°C
T <sub>STG</sub>	Storage Temperature Range	-55 to 150	-55 to 150	°C
I <sub>DM</sub> <sup>①</sup>	Pulse Drain Current Tested	80	-80	A
I <sub>D</sub>	Continuous Drain Current	28	-25	A
P <sub>D</sub>	Maximum Power Dissipation	32.9	32.9	W
E <sub>AS</sub>	Single Pulse Avalanche Energy	25	25	mJ
I <sub>AS</sub>	Avalanche Current	10	-10	A

**Thermal Characteristics**

Symbol	Parameter	Rating	Unit
R <sub>θJA</sub> <sup>③</sup>	Thermal Resistance-Junction to Ambient	62	°C/W
R <sub>θJC</sub>	Thermal Resistance Junction-Case	5.0	°C/W

Note ① : Max. current is limited by bonding wire.

Note ② : UIS tested and pulse width are limited by maximum junction temperature 150°C.

Note ③ : Surface Mounted on 1in<sup>2</sup> FR-4 board with 1oz.



**Dual N+P Channel Enhancement Mode MOSFET**

**Electrical Characteristics** ( $T_J=25^{\circ}\text{C}$ , Unless Otherwise Noted)

Symbol	Parameter	Test Conditions	Min	Typ	Max	Unit
<b>Static Electrical Characteristics</b>						
$BV_{DSS}$	Drain-Source Breakdown Voltage	$V_{GS}=0V, I_D=250\mu A$	40	---	---	V
$I_{DSS}$	Zero Gate Voltage Drain Current	$V_{DS}=32V, V_{GS}=0V$	---	---	1	$\mu A$
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS}=V_{GS}, I_D=250\mu A$	1.5	---	2.5	V
$I_{GSS}$	Gate Leakage Current	$V_{GS}=\pm 20V, V_{DS}=0V$	---	---	$\pm 100$	nA
$R_{DS(on)}$	Drain-Source On-state Resistance	$V_{GS}=10V, I_D=10A$	---	14	21	m $\Omega$
		$V_{GS}=4.5V, I_D=5A$	---	18	25	
gfs	Forward Transconductance	$V_{DS}=5V, I_D=5A$	---	14	---	S
<b>Dynamic Characteristics<sup>⑤</sup></b>						
$C_{iss}$	Input Capacitance	$V_{GS}=0V, V_{DS}=20V, \text{Freq.}=1\text{MHz}$	---	815	---	pF
$C_{oss}$	Output Capacitance		---	95	---	
$C_{rss}$	Reverse Transfer Capacitance		---	60	---	
$T_{d(on)}$	Turn-on Delay Time	$V_{DD}=20V, V_{GS}=10V, R_G=6\Omega, I_D=1A$	---	7.8	---	nS
$T_r$	Turn-on Rise Time		---	6.9	---	
$T_{d(off)}$	Turn-off Delay Time		---	22.4	---	
$T_f$	Turn-off Fall Time		---	4.8	---	
$Q_g$	Total Gate Charge(4.5V)	$V_{DS}=20V, V_{GS}=10V, I_D=10A$	---	15.7	---	nC
$Q_{gs}$	Gate-Source Charge		---	3.24	---	
$Q_{gd}$	Gate-Drain Charge		---	2.75	---	
<b>Source-Drain Characteristics</b>						
$V_{SD}^{④}$	Diode Forward Voltage	$V_{GS}=0V, I_S=1A, T_J=25^{\circ}\text{C}$	---	---	1.1	V
$I_S$	Continuous Source Current	$V_G=V_D=0V, \text{Force Current}$	---	---	6.1	A
$I_{SM}$	Pulsed Source Current		---	---	23	A

Note ④: Pulse test (pulse width 300us, duty cycle 2%).

Note ⑤: Guaranteed by design, not subject to production testing.



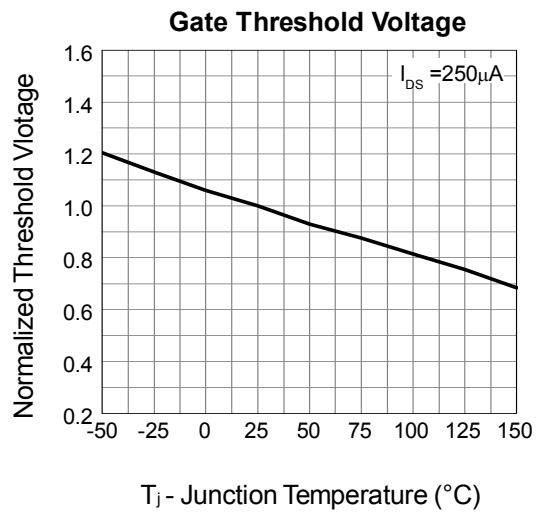
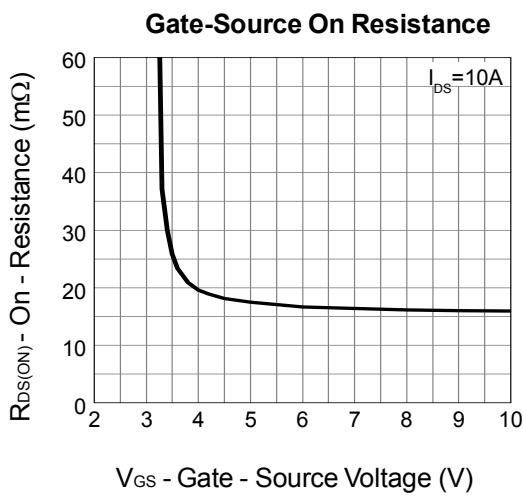
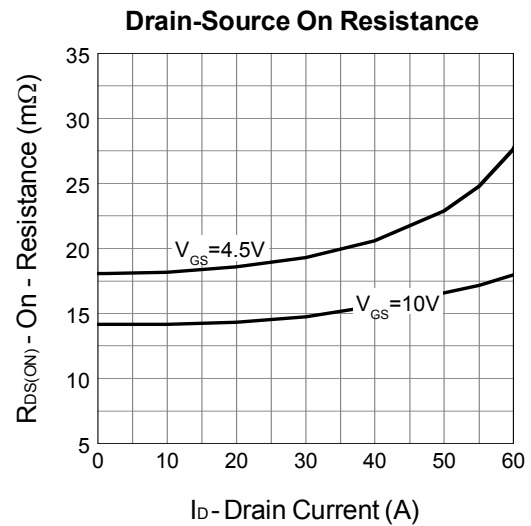
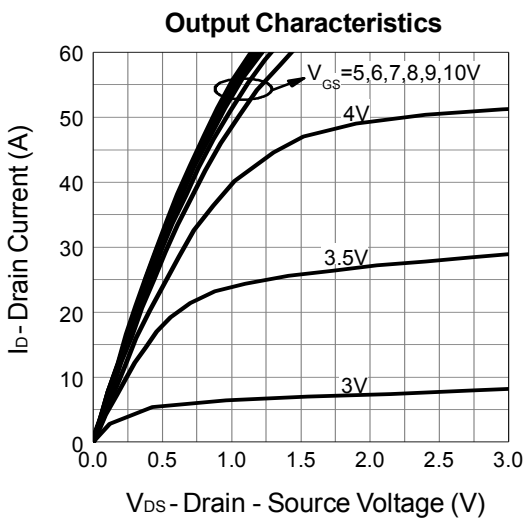
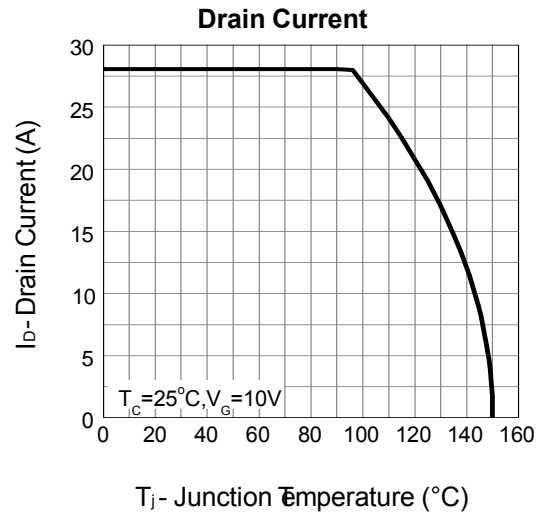
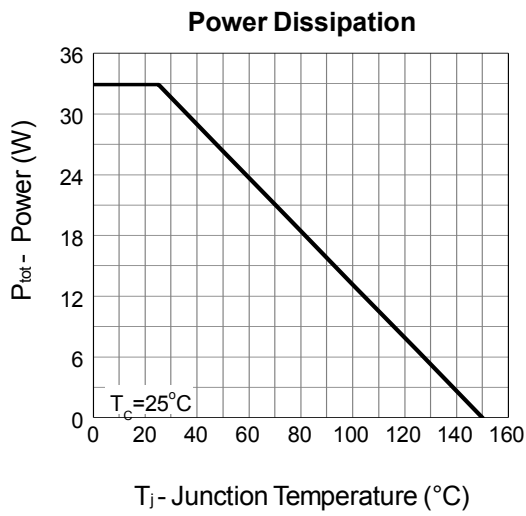
**Dual N+P Channel Enhancement Mode MOSFET**

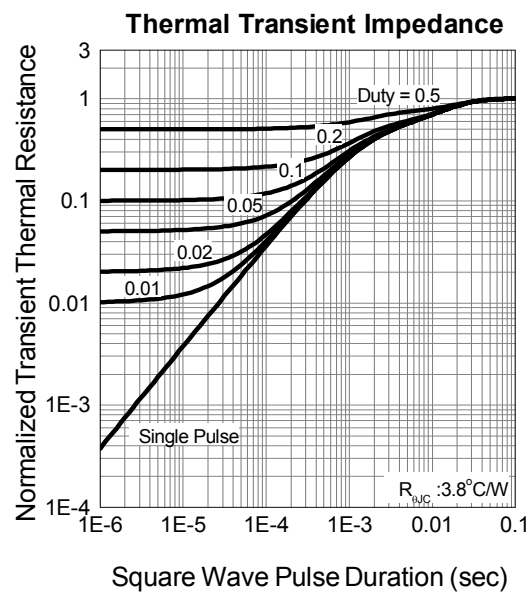
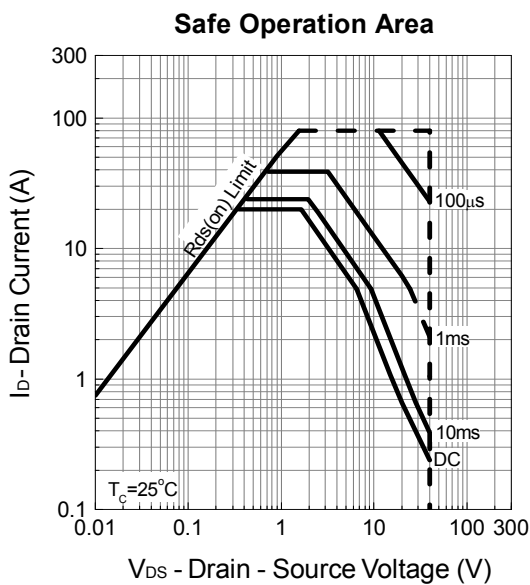
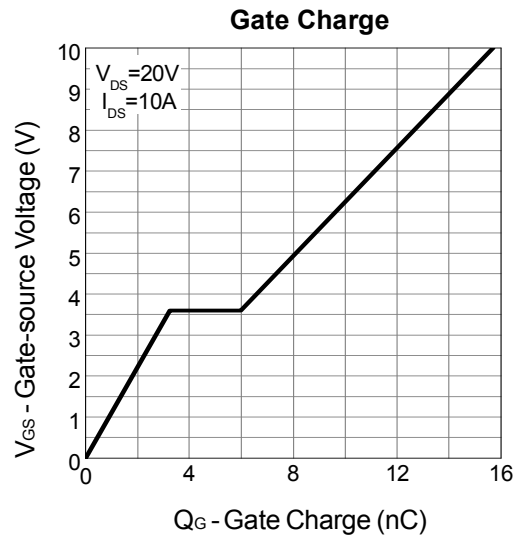
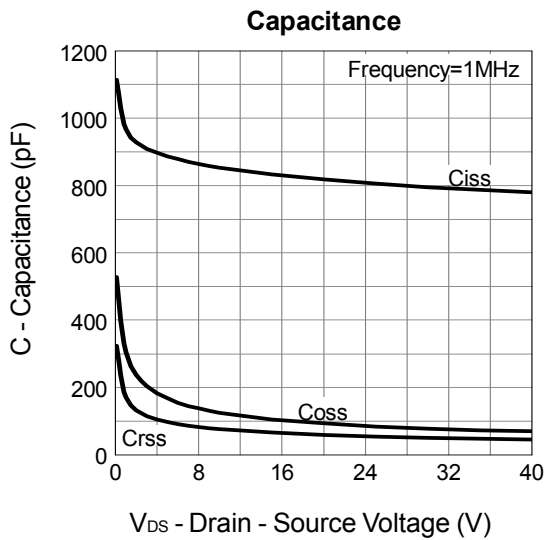
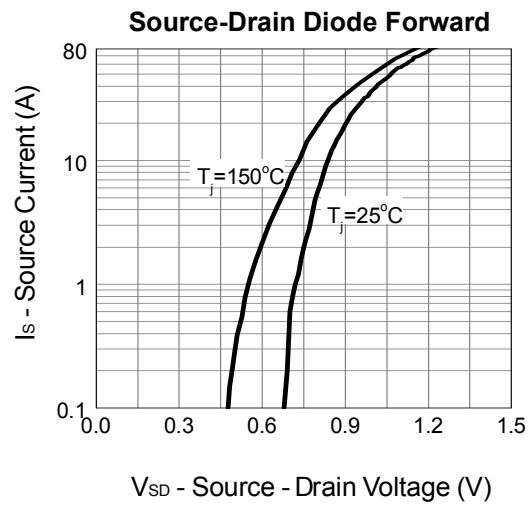
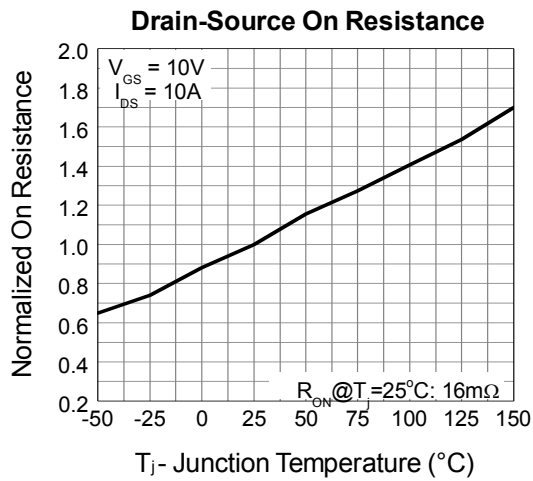
**Electrical Characteristics** ( $T_J=25^{\circ}\text{C}$ , Unless Otherwise Noted)

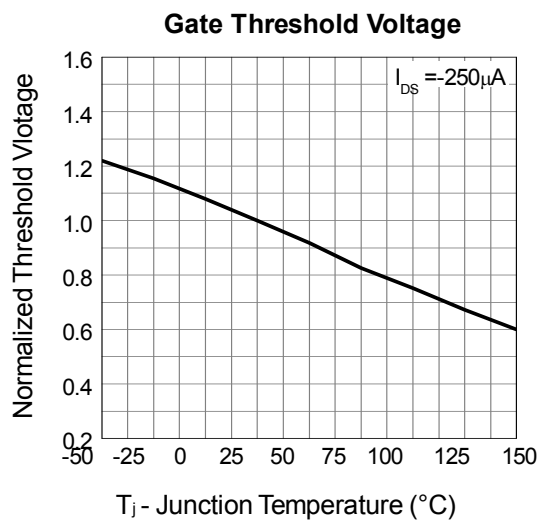
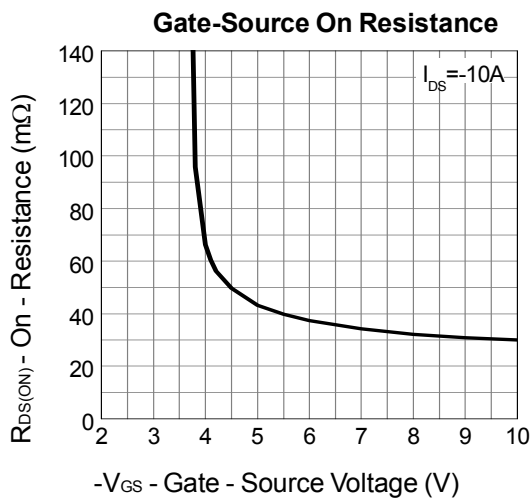
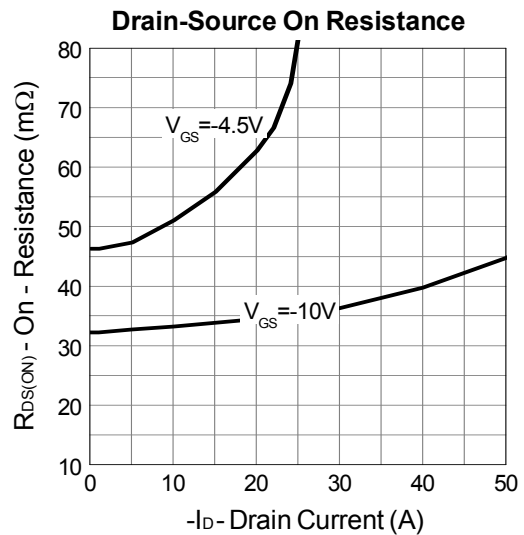
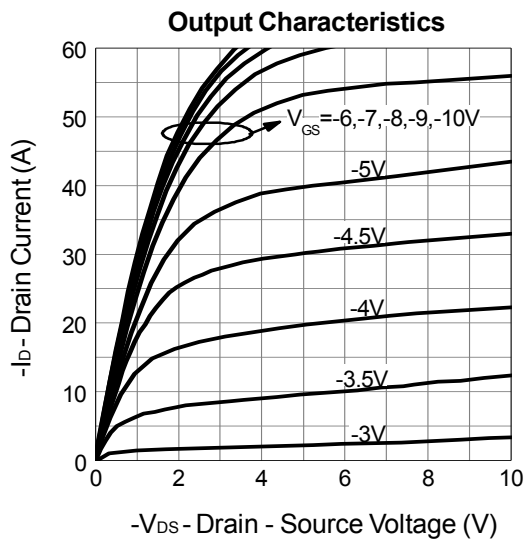
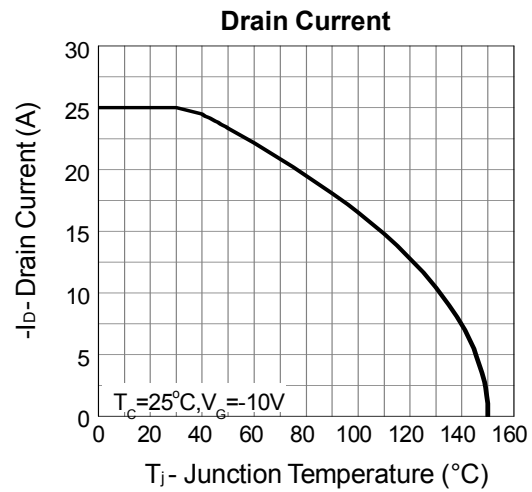
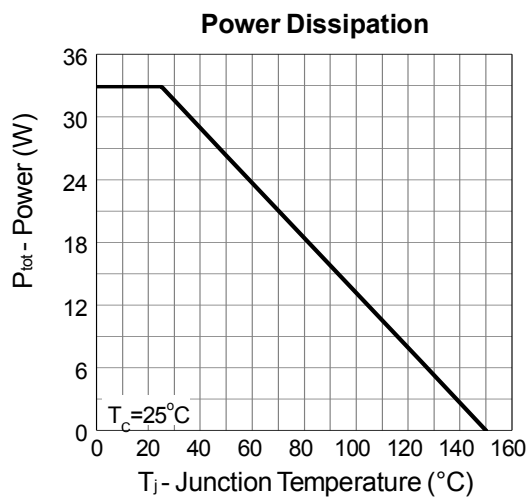
Symbol	Parameter	Test Conditions	Min	Typ	Max	Unit
<b>Static Electrical Characteristics</b>						
$BV_{DSS}$	Drain-Source Breakdown Voltage	$V_{GS}=0V, I_D=-250\mu A$	-40	---	---	V
$I_{DSS}$	Zero Gate Voltage Drain Current	$V_{DS}=-32V, V_{GS}=0V$	---	---	1	$\mu A$
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS}=V_{GS}, I_D=-250\mu A$	-1.5	---	-2.5	V
$I_{GSS}$	Gate Leakage Current	$V_{GS}=\pm 20V, V_{DS}=0V$	---	---	$\pm 100$	nA
$R_{DS(on)}$	Drain-Source On-state Resistance	$V_{GS}=-10V, I_D=-10A$	---	32	39	m $\Omega$
		$V_{GS}=-4.5V, I_D=-10A$	---	46	62	
gfs	Forward Transconductance	$V_{DS}=-5V, I_D=-6A$	---	13	---	S
<b>Dynamic Characteristics</b> <sup>⑤</sup>						
$C_{iss}$	Input Capacitance	$V_{GS}=0V, V_{DS}=-20V, \text{Freq.}=1\text{MHz}$	---	668	---	pF
$C_{oss}$	Output Capacitance		---	98	---	
$C_{rss}$	Reverse Transfer Capacitance		---	72	---	
$T_{d(on)}$	Turn-on Delay Time	$V_{DD}=-20V, V_{GS}=-10V, R_G=6\Omega, I_D=-1A$	---	8.7	---	nS
$T_r$	Turn-on Rise Time		---	7	---	
$T_{d(off)}$	Turn-off Delay Time		---	31	---	
$T_f$	Turn-off Fall Time		---	17	---	
$Q_g$	Total Gate Charge	$V_{DS}=-20V, V_{GS}=-10V, I_D=-10A$	---	15	---	nC
$Q_{gs}$	Gate-Source Charge		---	2.4	---	
$Q_{gd}$	Gate-Drain Charge		---	3.5	---	
<b>Source-Drain Characteristics</b>						
$V_{SD}$ <sup>④</sup>	Diode Forward Voltage	$V_{GS}=0V, I_S=-1A, T_J=25^{\circ}\text{C}$	---	---	-1	V
$I_S$	Continuous Source Current	$V_G=V_D=0V, \text{Force Current}$	---	---	-6	A
$I_{SM}$	Pulsed Source Current		---	---	-22	A

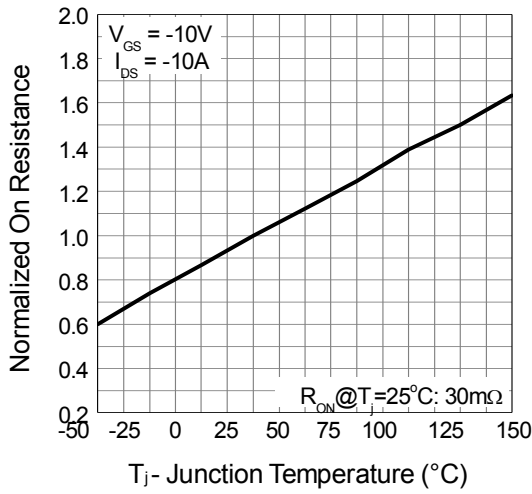
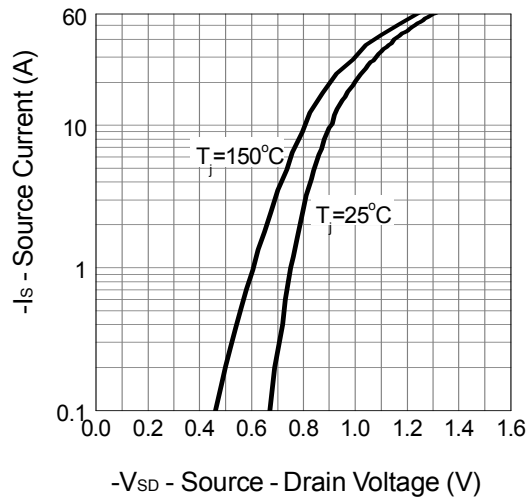
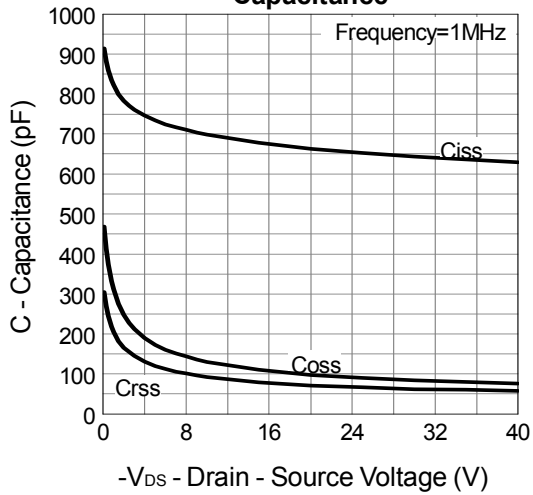
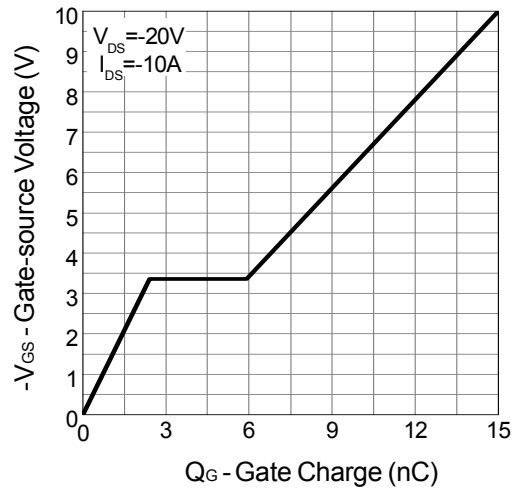
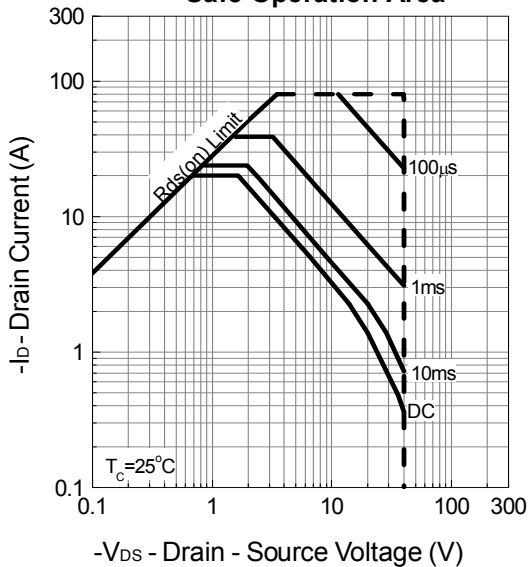
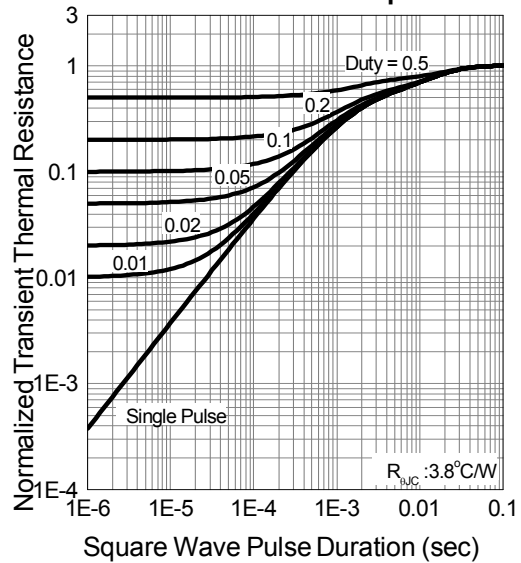
Note ④: Pulse test (pulse width 300us, duty cycle 2%).

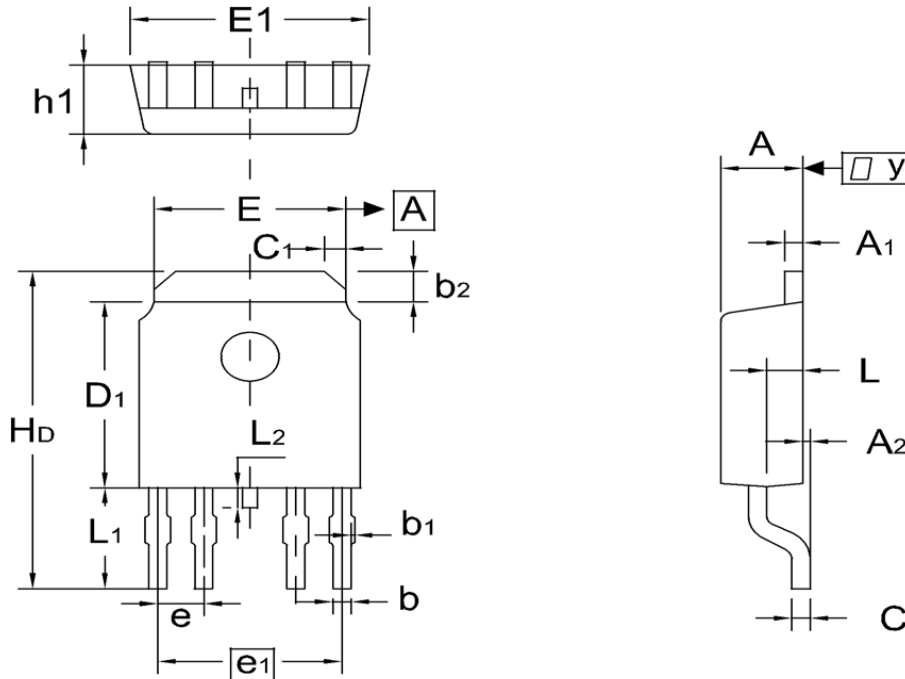
Note ⑤: Guaranteed by design, not subject to production testing.

**Dual N+P Channel Enhancement Mode MOSFET**
**N Channel Typical Operating Characteristics**


**Dual N+P Channel Enhancement Mode MOSFET**


**Dual N+P Channel Enhancement Mode MOSFET**
**P Channel Typical Operating Characteristics**


**Dual N+P Channel Enhancement Mode MOSFET**
**Drain-Source On Resistance**

**Source-Drain Diode Forward**

**Capacitance**

**Gate Charge**

**Safe Operation Area**

**Thermal Transient Impedance**


**Dual N+P Channel Enhancement Mode MOSFET**
**TO-252-4L Package Outline Dimensions**

**DIMENSIONS** ( unit : mm )

Symbol	Min	Typ	Max	Symbol	Min	Typ	Max
<b>A</b>	2.1	2.3	2.5	<b>A<sub>1</sub></b>	0.4	0.5	0.6
<b>A<sub>2</sub></b>	--	--	0.3	<b>b</b>	0.4	0.5	0.6
<b>b<sub>1</sub></b>	--	--	0.1	<b>b<sub>2</sub></b>	0.8	1.0	1.2
<b>C</b>	0.4	0.5	0.6	<b>C<sub>1</sub></b>	0.4	0.6	0.8
<b>D<sub>1</sub></b>	5.7	6.1	6.5	<b>E</b>	5.0	5.3	5.6
<b>E<sub>1</sub></b>	6.3	6.6	6.9	<b>e</b>	--	1.27	--
<b>e<sub>1</sub></b>	--	5.08	--	<b>H<sub>D</sub></b>	9.6	10.0	10.4
<b>h<sub>1</sub></b>	2.1	2.3	2.5	<b>L</b>	0.80	1.0	1.2
<b>L<sub>1</sub></b>	2.6	2.9	3.2	<b>L<sub>2</sub></b>	0.35	0.65	0.95