

Enhancement Mode N-Channel Power MOSFET

Features

- ◆ Low $R_{DS(on)}$ & FOM
- ◆ Extremely low switching loss
- ◆ Excellent stability and uniformity
- ◆ Easy to drive
- ◆ EMI and performance balanced

Applications

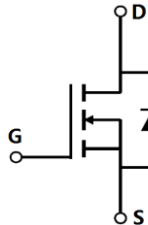
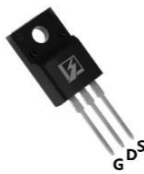

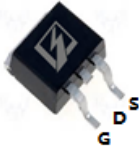
- ◆ Lighting
- ◆ Hard switching PWM
- ◆ Server power supply
- ◆ Charger

■ General Description

OSG65R290xEF use advanced GreenMOS™ technology to provide low $R_{DS(ON)}$, low gate charge, fast switching and excellent avalanche characteristics. This device is suitable for active power factor correction and switching mode power supply applications.

◆ $V_{DS, min@T_{jmax}}$	700 V
◆ $I_{D, pulse}$	45 A
◆ $R_{DS(ON), max @ V_{GS}=10 V}$	290 mΩ
◆ Q_g	21 nC

■ Schematic and Package Information

Schematic Diagram	PIN ASSIGNMENT TOP VIEW		
	 <p>TO220F OSG65R290FEF</p>	 <p>TO252 OSG65R290DEF</p>	 <p>TO263 OSG65R290KEF</p>

■ Absolute Maximum Ratings at $T_j=25^{\circ}\text{C}$ unless otherwise noted

Parameter	Symbol	Value	Unit
Drain source voltage	V_{DS}	650	V
Gate source voltage	V_{GS}	±30	V
Continuous drain current ¹⁾ , $T_C=25^{\circ}\text{C}$	I_D	15	A
Continuous drain current ¹⁾ , $T_C=100^{\circ}\text{C}$		9.5	
Pulsed drain current ²⁾ , $T_C=25^{\circ}\text{C}$	$I_{D, pulse}$	45	A
Diode forward current ¹⁾	I_S	15	A
Pulsed source current ²⁾	I_{SP}	45	A
Power dissipation ³⁾ for TO252, TO263, $T_C=25^{\circ}\text{C}$	P_D	104	W
Power dissipation ³⁾ for TO220F, $T_C=25^{\circ}\text{C}$		32	
Single pulsed avalanche energy ⁵⁾	E_{AS}	250	mJ
MOSFET dv/dt ruggedness, $V_{DS}=0\text{...}480\text{ V}$	dv/dt	50	V/ns
Reverse diode dv/dt, $V_{DS}=0\text{...}480\text{ V}$, $I_{SD}\leq I_D$	dv/dt	15	V/ns
Operation and storage temperature	T_{stg}, T_j	-55 to 150	°C

■ Thermal Characteristics

Parameter	Symbol	Value		Unit
		TO252/TO263	TO220F	
Thermal resistance, junction-case	$R_{\theta JC}$	1.2	3.9	°C/W
Thermal resistance, junction-ambient ⁴⁾	$R_{\theta JA}$	62	62.5	°C/W

■ Electrical Characteristics at $T_j=25\text{ }^\circ\text{C}$ unless otherwise specified

Parameter	Symbol	Min.	Typ.	Max.	Unit	Test condition
Drain-source breakdown voltage	BV_{DSS}	650			V	$V_{GS}=0\text{ V}$, $I_D=250\text{ }\mu\text{A}$
		700				$V_{GS}=0\text{ V}$, $I_D=250\text{ }\mu\text{A}$, $T_j=150\text{ }^\circ\text{C}$
Gate threshold voltage	$V_{GS(th)}$	2.7		3.7	V	$V_{DS}=V_{GS}$, $I_D=250\text{ }\mu\text{A}$
Drain-source on-state resistance	$R_{DS(on)}$		0.25	0.29	Ω	$V_{GS}=10\text{ V}$, $I_D=7.5\text{ A}$
			0.68			$V_{GS}=10\text{ V}$, $I_D=7.5\text{ A}$, $T_j=150\text{ }^\circ\text{C}$
Gate-source leakage current	I_{GSS}			100	nA	$V_{GS}=30\text{ V}$
				-100		$V_{GS}=-30\text{ V}$
Drain-source leakage current	I_{DSS}			1	μA	$V_{DS}=650\text{ V}$, $V_{GS}=0\text{ V}$

■ Dynamic Characteristics

Parameter	Symbol	Min.	Typ.	Max.	Unit	Test condition
Input capacitance	C_{iss}		1079		pF	$V_{GS}=0\text{ V}$, $V_{DS}=50\text{ V}$, $f=100\text{ kHz}$
Output capacitance	C_{oss}		74.1		pF	
Reverse transfer capacitance	C_{rss}		2.1		pF	
Turn-on delay time	$t_{d(on)}$		30.1		ns	$V_{GS}=10\text{ V}$, $V_{DS}=400\text{ V}$, $R_G=2\text{ }\Omega$, $I_D=8\text{ A}$
Rise time	t_r		19.5		ns	
Turn-off delay time	$t_{d(off)}$		61.5		ns	
Fall time	t_f		15.5		ns	

■ Gate Charge Characteristics

Parameter	Symbol	Min.	Typ.	Max.	Unit	Test condition
Total gate charge	Q_g		21.0		nC	$I_D=8\text{ A}$, $V_{DS}=400\text{ V}$, $V_{GS}=10\text{ V}$
Gate-source charge	Q_{gs}		5.0		nC	
Gate-drain charge	Q_{gd}		7.4		nC	
Gate plateau voltage	V_{plateau}		5.5		V	

■ Body Diode Characteristics

Parameter	Symbol	Min.	Typ.	Max.	Unit	Test condition
Diode forward current ²⁾	I_S			15	A	$V_{GS}<V_{th}$
Pulsed source current	I_{SP}			45		
Diode forward voltage	V_{SD}			1.3	V	$I_S=15\text{ A}$, $V_{GS}=0\text{ V}$
Reverse recovery time	t_{rr}		262.4		ns	$V_R=400\text{ V}$, $I_S=8\text{ A}$, $di/dt=100\text{ A}/\mu\text{s}$
Reverse recovery charge	Q_{rr}		2.9		μC	
Peak reverse recovery current	I_{rrm}		23.4		A	

■ Note

- 1) Calculated continuous current based on maximum allowable junction temperature.
- 2) Repetitive rating; pulse width limited by max. junction temperature.
- 3) P_d is based on max. junction temperature, using junction-case thermal resistance.
- 4) The value of $R_{\theta JA}$ is measured with the device mounted on 1 in 2 FR-4 board with 2oz. Copper, in a still air environment with $T_a=25\text{ }^\circ\text{C}$.
- 5) $V_{DD}=100\text{ V}$, $R_G=50\text{ }\Omega$, $L=10\text{ mH}$, starting $T_j=25\text{ }^\circ\text{C}$.

■ **Electrical Characteristics Diagrams**

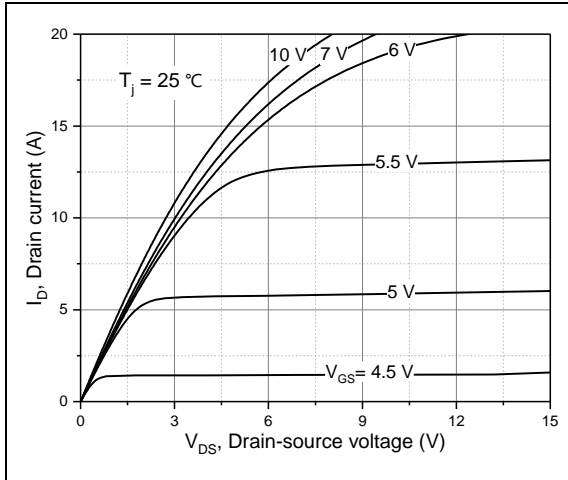


Figure 1, Typ. output characteristics

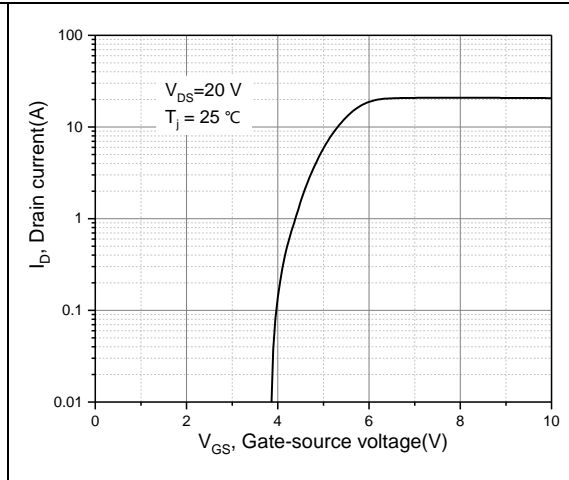


Figure 2, Typ. transfer characteristics

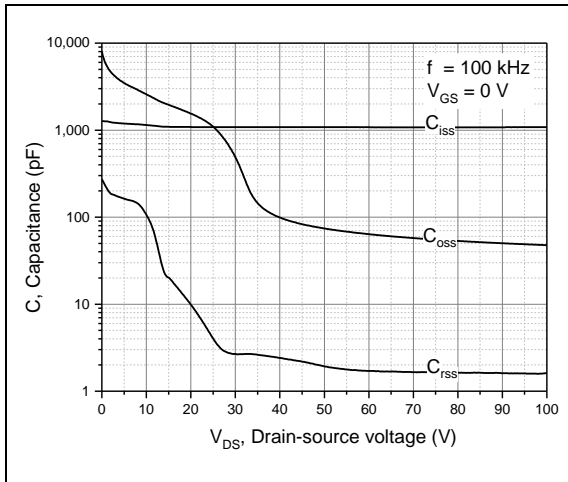


Figure 3, Typ. capacitances

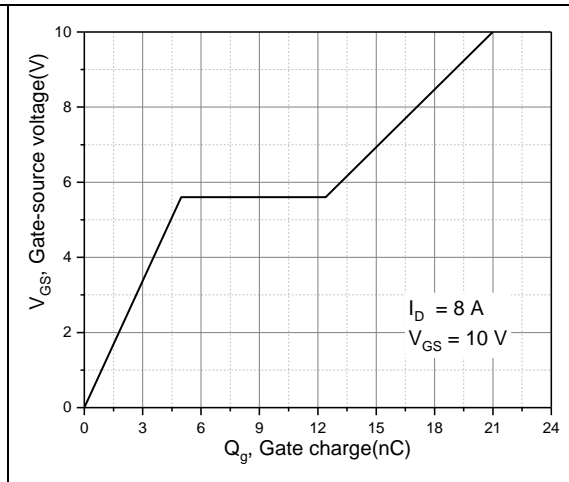


Figure 4, Typ. gate charge

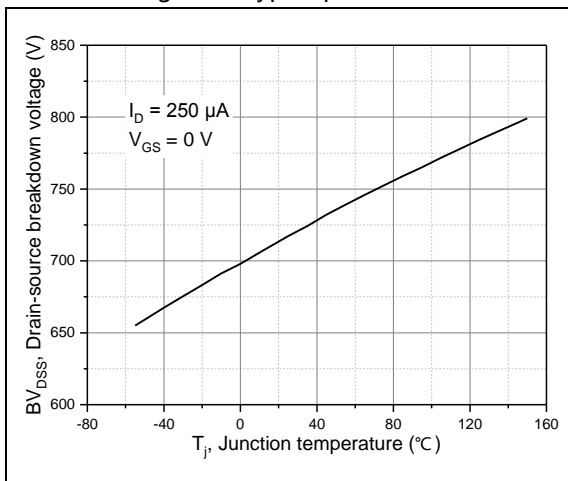


Figure 5, Drain-source breakdown voltage

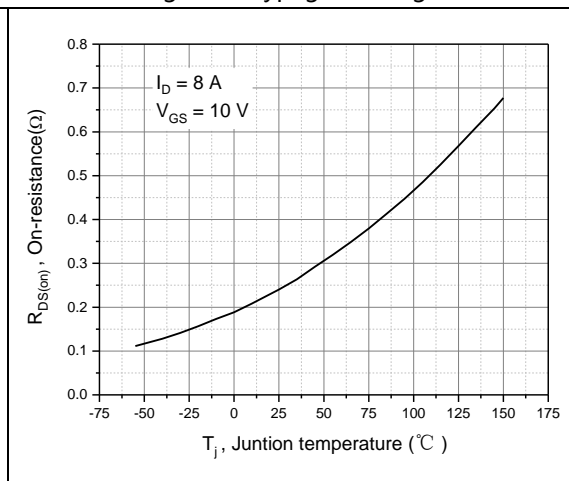


Figure 6, Drain-source on-state resistance

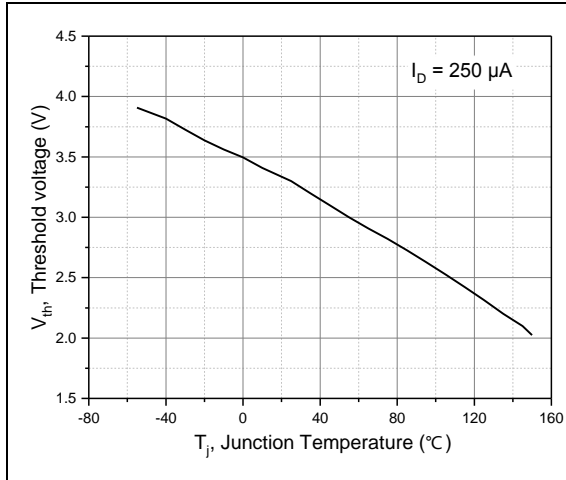


Figure 7, Threshold voltage

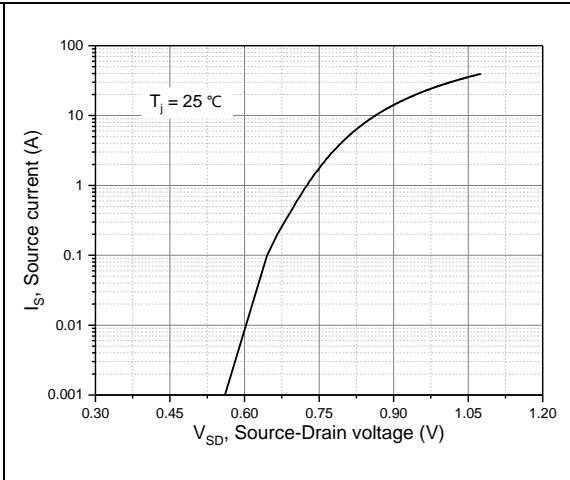


Figure 8, Forward characteristic of body diode

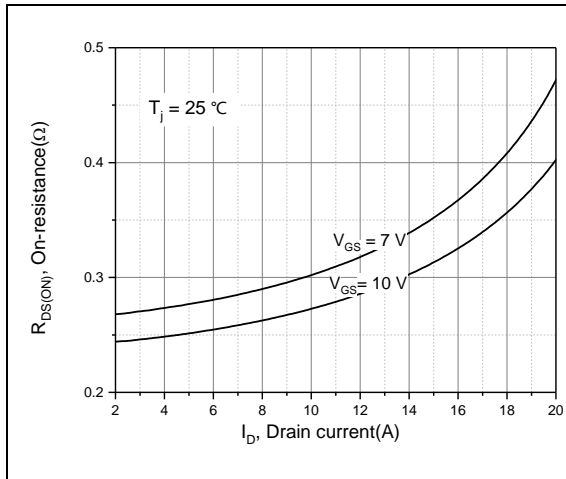


Figure 9, Drain-source on-state resistance

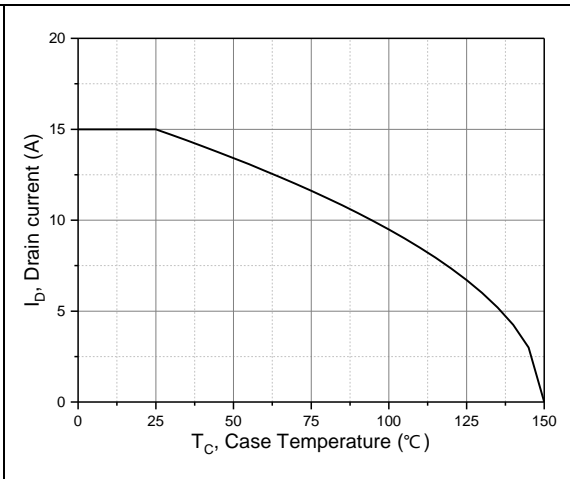


Figure 10, Drain current

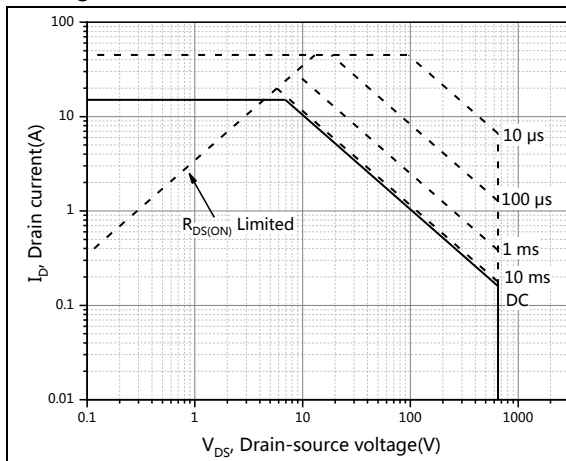


Figure 11, Safe operation area for
TO252/TO263 $T_c=25\text{ }^\circ\text{C}$

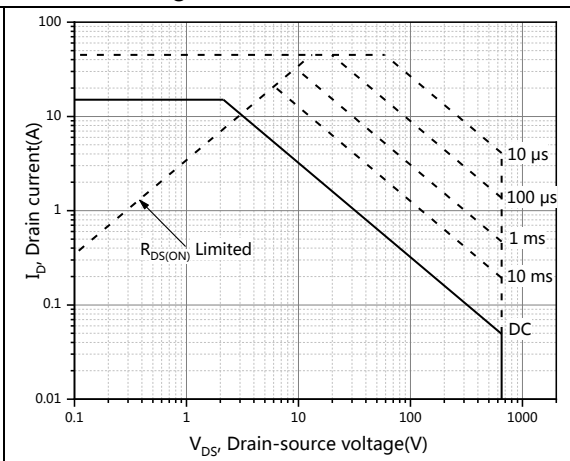


Figure 12, Safe operation area for
TO220F $T_c=25\text{ }^\circ\text{C}$

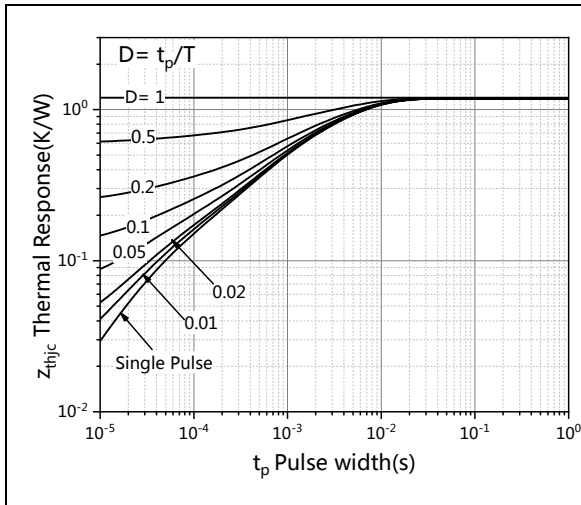


Figure 13, Max. transient thermal impedance for TO252/TO263

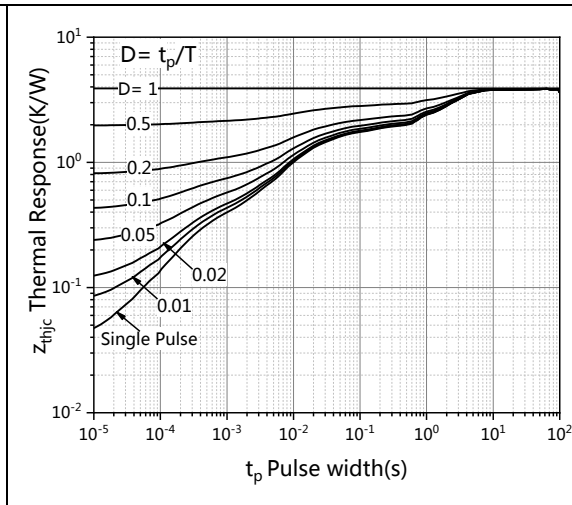
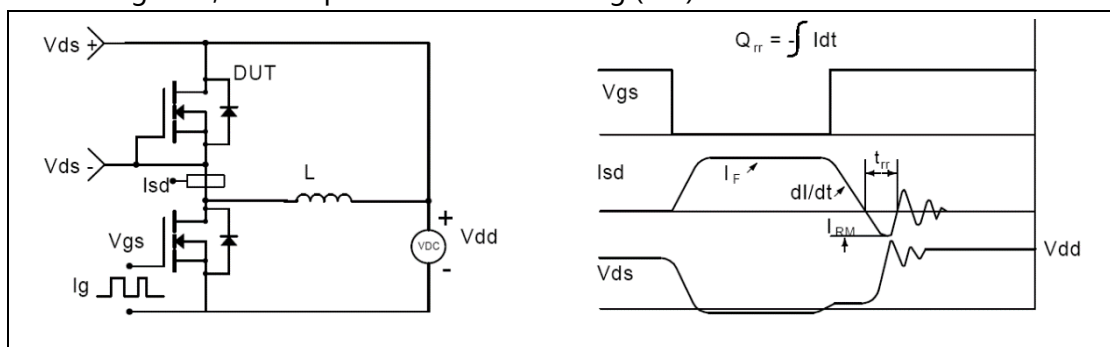
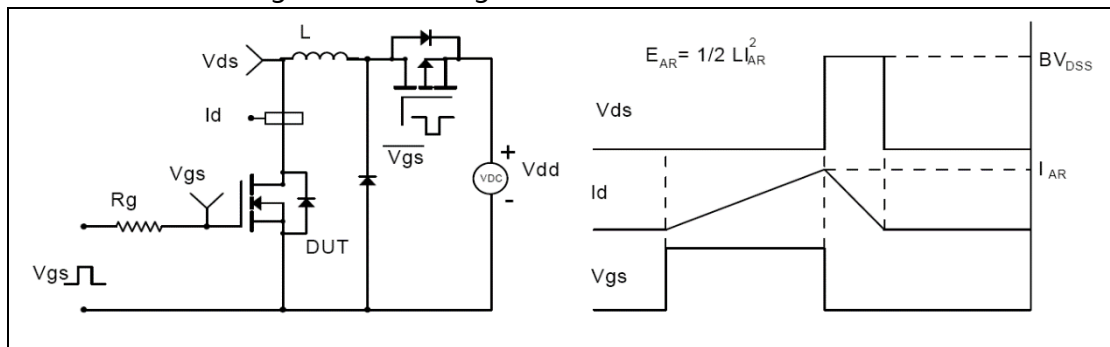
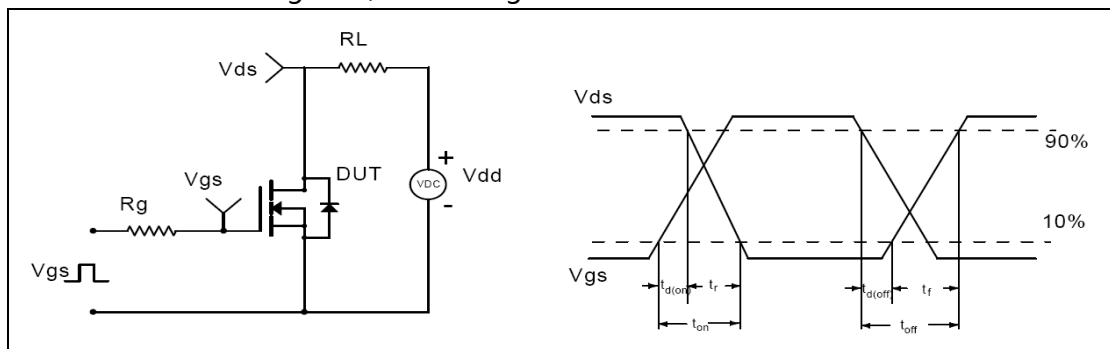
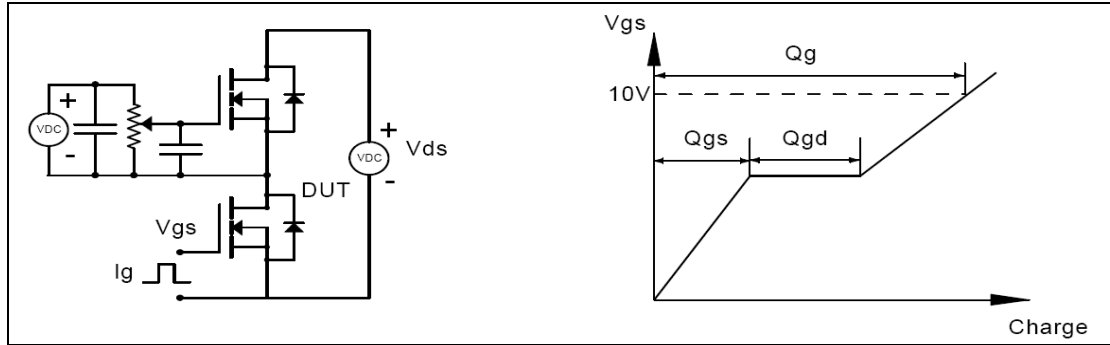


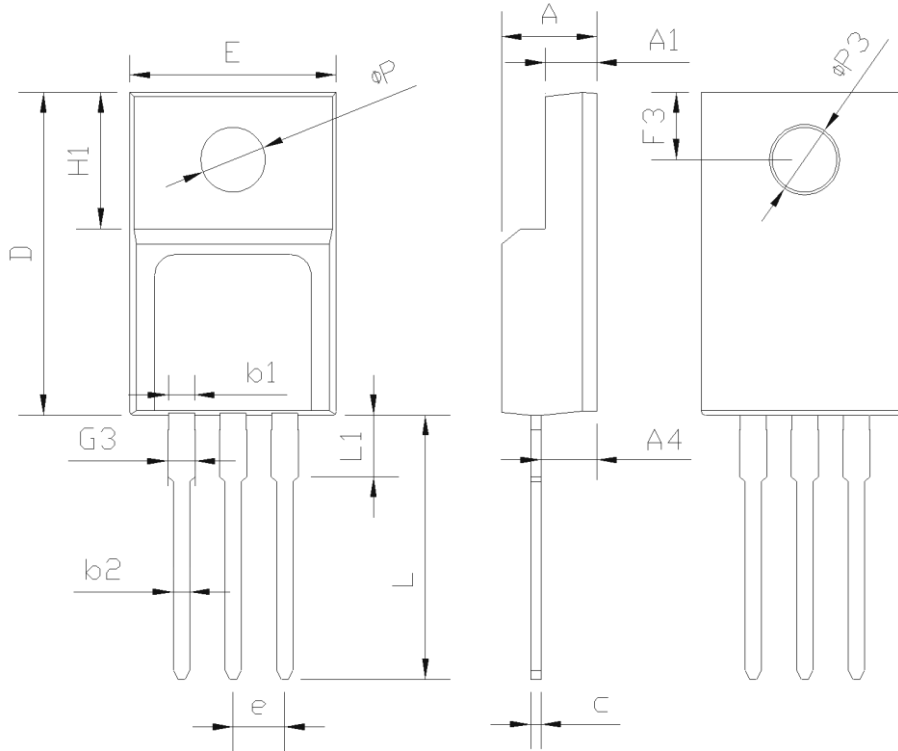
Figure 14, Max. transient thermal impedance for TO220F

■ Test circuits and waveforms



■ Package Information

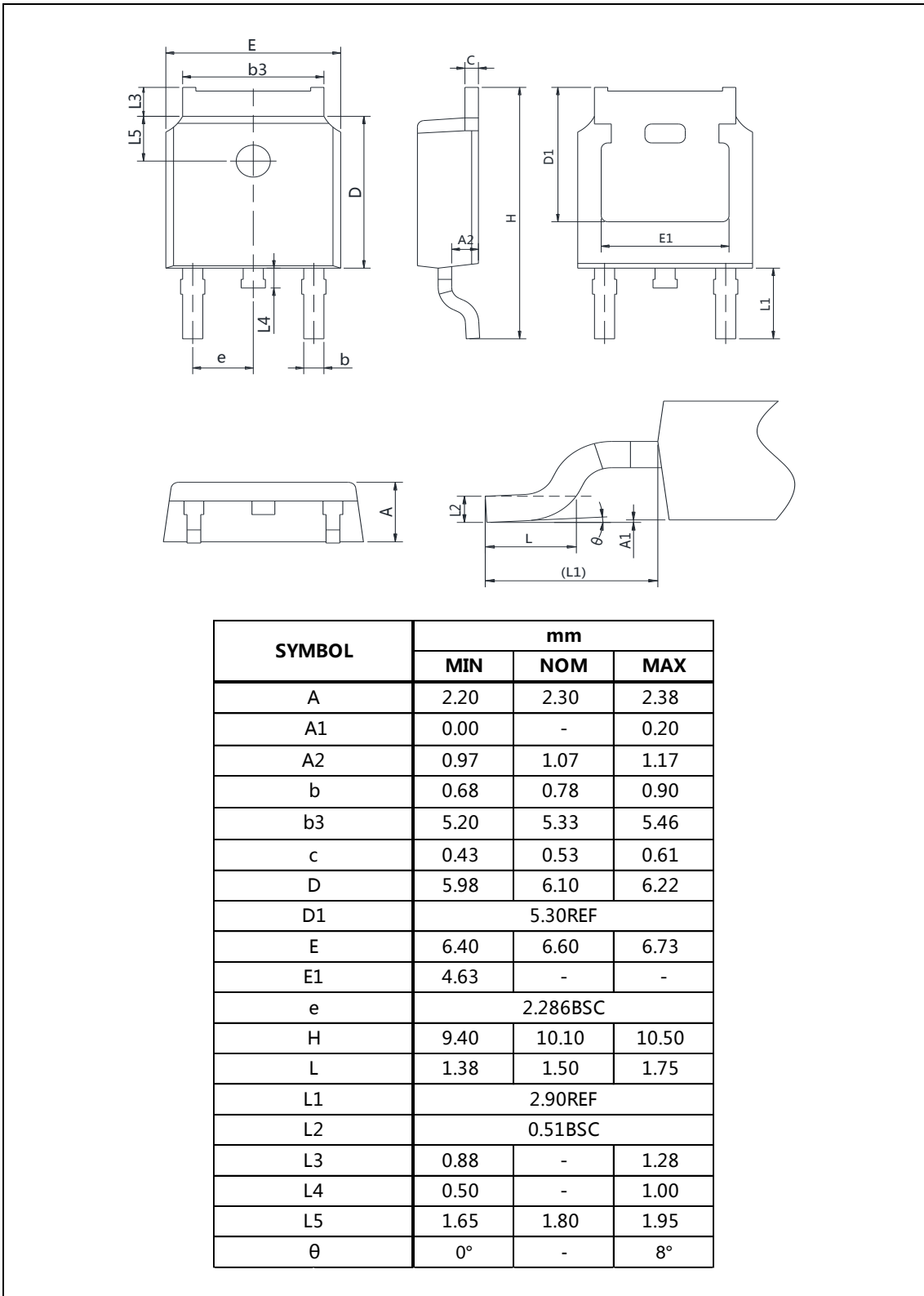
Figure1, TO220F package outline dimension



SYMBOL	mm		
	MIN	NOM	MAX
E	9.96	10.16	10.36
A	4.50	4.70	4.90
A1	2.34	2.54	2.74
A4	2.56	2.76	2.96
c	0.40	0.50	0.65
D	15.57	15.87	16.17
H1	6.70REF		
e	2.54BSC		
L	12.68	12.98	13.28
L1	2.88	3.03	3.18
ΦP	3.03	3.18	3.38
ΦP3	3.15	3.45	3.65
F3	3.15	3.30	3.45
G3	1.25	1.35	1.55
b1	1.18	1.28	1.43
b2	0.70	0.80	0.95

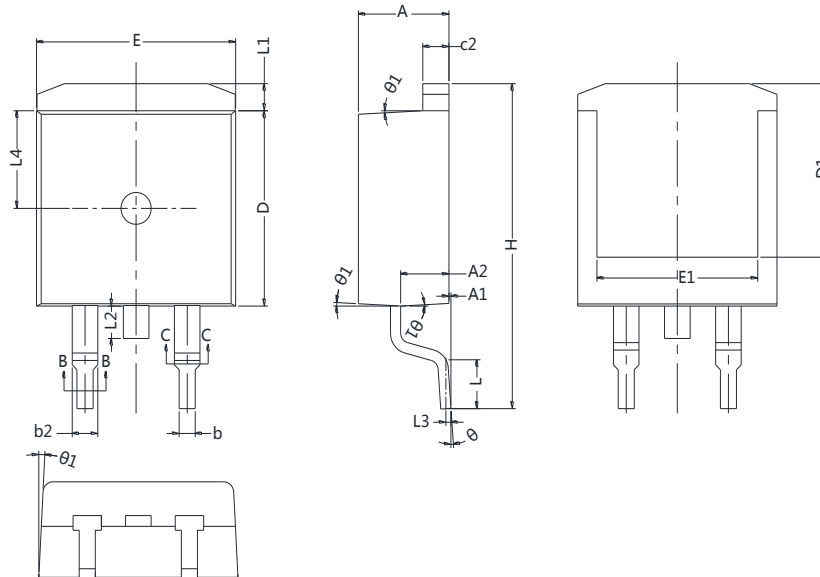
■ Package Information

Figure2, TO252 package outline dimension



■ Package Information

Figure3, TO263 package outline dimension



SYMBOL	mm		
	MIN	NOM	MAX
A	4.40	4.50	4.60
A1	0.00	0.10	0.25
A2	2.20	2.40	2.60
b	0.76	-	0.89
b1	0.75	0.80	0.85
b2	1.23	-	1.37
b3	1.22	1.27	1.32
c	0.47	-	0.60
c1	0.46	0.51	0.56
c2	1.25	1.30	1.35
D	9.10	9.20	9.30
D1	8.00	-	-
E	9.80	9.90	10.00
E1	7.80	-	-
e	2.54BSC		
H	14.90	15.30	15.70
L	2.00	2.30	2.60
L1	1.17	1.27	1.40
L2	-	-	1.75
L3	0.25BSC		
L4	4.60REF		
θ	0°	-	8°
θ1	1°	3°	5°

■ Ordering Information

Package	Units/Tube	Tubes/Inner Box	Units/Inner Box	Inner Box/Carton Box	Units/Carton Box
TO220F	50	20	1000	6	6000

Package	Units/ Reel	Reels/Inner Box	Units/Inner Box	Inner Box/Carton Box	Units/Carton Box
TO263	800	1	800	10	8000
TO252	2500	2	5000	5	25000

■ Product Information

Product	Package	Pb Free	RoHS	Halogen Free
OSG65R290FEF	TO220F	yes	yes	yes
OSG65R290DEF	TO252	yes	yes	yes
OSG65R290KEF	TO263	yes	yes	yes

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