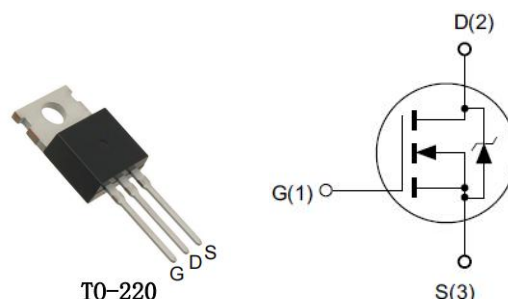


Features

- ◆ 650V, 13A, $R_{DS(ON)}(Typ.) = 0.60\Omega @ V_{GS} = 10V$.
- ◆ Low C_{rss}
- ◆ Fast Switching
- ◆ 100% Avalanche Tested

Application

- ◆ Adapter
- ◆ LCD Panel Power
- ◆ E-Bike Charger
- ◆ Switching Mode Power Supply



Absolute Maximum Ratings $T_c = 25^\circ C$ unless otherwise noted

Symbol	Parameter	Limit	Unit
		TO-220	
V_{DS}	Drain-Source Voltage ^a	650	V
V_{GS}	Gate-Source Voltage	± 30	V
I_D	Drain Current-Continuous, $T_c = 25^\circ C$	13	A
	Drain Current-Continuous, $T_c = 100^\circ C$	7.8	A
I_{DM}	Drain Current-Pulsed ^b	52	A
P_D	Maximum Power Dissipation @ $T_J = 25^\circ C$	150	W
EAS	Single Pulsed Avalanche Energy ^d	550	mJ
T_J, T_{STG}	Operating and Store Temperature Range	-55 to 150	$^\circ C$

Thermal Characteristics

Symbol	Parameter	Value	Unit
$R_{\theta JC}$	Thermal Resistance, Junction-Case Max.	0.83	$^\circ C/W$
$R_{\theta JA}$	Thermal Resistance Junction-Ambient Max	62.5	$^\circ C/W$

Electrical Characteristics $T_J = 25^\circ C$ unless otherwise noted

Off Characteristics

Symbol	Parameter	Test Condition	Min.	Typ.	Max.	Unit
BV_{DSS}	Drain-Source Breakdown Voltage	$V_{GS} = 0V, I_D = 250\mu A$	650	-	-	V
I_{DSS}	Zero Gate Voltage Drain Current	$V_{DS} = 650V, V_{GS} = 0V$	-	-	1	μA
I_{GSS}	Forward Gate Body Leakage Current	$V_{DS} = 0V, V_{GS} = \pm 30V$	-	-	± 100	nA

■ On Characteristics

Symbol	Parameter	Test Condition	Min.	Typ.	Max.	Unit
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}, I_D = 250\mu A$	2.0	-	4.0	V
$R_{DS(on)}$	Static Drain-Source On-Resistance ^c	$V_{GS} = 10V, I_D = 6.5A$	-	0.60	0.72	Ω

■ Dynamic Characteristics

Symbol	Parameter	Test Condition	Min.	Typ.	Max.	Unit
Ciss	Input Capacitance	$V_{DS} = 25V,$ $V_{GS} = 0V,$ $f = 1.0MHz$	-	2022	-	pF
Coss	Output Capacitance		-	170	-	pF
Crss	Reverse Transfer Capacitance		-	7	-	pF

■ On Characteristics

Symbol	Parameter	Test Condition	Min.	Typ.	Max.	Unit
$t_{d(on)}$	Turn-On Delay Time	$V_{DD} = 325V, I_D = 12A,$ $R_G = 10\Omega, V_{GS} = 10V$	-	29	-	ns
t_r	Turn-On Rise Time		-	27	-	ns
$t_{d(off)}$	Turn-Off Delay Time		-	65	-	ns
t_f	Turn-Off Fall Time		-	46	-	ns
Qg	Total Gate Charge	$V_{DS} = 520V, I_D = 12A,$ $V_{GS} = 10V$	-	40.5	-	nC
Qgs	Gate-Source Charge		-	10.3	-	nC
Qgd	Gate-Drain Charge		-	14.5	-	nC

■ Drain-Source Diode Characteristics

Symbol	Parameter	Test Condition	Min.	Typ.	Max.	Unit
I_S	Drain-Source Diode Forward Continuous Current	$V_{GS} = 0V$	-	-	13	A
I_{SM}	Maximum Pulsed Current	$V_{GS} = 0V$	-	-	52	A
V_{SD}	Drain-Source Diode Forward Voltage	$V_{GS} = 0V, I_S = 13A$	-	-	1.5	V
trr	Reverse Recovery Time	$I_S = 13A, T_J = 25^\circ C$ $dI_F/dt = 100A/\mu s,$ $V_{GS} = 0V$	-	425	-	ns
Qrr	Reverse Recovery Charge		-	4290	-	nC

Notes:

- $T_J = +25^\circ C$ to $+150^\circ C$
- Repetitive rating; pulse width limited by maximum junction temperature.
- Pulse width $\leq 300\mu s$; duty cycle $\leq 2\%$
- $L = 10mH, V_{DD} = 50V, I_{as} = 10.5A, R_G = 25\Omega$ Starting $T_J = 25^\circ C$

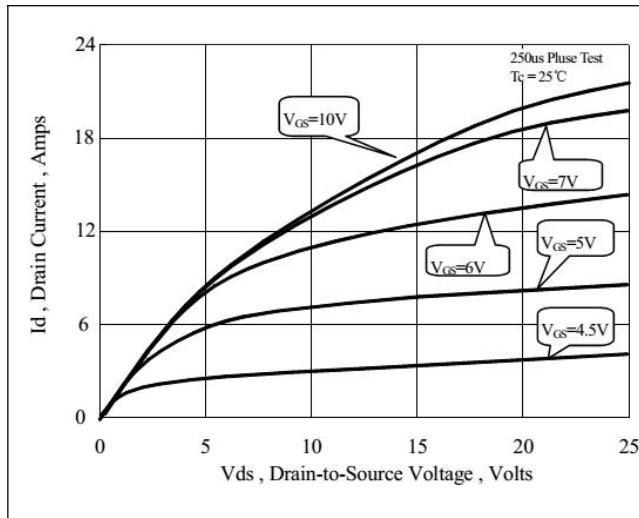


Figure 1. On-State Characteristics

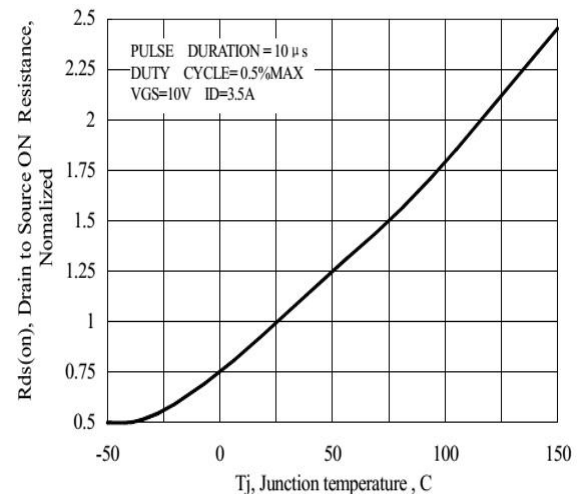


Figure 2. Normalized On-Resistance Variation with Temperature

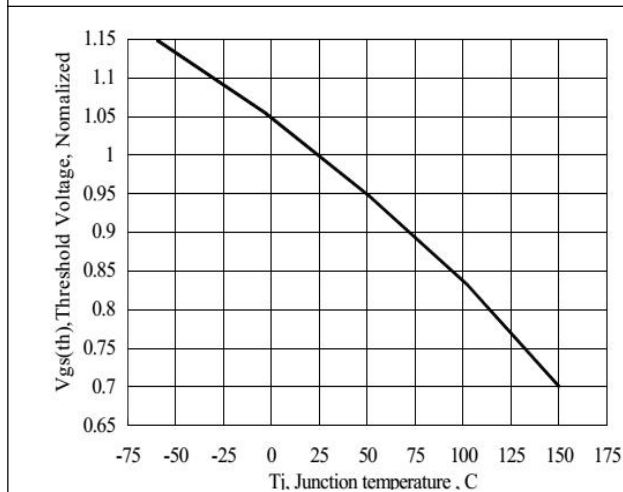


Figure 3. Gate Threshold Variation with Temperature

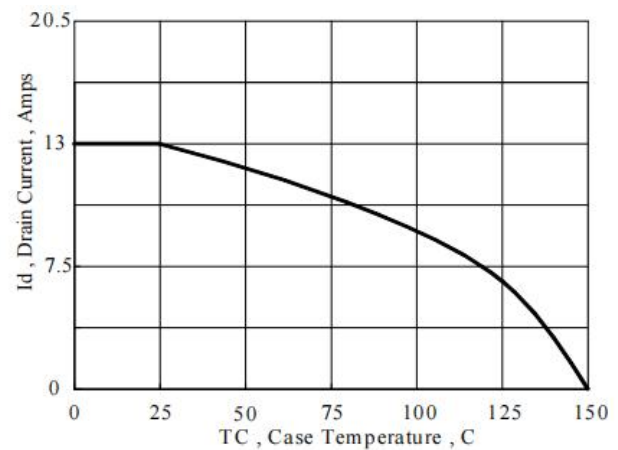


Figure 4. Maximum Drain Current with Case Temperature

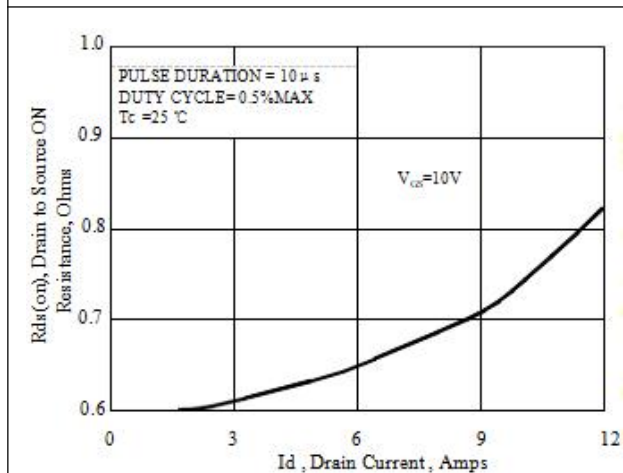


Figure 8. Typical Drain to Source ON Resistance vs Drain Current

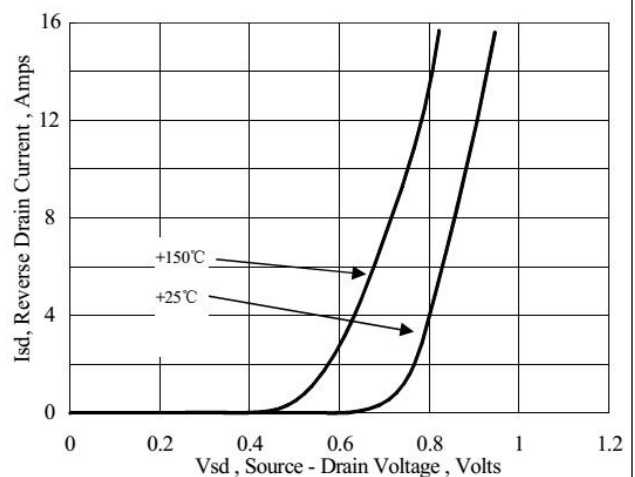
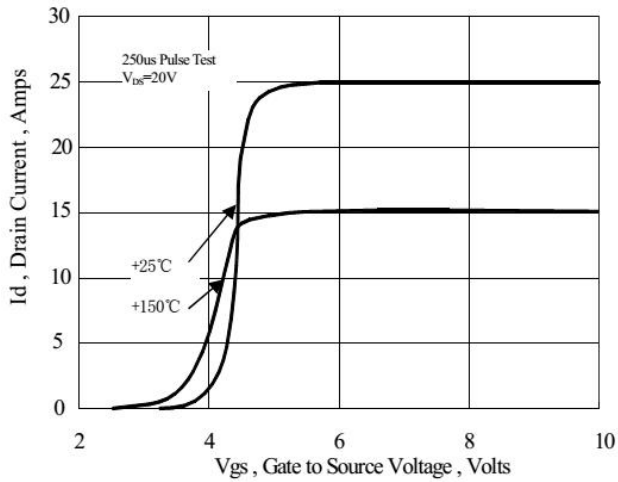


Figure 6. Body Diode Forward Voltage Variation with Source Current



**Figure 7. Transfer Characteristics
Variation with Source Current**

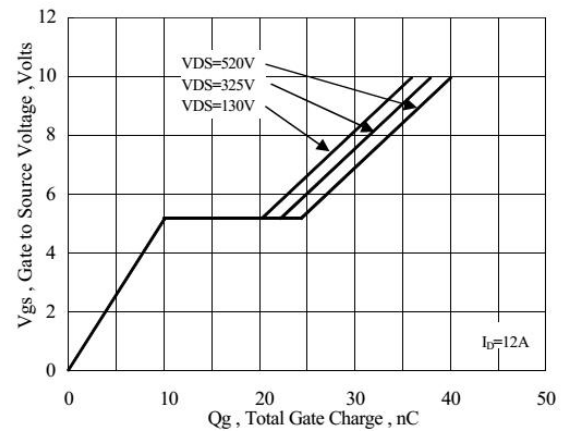


Figure 8. Gate Charge Characteristics

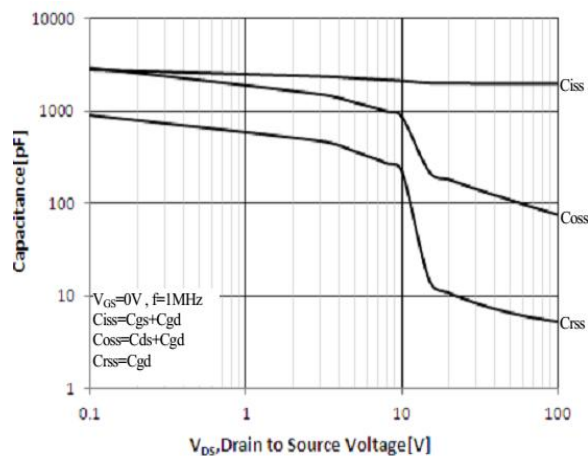


Figure 9. Capacitance Characteristics

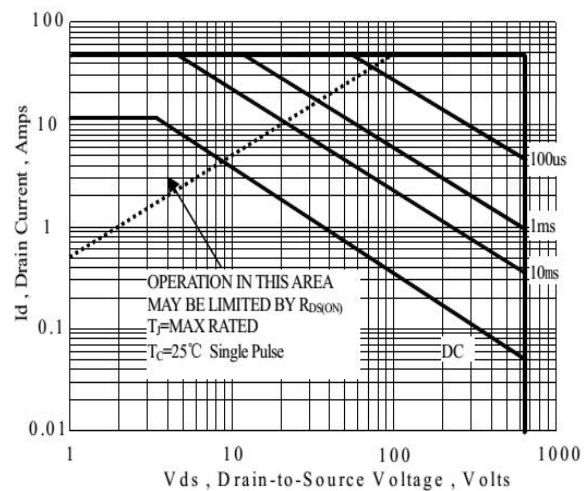


Figure 10. Maximum Safe Operating Area

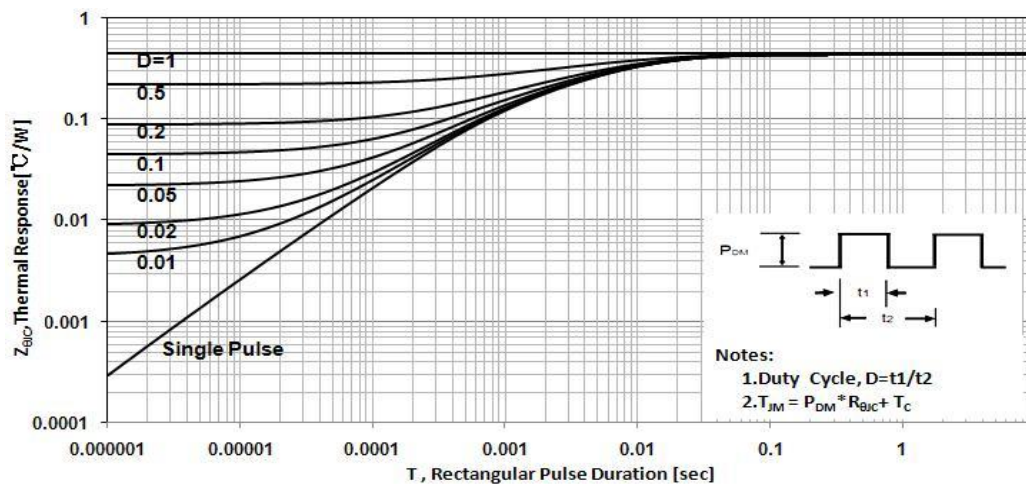


Figure 11. Normalized Effective Transient Thermal Impedance With Pulse Duration

■ Package Information

