

# P-Channel Enhancement Mode MOSFET

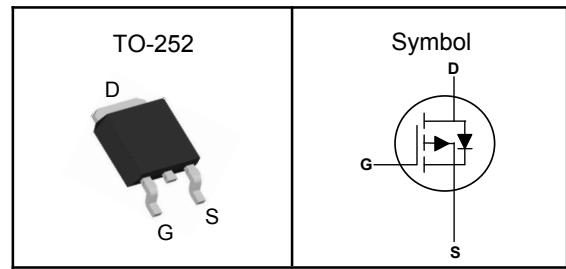
## Features

- Advanced trench cell design
- Low Thermal Resistance
- ROHS Compliant & Halogen-Free
- 100% UIS and Rg Tested

## Applications

- Motor drivers
- DC - DC Converter

## Pin Description



$V_{DSS}$	-40	V
$R_{DS(ON)-Typ}$	14	m $\Omega$
$I_D$	-40	A

## Absolute Maximum Ratings ( $T_J=25^\circ\text{C}$ , Unless Otherwise Noted)

Symbol	Parameter	Rating	Unit
$V_{DSS}$	Drain-Source Voltage	-40	V
$V_{GSS}$	Gate-Source Voltage	$\pm 20$	V
$T_J$	Maximum Junction Temperature	-55 to 150	$^\circ\text{C}$
$T_{STG}$	Storage Temperature Range	-55 to 150	$^\circ\text{C}$
$I_{DM}^{①}$	Pulse Drain Current Tested	-160	A
$I_D$	Continuous Drain Current	$T_c=25^\circ\text{C}$ -40	A
$P_D$	Maximum Power Dissipation	$T_c=25^\circ\text{C}$ 100	W
$I_{AS}^{②}$	Avalanche Current, Single pulse	L=0.1mH 60	A
$E_{AS}^{②}$	Avalanche Energy, Single pulse	L=0.5mH 100	mJ

## Thermal Characteristics

Symbol	Parameter	Rating	Unit
$R_{\theta JA}^{③}$	Thermal Resistance-Junction to Ambient	16	$^\circ\text{C/W}$
$R_{\theta JC}$	Thermal Resistance-Junction to Case	1.25	$^\circ\text{C/W}$

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

Note ② : UIS tested and pulse width are limited by maximum junction temperature  $150^\circ\text{C}$ .

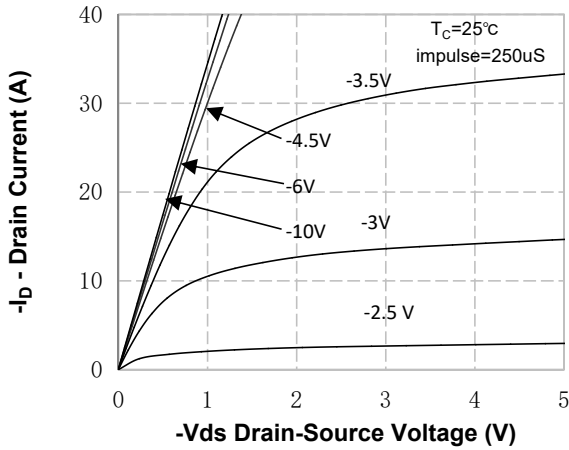
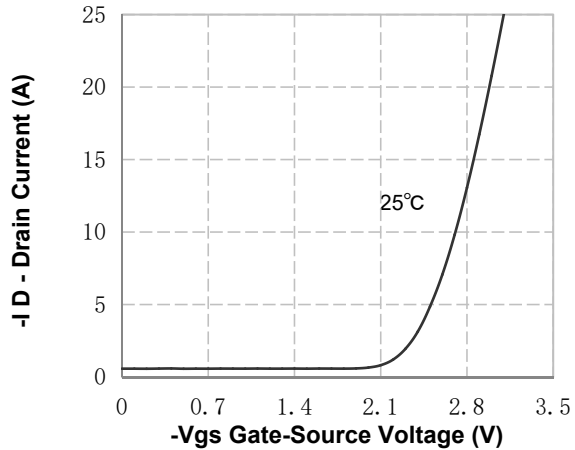
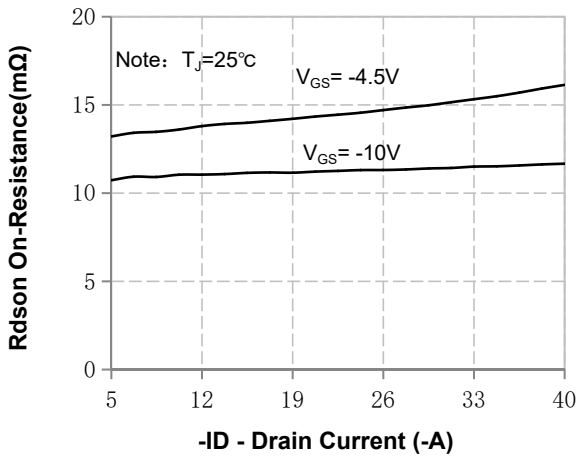
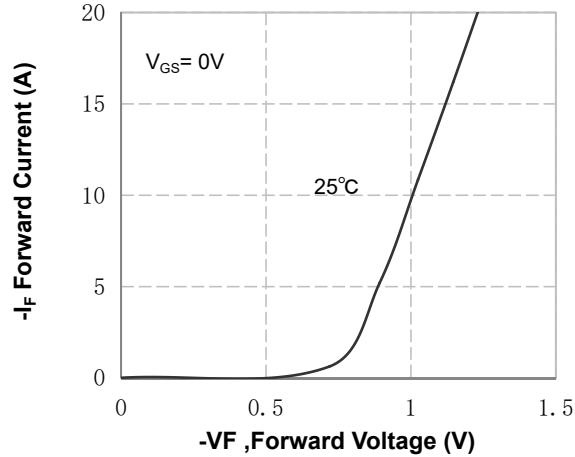
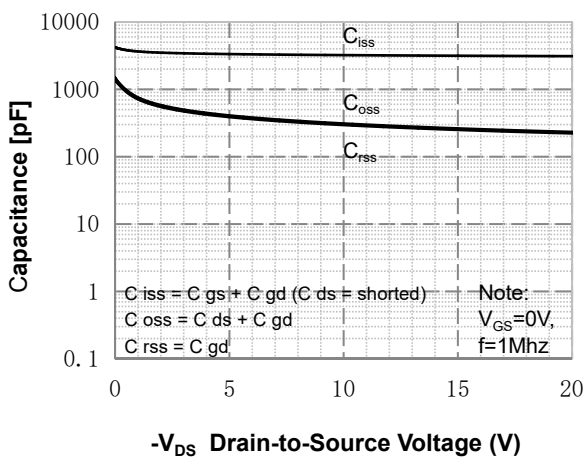
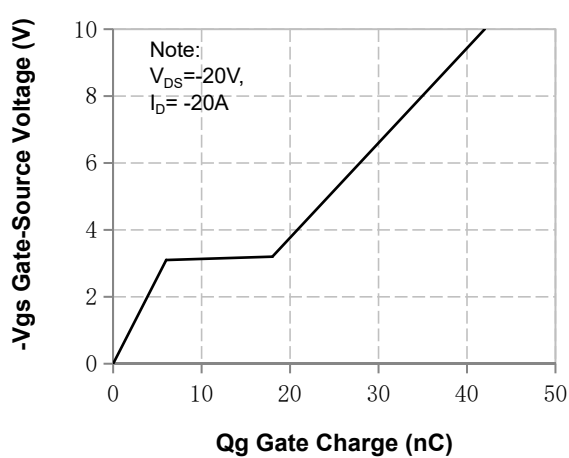
Note ③ : Surface Mounted on  $1\text{in}^2$  FR-4 board with 1oz.

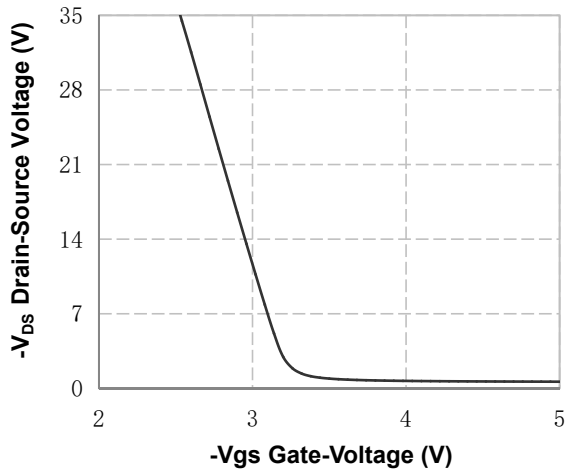
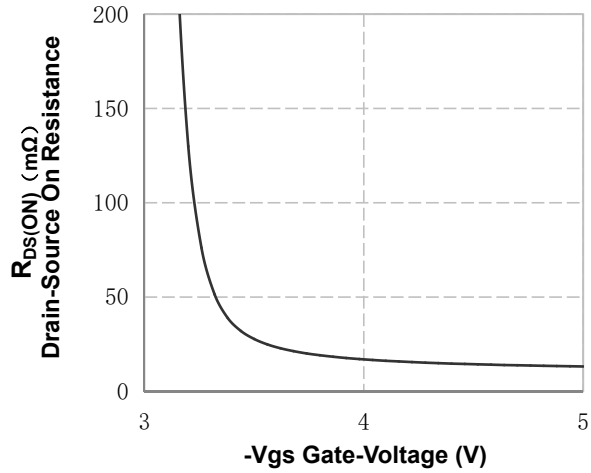
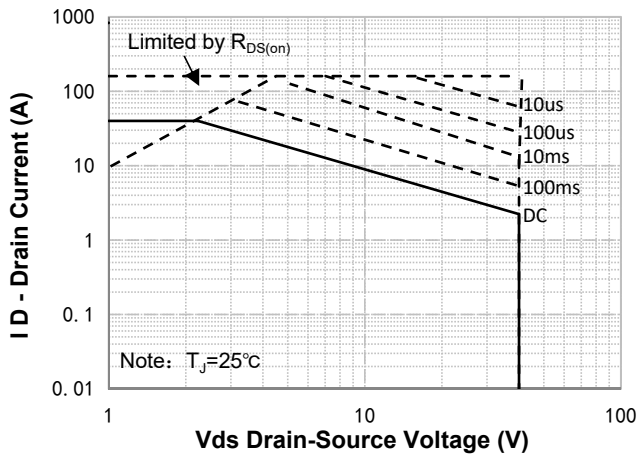
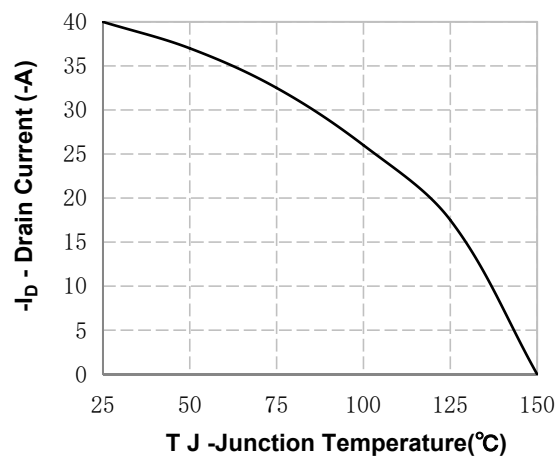
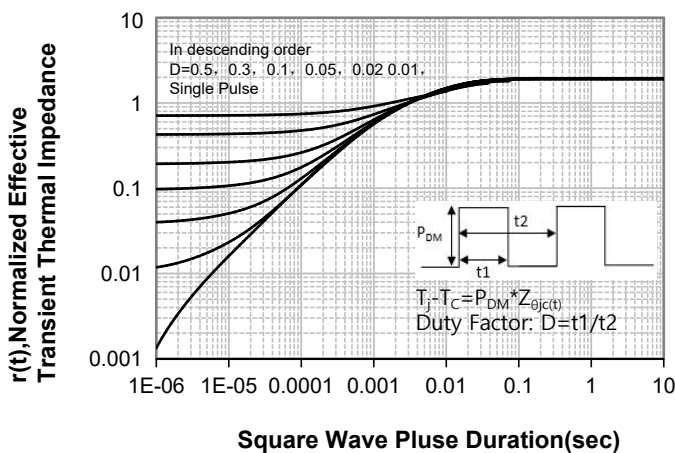
**P-Channel Enhancement Mode MOSFET****Electrical Characteristics** ( $T_J=25^\circ\text{C}$ , Unless Otherwise Noted)

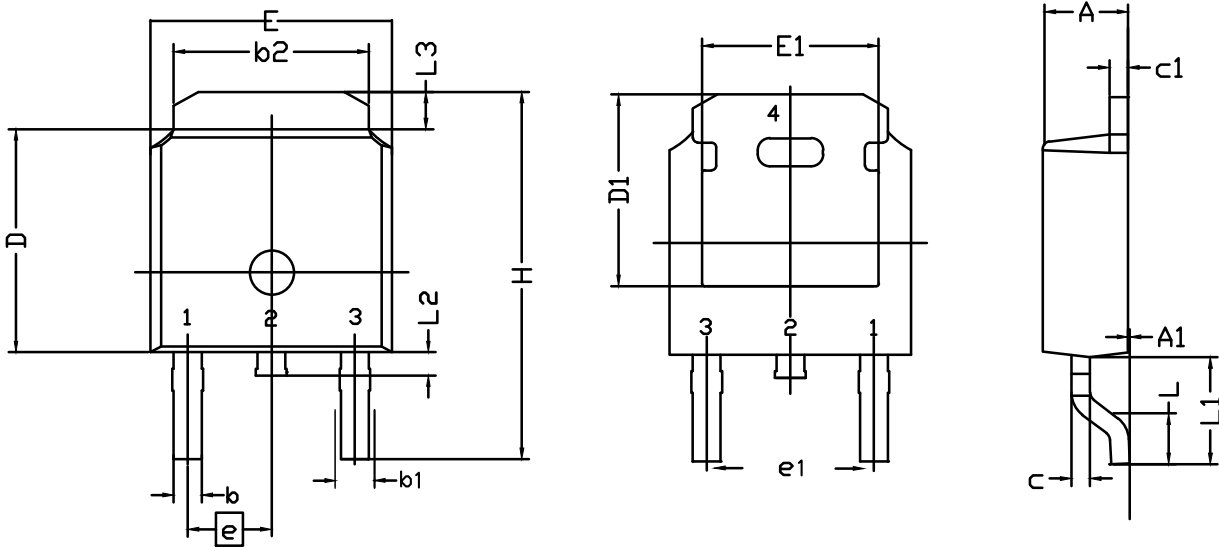
Symbol	Parameter	Test Conditions	Min	Typ	Max	Unit
<b>Static Electrical Characteristics</b>						
$BV_{DSS}$	Drain-Source Breakdown Voltage	$V_{GS}=0V, I_D=-250\mu A$	-40	---	---	V
$I_{DSS}$	Zero Gate Voltage Drain Current	$V_{DS}=-40V, V_{GS}=0V$	---	---	-1	$\mu A$
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS}=V_{GS}, I_D=-250\mu A$	-1.2	---	-2.0	V
$I_{GSS}$	Gate Leakage Current	$V_{GS}=\pm 20V, V_{DS}=0V$	---	---	$\pm 100$	nA
$R_{DS(on)}$	Drain-Source On-state Resistance	$V_{GS}=-10V, I_D=-20A$	---	11	14	m $\Omega$
		$V_{GS}=-4.5V, I_D=-20A$	---	14	16	m $\Omega$
<b>Dynamic Characteristics</b> <sup>⑤</sup>						
$C_{iss}$	Input Capacitance	$V_{GS}=0V, V_{DS}=-20V, \text{Freq.}=1\text{MHz}$	---	3120	---	pF
$C_{oss}$	Output Capacitance		---	238	---	
$C_{rss}$	Reverse Transfer Capacitance		---	226	---	
$T_{d(on)}$	Turn-on Delay Time	$V_{GS}=-10V, V_{DD}=-20V, I_D=-20A, R_G=3\Omega$	---	14	---	nS
$T_r$	Turn-on Rise Time		---	16	---	
$T_{d(off)}$	Turn-off Delay Time		---	36	---	
$T_f$	Turn-off Fall Time		---	38	---	
$Q_g$	Total Gate Charge	$V_{GS}=-10V, V_{DD}=-20V, I_D=-20A$	---	42	---	nC
$Q_{gs}$	Gate-Source Charge		---	7	---	
$Q_{gd}$	Gate-Drain Charge		---	8	---	
<b>Source-Drain Characteristics</b>						
$V_{SD}$ <sup>④</sup>	Diode Forward Voltage	$I_S=-20A, V_{GS}=0V$	---	---	-1.2	V

Note ④: Pulse test (pulse width $\leq 300\mu s$ , duty cycle $\leq 2\%$ ).

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

**P-Channel Enhancement Mode MOSFET**
**Typical Characteristics**

**Figure 1. On-Region Characteristics**

**Figure 2. Transfer Characteristics**

**Figure 3. On-Resistance Variation vs Drain Current and Gate Voltage**

**Figure 4. Body Diode Forward Voltage Variation with Source Current and Temperature**

**Figure 5. Capacitance Characteristics**

**Figure 6. Gate Charge Characteristics**

**P-Channel Enhancement Mode MOSFET**

**Figure 7.  $V_{DS}$  Drain-Source Voltage vs Gate Voltage**

**Figure 8. On-Resistance vs Gate Voltage**

**Figure 9. Maximum Safe Operating Area**

**Figure 10. Maximum Continuous Drain Current vs Temperature**

**Figure 11. Transient Thermal Response Curve**

**P-Channel Enhancement Mode MOSFET**
**TO-252 Package Outline Dimensions**


Symbol	Dimensions (unit:mm)			Symbol	Dimensions (unit:mm)		
	Min	Typ	Max		Min	Typ	Max
<b>A</b>	2.20	2.30	2.38	<b>E</b>	6.40	6.60	6.731
<b>A<sub>1</sub></b>	0.00	0.10	0.20	<b>E<sub>1</sub></b>	4.40	--	--
<b>b</b>	0.64	0.76	0.89	<b>e</b>	2.286 BSC		
<b>b<sub>1</sub></b>	0.77	0.85	1.14	<b>e<sub>1</sub></b>	4.572 BSC		
<b>b<sub>2</sub></b>	5.00	5.33	5.46	<b>H</b>	9.40	10.00	10.40
<b>c</b>	0.458	0.508	0.610	<b>L</b>	1.40	1.52	1.77
<b>C<sub>1</sub></b>	0.458	0.508	0.620	<b>L<sub>1</sub></b>	--	2.743	--
<b>D</b>	5.98	6.10	6.223	<b>L<sub>2</sub></b>	0.60	0.80	1.01
<b>D<sub>1</sub></b>	5.20	5.25	5.38	<b>L<sub>3</sub></b>	0.90	1.06	1.25