

## P-Channel Enhancement Mode MOSFET

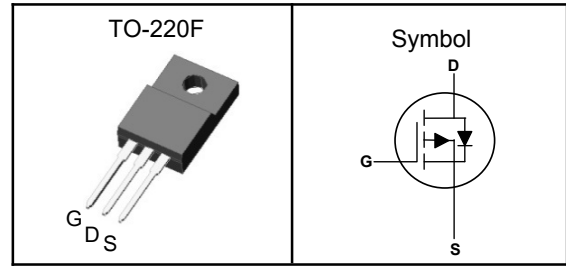
### Features

- 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
$R_{DS(ON)-Typ}$	12	m $\Omega$
$I_D$	-38	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	-114	A
$I_D$	Continuous Drain Current	-38	A
$P_D$	Maximum Power Dissipation	35	W
$E_{AS}$	Single Pulse Avalanche Energy	146	mJ

### Thermal Characteristics

Symbol	Parameter	Rating	Unit
$R_{\theta JA}^{③}$	Thermal Resistance-Junction to Ambient	65	$^\circ\text{C}/\text{W}$
$R_{\theta JC}$	Thermal Resistance-Junction to Case	3.57	$^\circ\text{C}/\text{W}$

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.



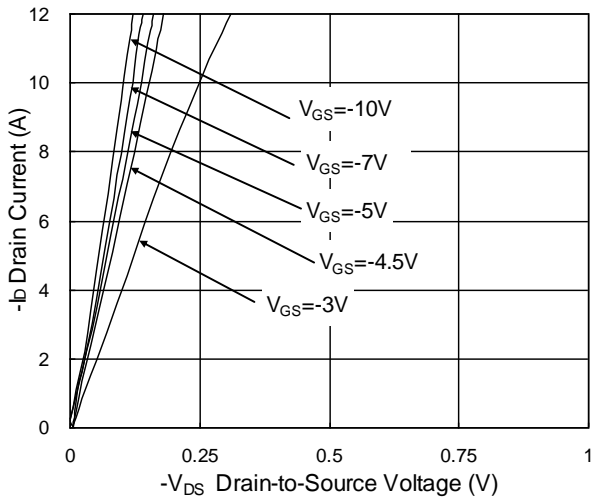
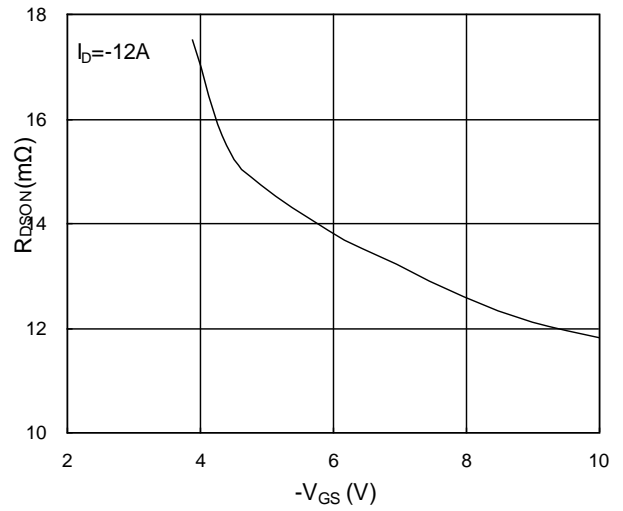
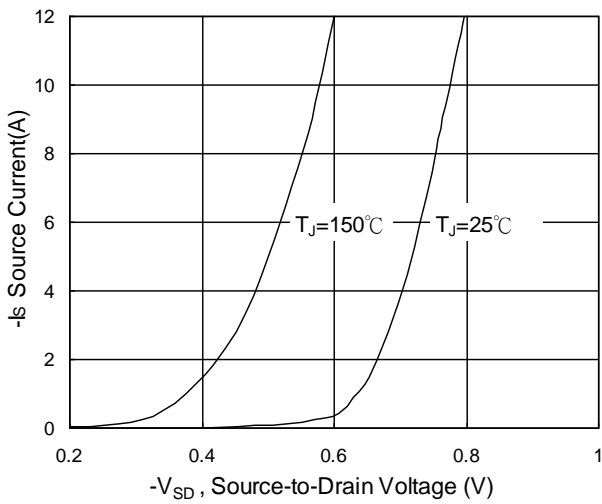
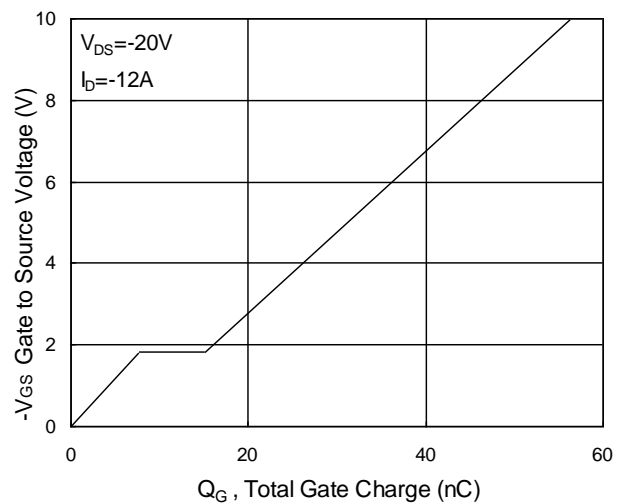
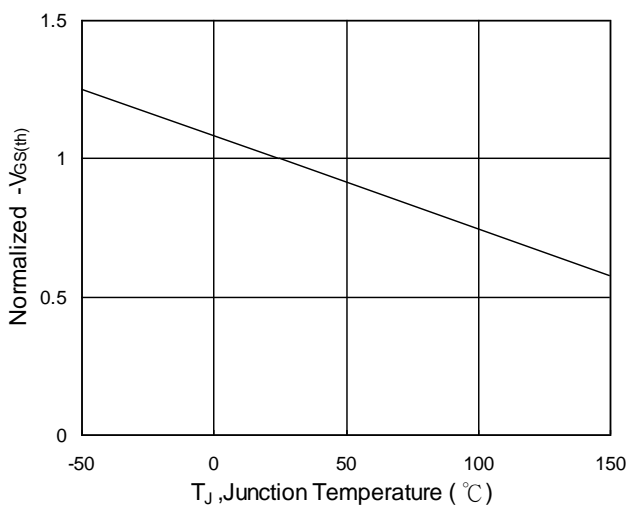
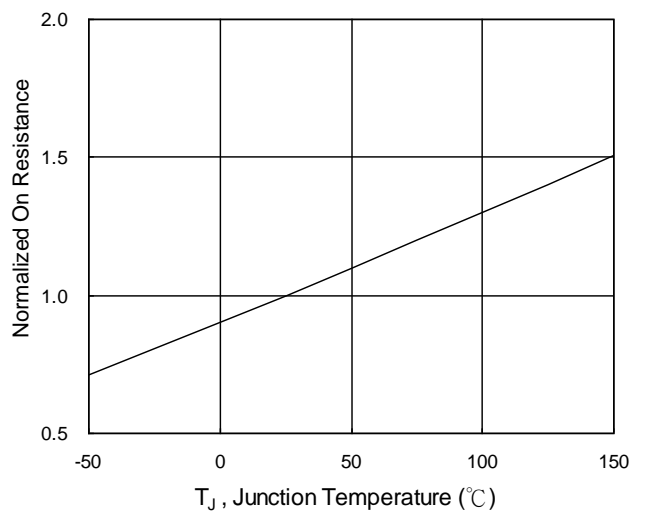
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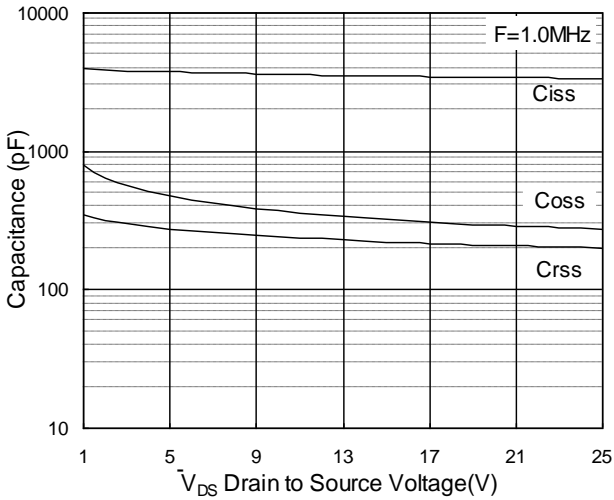
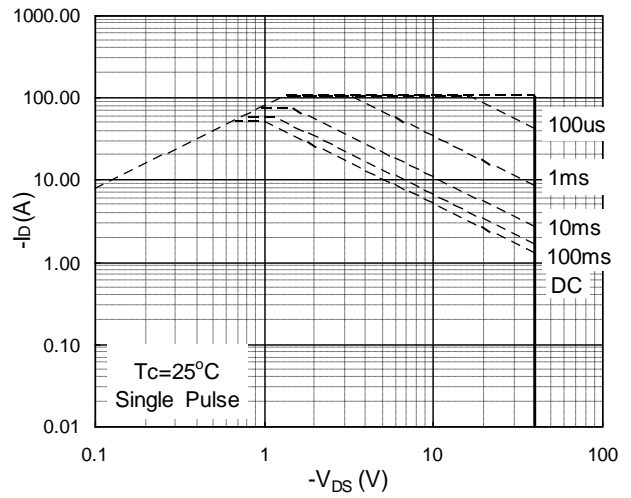
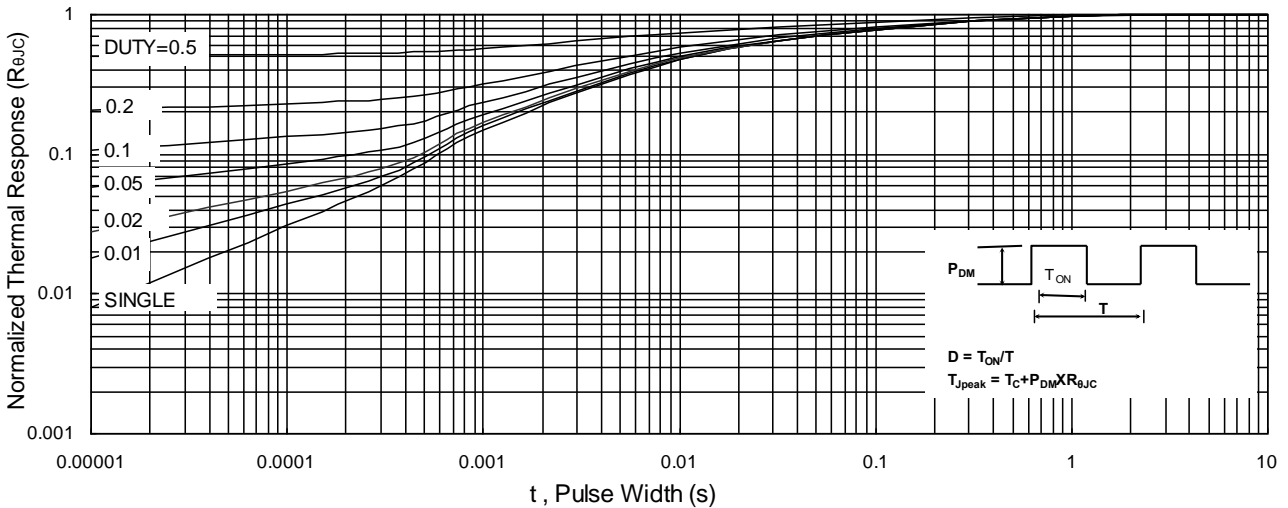
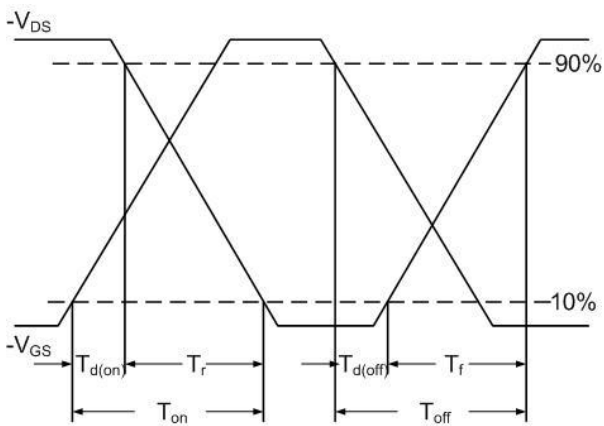
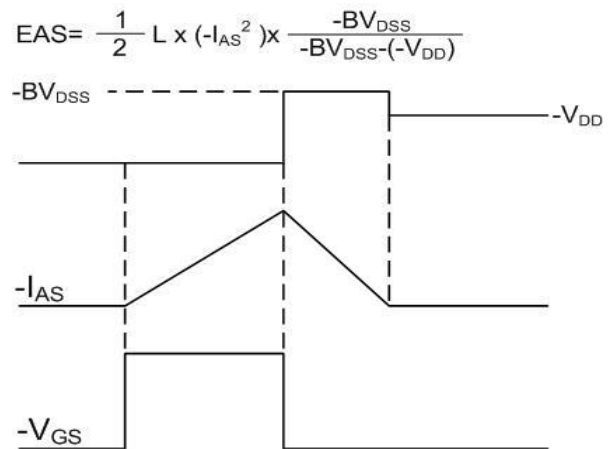
**Electrical Characteristics** ( $T_J=25^{\circ}\text{C}$ , Unless Otherwise Noted)

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	$V_{DS}=V_{GS}, I_D=-250\mu A$	-1.0	---	-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	$V_{GS}=-10V, I_D=-18A$	---	12	15	m $\Omega$
		$V_{GS}=-4.5V, I_D=-12A$	---	15	20	m $\Omega$
<b>Dynamic Characteristics<sup>⑤</sup></b>						
$C_{iss}$	Input Capacitance	$V_{GS}=0V, V_{DS}=-15V, \text{Freq.}=1\text{MHz}$	---	3280	---	pF
$C_{oss}$	Output Capacitance		---	320	---	
$C_{rss}$	Reverse Transfer Capacitance		---	210	---	
$T_{d(on)}$	Turn-on Delay Time	$V_{GS}=-10V, V_{DD}=-15V, I_D=-1A, R_G=3.3\Omega$	---	40	---	nS
$T_r$	Turn-on Rise Time		---	35.2	---	
$T_{d(off)}$	Turn-off Delay Time		---	100	---	
$T_f$	Turn-off Fall Time		---	9.6	---	
$Q_g$	Total Gate Charge	$V_{GS}=-4.5V, V_{DS}=-20V, I_D=-12A$	---	27.9	---	nC
$Q_{gs}$	Gate-Source Charge		---	7.7	---	
$Q_{gd}$	Gate-Drain Charge		---	7.5	---	
<b>Source-Drain Characteristics</b>						
$V_{SD}^{④}$	Diode Forward Voltage	$I_S=-1A, V_{GS}=0V$	---	---	-1.0	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.

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**Typical Characteristics**

**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  $T_J$**

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**Fig.7 Capacitance**

**Fig.8 Safe Operating Area**

**Fig.9 Normalized Maximum Transient Thermal Impedance**

**Fig.10 Switching Time Waveform**

**Fig.11 Unclamped Inductive Waveform**

**P-Channel Enhancement Mode MOSFET**
**TO-220F Package Outline Data**
