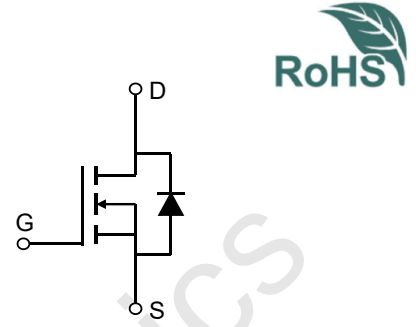


Description

Features

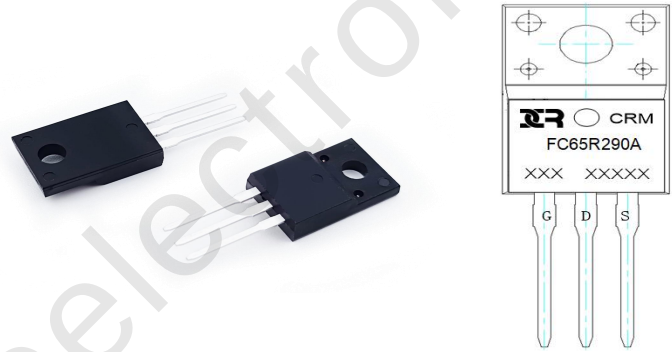
- 650V, 11A
 $R_{DS(ON)} \text{ Typ} = 250\text{m}\Omega @ V_{GS} = 10\text{V}$
- Low FOM $R_{DS(ON)} \times Q_G$
- Extremely low losses due to very low E_{on} and E_{off}
- Qualified for industrial grade applications according to JEDEC
- Excellent stability and uniformity



Schematic Diagram

Application

- SMPS
- Adapter
- LED lighting
- EV Charger
- Telecom power
- Solar Inverter



Marking and Pin Assignment

Package Marking and Ordering Information

Device	Marking	Package	Outline	TUBE (pcs)	Inner Box (pcs)	Per Carton (pcs)
CRMFC65R290A	CRMFC65R290A	TO-220F-3L	TUBE	50	1000	5000

Absolute Maximum Ratings (@ $T_J = 25^\circ\text{C}$ unless otherwise noted)

Symbol	Parameter	Conditions	Value	Units
I_D	Continuous drain current ⁽¹⁾	$T_C = 25^\circ\text{C}$	11	A
		$T_C = 100^\circ\text{C}$	7	A
$I_{D,pulse}$	Pulsed drain current ⁽²⁾	$T_C = 25^\circ\text{C}$	25	A
E_{AS}	Avalanche energy, single pulse	$V_{DD}=50\text{V}; I_d=3.4\text{A}$	300	mJ
I_{AS}	Avalanche current, single pulse	-	3.4	A
dv/dt	MOSFET dv/dt ruggedness	$V_{DS}=0\ldots 400\text{V}$	50	V/ns
V_{GS}	Gate source voltage (static)		± 20	V
V_{GS}	Gate source voltage (dynamic)	AC ($f > 1\text{ Hz}$)	± 30	V
P_{tot}	Power dissipation	$T_C = 25^\circ\text{C}$	40	W
T_J, T_{stg}	Operating and Storage temperature	-	-55 to 150	$^\circ\text{C}$
I_S	Continuous diode forward current	$T_C = 25^\circ\text{C}$	11	A
$I_{S,pulse}$	Diode pulse current ⁽²⁾	$T_C = 25^\circ\text{C}$	25	A
dv/dt	Reverse diode dv/dt	$V_{DS}=0\ldots 400\text{V}, I_{SD} \leq 7\text{A}$	15	V/ns

Thermal Characteristics

Symbol	Parameter	Value	Unit
$R_{\theta JC}$	Thermal Resistance, Junction-to-Case	3.1	$^{\circ}\text{C} / \text{W}$
$R_{\theta JA}$	Thermal Resistance, Junction-to- Ambient	68	$^{\circ}\text{C} / \text{W}$

Static Characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$V_{(BR)DSS}$	Drain-source breakdown voltage	$V_{GS}=0V, I_D=1mA$	650	-	-	V
$V_{(GS)th}$	Gate threshold voltage	$V_{DS}=V_{GS}, I_D=0.25mA$	3	3.5	4	V
I_{DSS}	Zero gate voltage drain current	$V_{DS}=650V, V_{GS}=0V, T_j=25^{\circ}\text{C}$	-	-	1	μA
I_{GSS}	Gate-source leakage current	$V_{GS}=\pm 30V, V_{DS}=0V$	-	± 2	± 100	nA
$R_{DS(on)}$	Drain-source on-state resistance	$V_{GS}=10V, I_D=7A, T_j=25^{\circ}\text{C}$	-	250	290	m Ω
		$V_{GS}=10V, I_D=7A, T_j=150^{\circ}\text{C}$	-	630	-	m Ω
R_G	Gate resistance	$f=1\text{MHz}, \text{open drain}$	-	8	-	Ω

Dynamic Characteristics

C_{iss}	Input Capacitance	$V_{GS}=0V,$	-	450	-	pF
C_{oss}	Output Capacitance	$V_{DS}=50V,$	-	60	-	pF
C_{rss}	Reverse Transfer Capacitance	$f=100\text{kHz}$	-	4.3	-	pF
Q_g	Gate charge total		-	22	-	nC
Q_{gs}	Gate to source charge	$V_{DD}=400V$	-	5	-	nC
Q_{gd}	Gate to drain charge	$I_D=7A$	-	11	-	nC
$V_{plateau}$	Gate plateau voltage	$V_{GS}=0 \text{ to } 10V$	-	6	-	V

Switching Characteristics

$t_{d(on)}$	Turn-On DelayTime	$V_{DD}=400V$	-	20	-	ns
t_r	Turn-On Rise Time	$V_{GS}=15V$	-	13	-	ns
$t_{d(off)}$	Turn-Off DelayTime	$I_D=7A$	-	40	-	ns
t_f	Turn-Off Fall Time	$R_G=10\Omega$	-	15	-	ns

Diode Recovery Characteristics

I_{rrm}	Peak reverse recovery current		-	16	-	A
V_{SD}	Drain to Source Diode Forward Voltage	$V_R=400V$	-	-	1.3	V
t_{rr}	Body Diode Reverse Recovery Time	$I_F=7A$ $diF/dt=100A/\mu s$	-	220	-	ns
Q_{rr}	Body Diode Reverse Recovery Charge		-	2.2	-	μC

Notes:

1. Limited by $T_{j,max}$. Maximum Duty Cycle $D = 0.50$
2. Pulse width t_p limited by $T_{j,max}$

Typical Performance Characteristics

Fig.1 Typical Output characteristics (25°C)

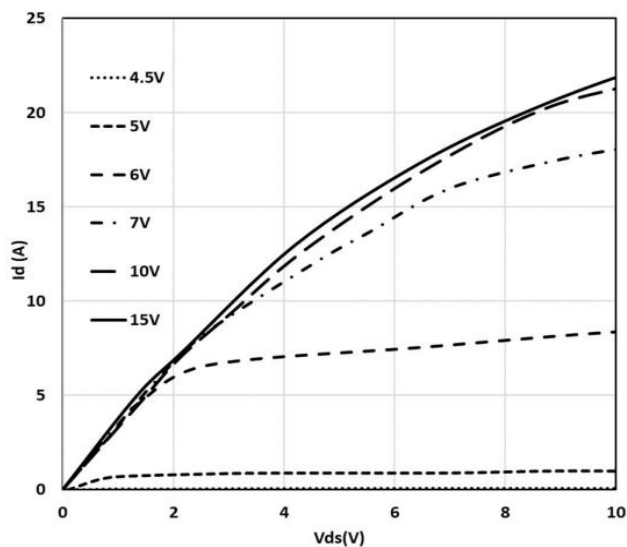


Fig.2 Transfer characteristics

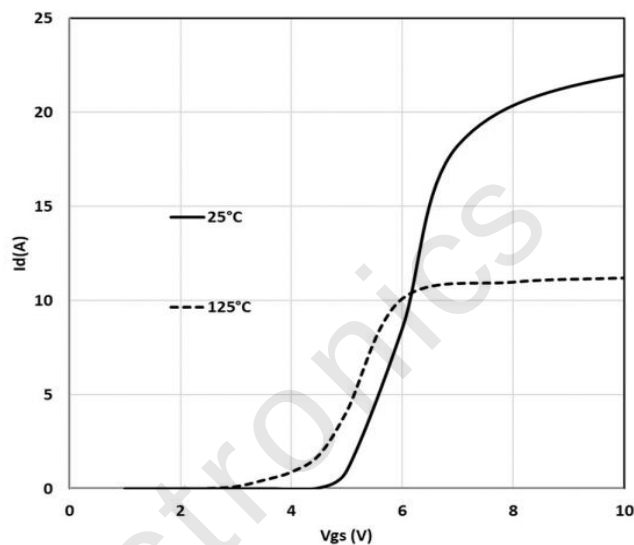


Fig.3 Safe Operating Area

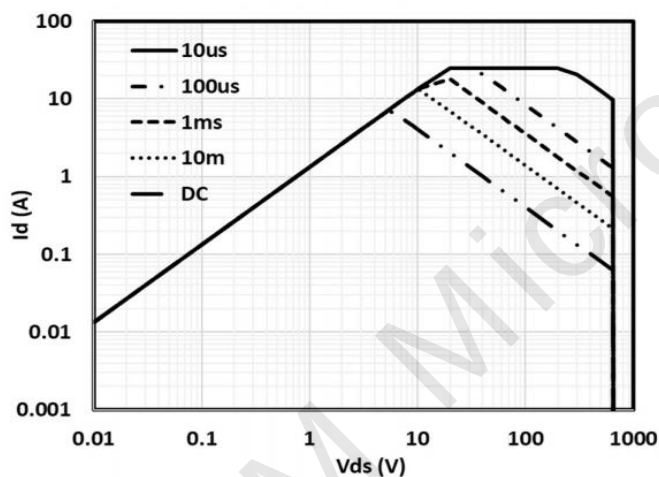


Fig.4 Power dissipation

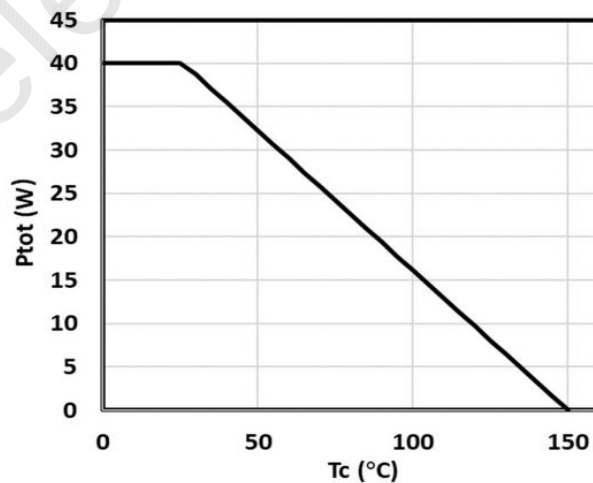


Fig.5 Gate charge

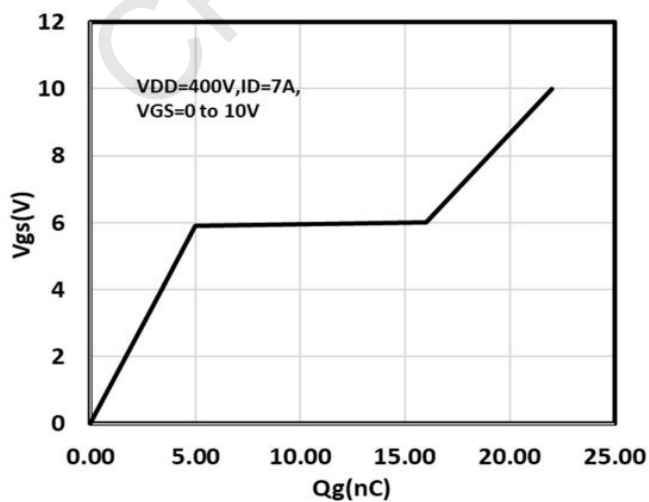
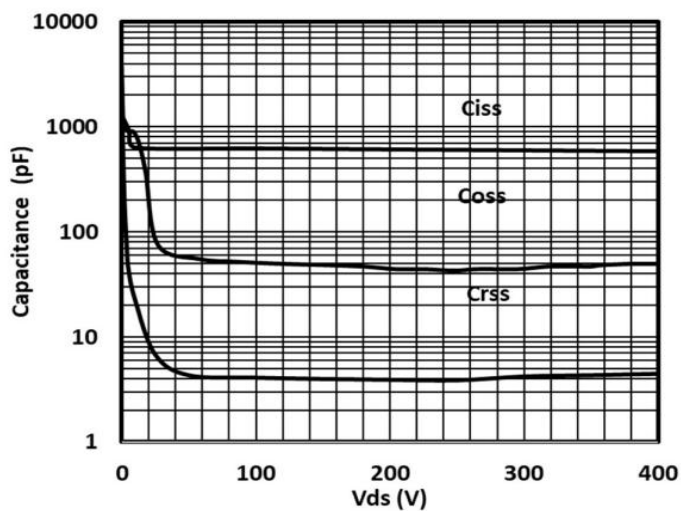


Fig.6 Typical capacitance characteristics



Typical Performance Characteristics

Fig.7 On Resistor vs. Junction temperature

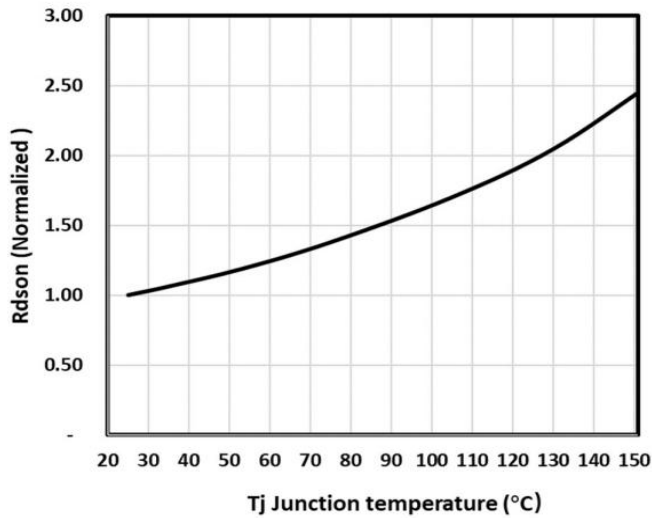


Fig.8 Drain-Source Breakdown Voltage

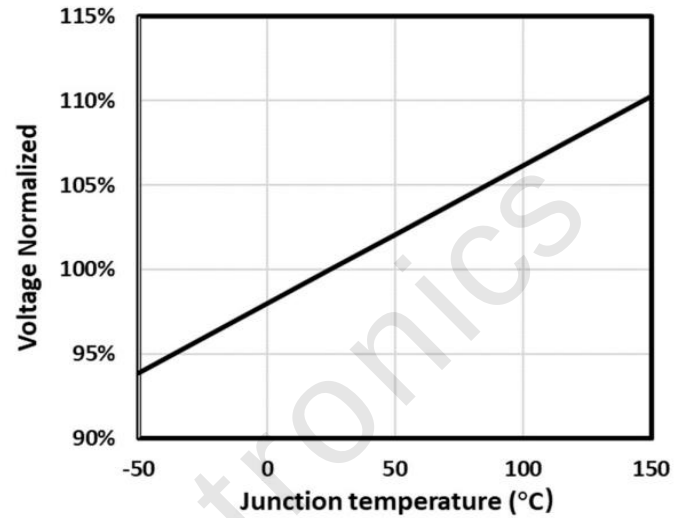
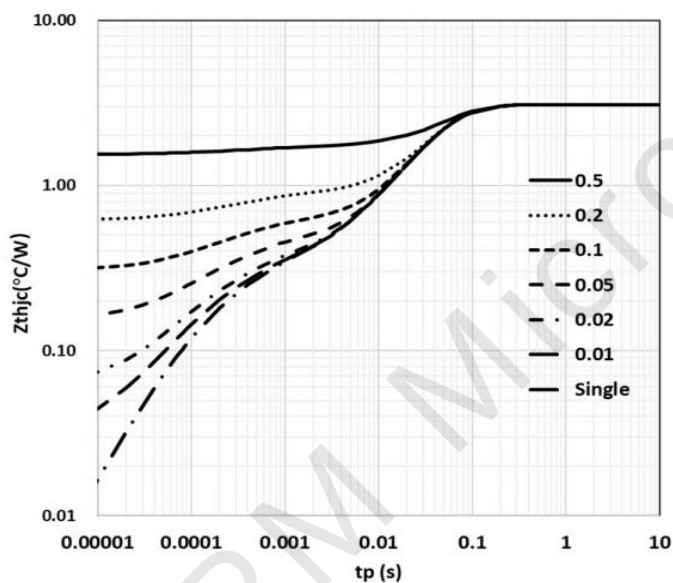
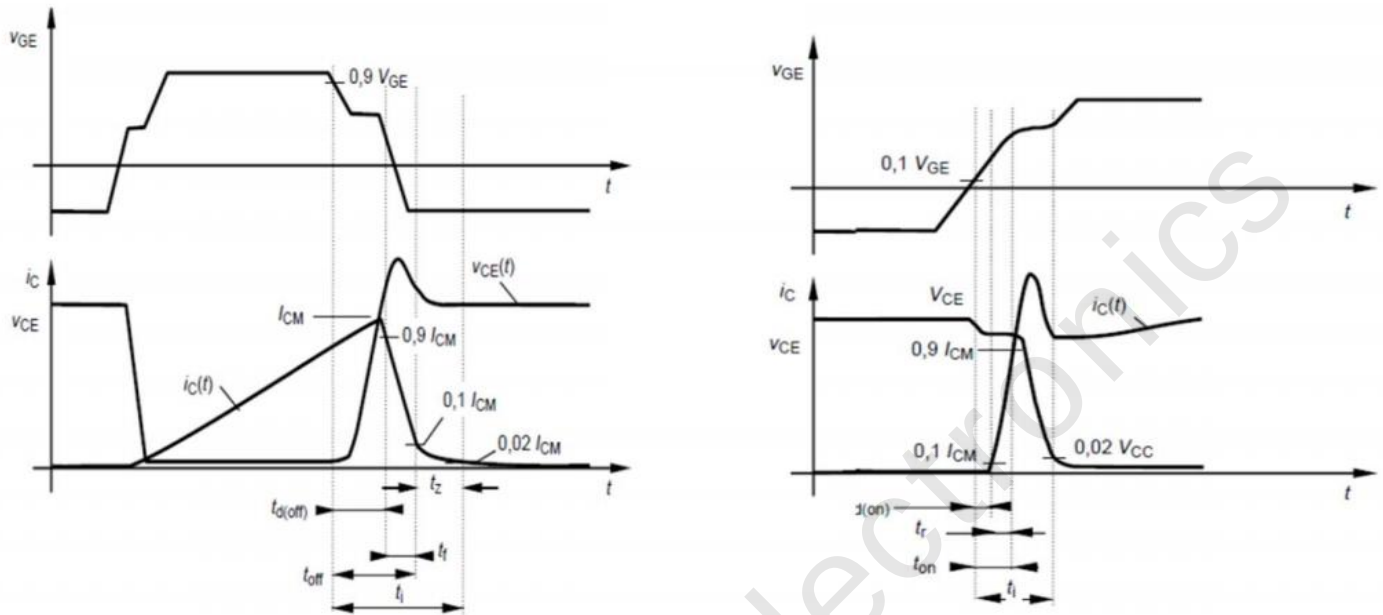


Fig.9 Transient thermal impedance

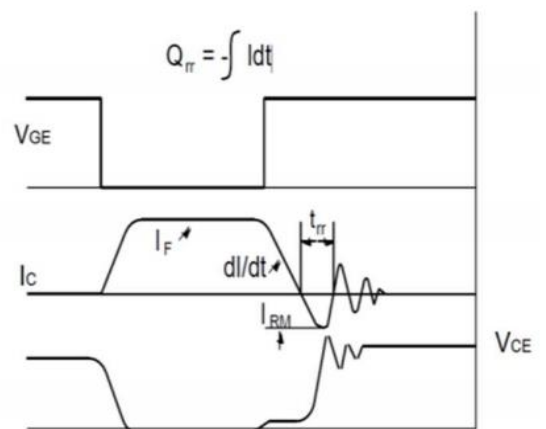
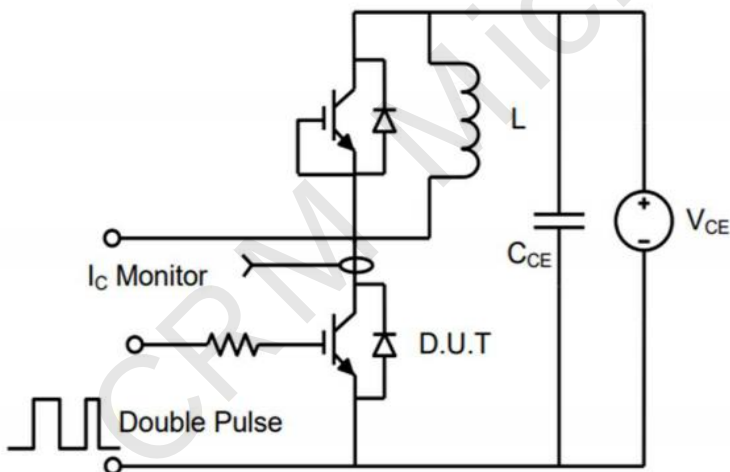


Test Circuit

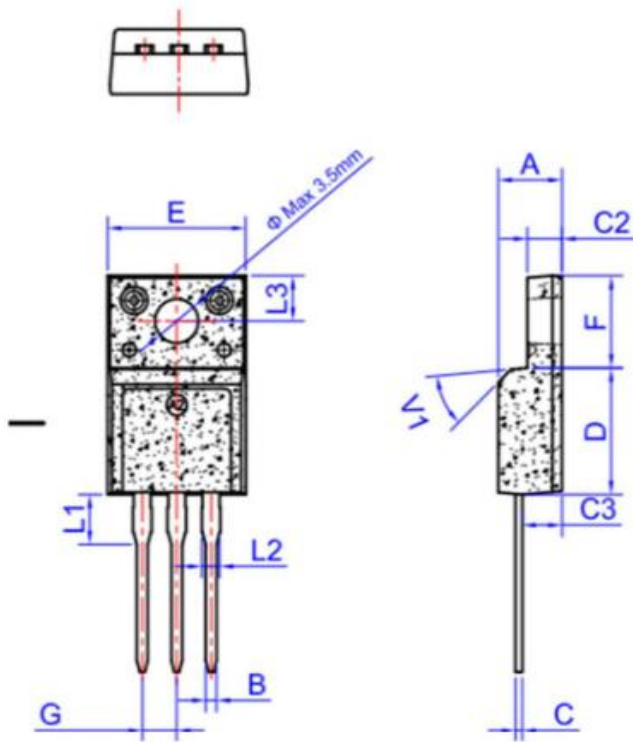
Switching Test Circuit & Waveforms



Diode Recovery Test Circuit & Waveforms



Package Mechanical Data(TO-220F-3L)



Ref.	Dimensions					
	Millimeters			Inches		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A	4.50		4.90	0.177		0.193
B	0.74	0.80	0.83	0.029	0.031	0.033
C	0.47		0.65	0.019		0.026
C2	2.45		2.75	0.096		0.108
C3	2.60		3.00	0.102		0.118
D	8.80		9.30	0.346		0.366
E	9.80		10.4	0.386		0.410
F	6.40		6.80	0.252		0.268
G		2.54			0.1	
H	28.0		29.8	1.102		1.173
L1		3.63			0.143	
L2	1.14		1.70	0.045		0.067
L3		3.30			0.130	
V1		45°			45°	

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