

MOSFET Silicon N-Channel MOS

1 Description

Features

- Ultra-fast body diode
- Low drain-source on-resistance: $R_{DS(ON)} = 0.065\Omega$ (typ.)
- Easy to drive
- Pb-free plating, Halogen free mold compound and meet RoHS requirement

Applications

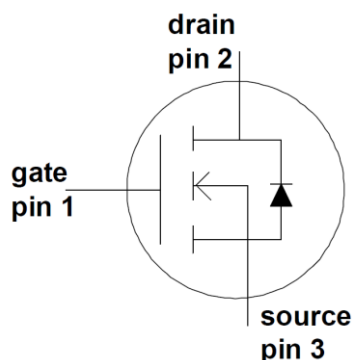
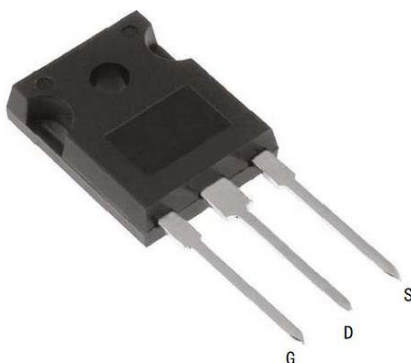
- For Soft Switching Boost PFC switch, HB or AHB or LLC half bridge and full bridge topologies.
- Such as phase-shift-bridge(ZVS),LLC Application-Server Power, Telecom Power, EV Charging, Solar inverter.

Table 1 Key Performance Parameters

Parameter	Value	Unit
$V_{DS} @ T_{j,max}$	650	V
$R_{DS(on),max}$	70	m Ω
Q_g,typ	95	nC
$I_D,pulse$	130	A
Body diode dv/dt	50	V/ns

Packaging and Internal Circuit

Part Name	Package	Marking	Packing Method	QTY/BOX
CMW60R070DFD	TO-247	CMW60R070DFD	Tube	1200PCS



2 Maximum ratings

at $T_j = 25^\circ\text{C}$, unless otherwise specified

Table 2 Maximum ratings

Parameter	Symbol	Value			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Continuous drain current ¹⁾	I_D		-	51	A	$T_C=25^\circ\text{C}$
				32		$T_C=100^\circ\text{C}$
Pulsed drain current ²⁾	$I_{D,pulse}$	-	-	130	A	$T_C=25^\circ\text{C}$
Avalanche energy, single pulse	E_{AS}	-	-	1000	mJ	$T_C=25^\circ\text{C}$, $V_{DD}=50\text{V}$, $R_G=25\Omega$
Avalanche current, single pulse	I_{AR}	-	-	5	A	$T_C=25^\circ\text{C}$, $V_{DD}=50\text{V}$, $R_G=25\Omega$
MOSFET dv/dt ruggedness	dv/dt	-	-	50	V/ns	$V_{DS}=0\ldots 400\text{V}$
Gate source voltage (static)	V_{GS}	-20	-	20	V	static;
Gate source voltage (dynamic)	V_{GS}	-30	-	30	V	AC ($f>1\text{ Hz}$)
Power dissipation	P_{tot}	-	-	390	W	$T_C=25^\circ\text{C}$
Storage temperature	T_{stg}	-55	-	150	$^\circ\text{C}$	
Operating junction temperature	T_j	-55	-	150	$^\circ\text{C}$	
Reverse diode dv/dt ³⁾	dv/dt	-	-	50	V/ns	$V_{DS}=0\ldots 400\text{V}$, $I_{SD}\leq 25\text{A}$, $T_j=25^\circ\text{C}$ see table 8

¹⁾ Limited by $T_{j,max}$. Maximum Duty Cycle $D = 0.5$

²⁾ Pulse width t_p limited by $T_{j,max}$

³⁾ Identical low side and high side switch with identical R_G

3 Thermal characteristics

Table 3 Thermal characteristics

Parameter	Symbol	Value			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Thermal resistance, junction-case	R_{thJC}	-	-	0.32	°C/W	-
Thermal resistance, junction-ambient	R_{thJA}	-	-	62	°C/W	device on PCB, minimal footprint

4 Electrical characteristics

at $T_j=25^{\circ}\text{C}$, unless otherwise specified

Table 4 Static characteristics

Parameter	Symbol	Value			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Drain-source breakdown voltage	$V_{(BR)DSS}$	600	-	-	V	$V_{GS}=0V, I_D=1mA$
Gate threshold voltage	$V_{(GS)th}$	3		5	V	$V_{DS}=V_{GS}, I_D=2mA$
Zero gate voltage drain current	I_{DSS}	-	-	5	μA	$V_{DS}=650V, V_{GS}=0V, T_j=25^{\circ}\text{C}$
Gate-source leakage current	I_{GSS}	-	-	100	nA	$V_{GS}=30V, V_{DS}=0V$
Drain-source on-state resistance	$R_{DS(on)}$	-	0.065	0.070	Ω	$V_{GS}=10V, I_D=25A, T_j=25^{\circ}\text{C}$
Gate resistance (Intrinsic)	R_G	-	1.1	-	Ω	$f=100kHz$, open drain

Table 5 Dynamic characteristics

Parameter	Symbol	Value			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Input capacitance	C_{iss}	-	4060	-	pF	$V_{GS}=0V, V_{DS}=100V, f=100kHz$
Output capacitance	C_{oss}	-	151	-	pF	$V_{GS}=0V, V_{DS}=100V, f=100kHz$
Reverse transfer capacitance	C_{rss}	-	2.6	-	pF	$V_{GS}=0V, V_{DS}=100V, f=100kHz$
Turn-on delay time	$t_{d(on)}$	-	48	-	ns	$V_{DD}=400V, V_{GS}=13V, I_D=25A$ $R_G=12.7\Omega$; see table 15
Rise time	t_r	-	28.3	-	ns	
Turn-off delay time	$t_{d(off)}$	-	130.7	-	ns	
Fall time	t_f	-	13.3	-	ns	

Table 6 Gate charge characteristics

Parameter	Symbol	Value			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Gate to source charge	Q_{gs}	-	21	-	nC	$V_{DD}=400V, I_D=25A, V_{GS}=10V$
Gate to drain charge	Q_{gd}	-	30	-	nC	
Gate charge total	Q_g	-	95	-	nC	
Gate plateau voltage	$V_{plateau}$	-	6.5	-	V	

Table 7 Reverse diode characteristics

Parameter	Symbol	Value			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Diode forward voltage	V_{SD}	-	1	-	V	$V_{GS}=0V, I_F=25A, T_J=25^{\circ}C$
Reverse recovery time	t_{rr}	-	146	-	ns	$V_r=400V, I_F=25A, di/dt=100A/\mu s$ see table 14
Reverse recovery charge	Q_{rr}	-	1.05	-	uC	
Peak reverse recovery current	I_{rrm}	-	13.7	-	A	

5 Electrical characteristics diagram

Table 8

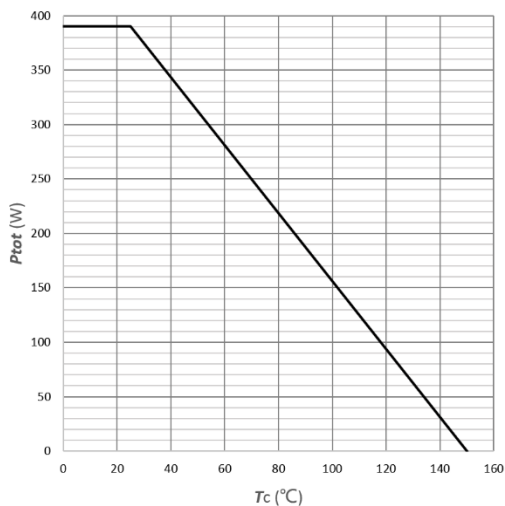
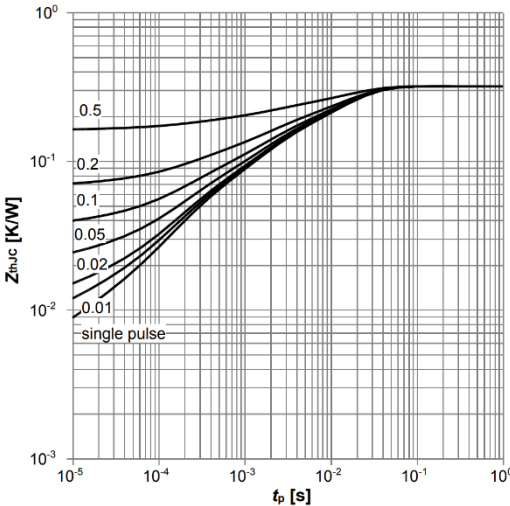
Power dissipation	Max. transient thermal impedance
 $P_{tot} = f(T_c)$	 $Z_{thjc} = f(t_p)$; parameter: $D = t_p/T$

Table 9

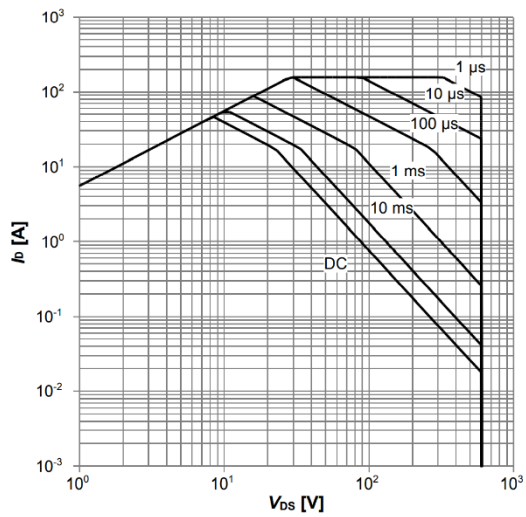
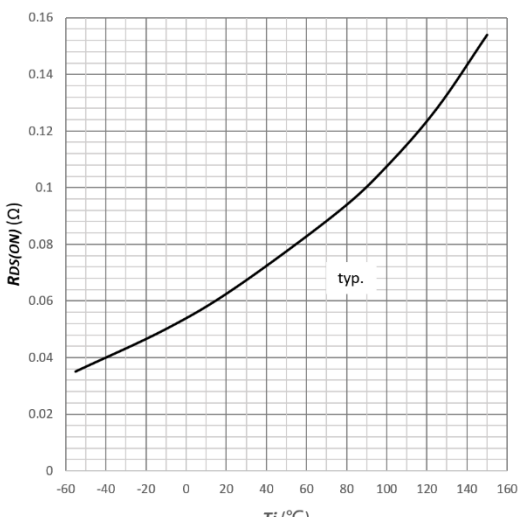
Safe operating area $T_C=25\text{ }^{\circ}\text{C}$	Drain-source on-state resistance
 $I_D = f(V_{DS})$; $T_C=25\text{ }^{\circ}\text{C}$; $V_{GS}>10\text{ V}$; $D=0$; parameter t_p	 $R_{DS(on)} = f(T_j)$; $I_D=25\text{ A}$; $V_{GS}=10\text{ V}$

Table 10

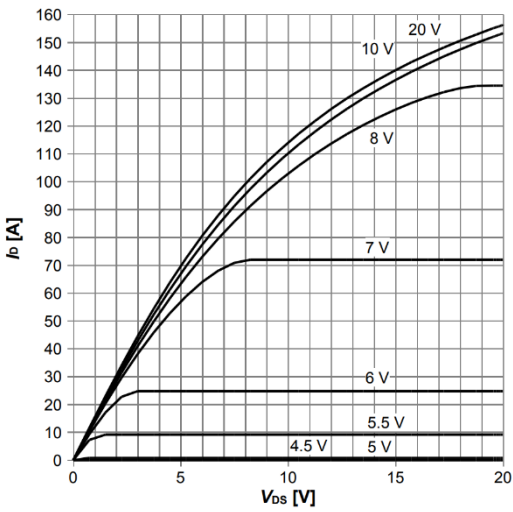
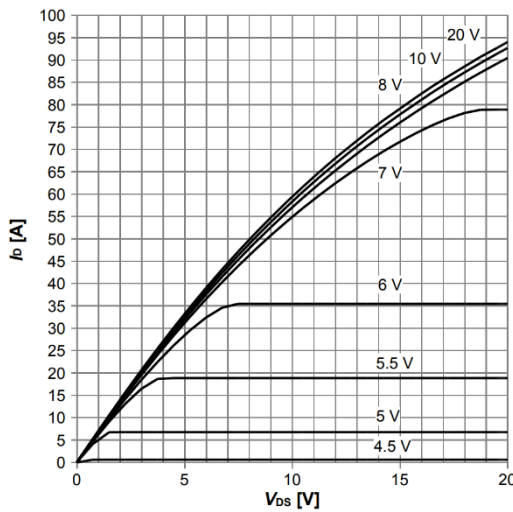
Typ. output characteristics $T_c=25^{\circ}\text{C}$	Typ. output characteristics $T_c=125^{\circ}\text{C}$
	
$I_D=f(V_{DS}); T_j=25^{\circ}\text{C}; \text{parameter: } V_{GS}$	$I_D=f(V_{DS}); T_j=125^{\circ}\text{C}; \text{parameter: } V_{GS}$

Table 11

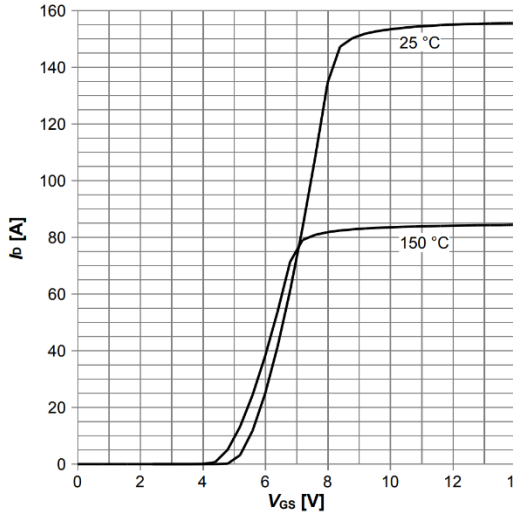
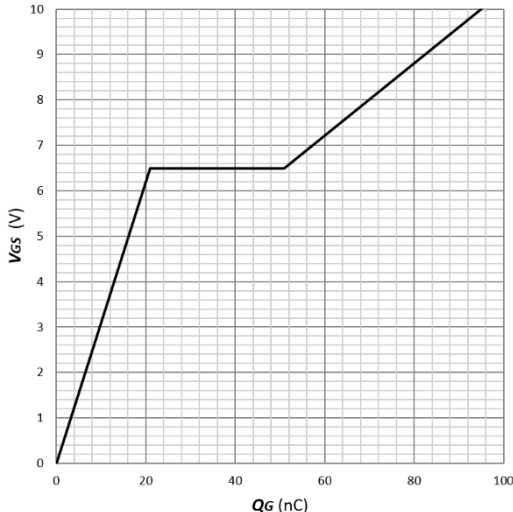
Typ. transfer characteristics	Typ. gate charge
	
$I_D=f(V_{GS}); I_{VDSI}=20\text{V};$	$V_{GS}=f(Q_{\text{gate}}); I_D=50\text{ A pulsed}; \text{parameter: } V_{DD}$

Table 12

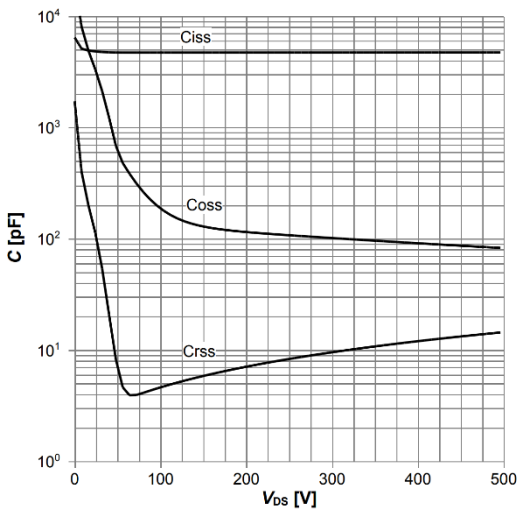
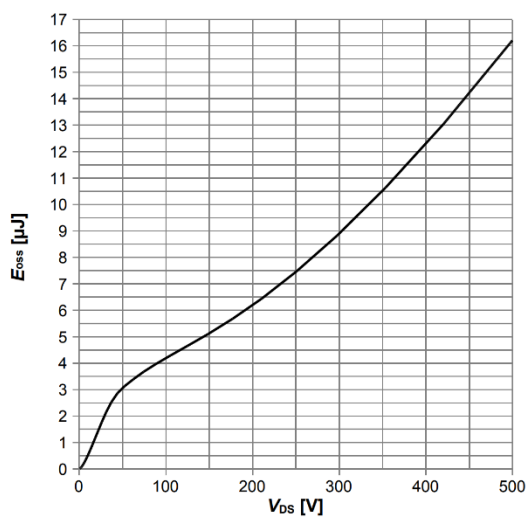
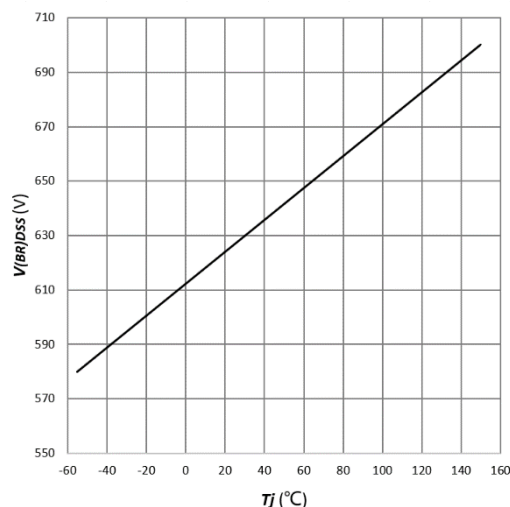
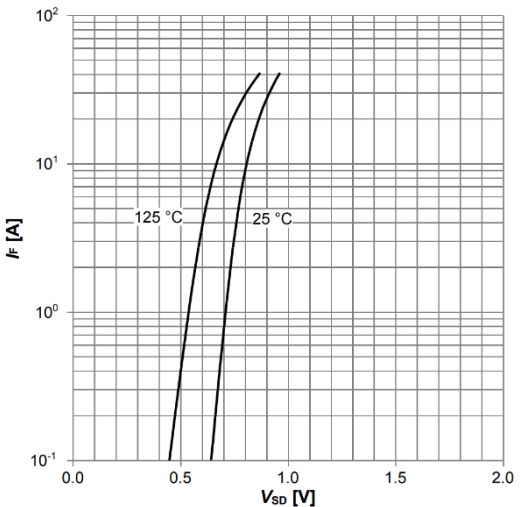
Typ. capacitances	Typ. Coss stored energy
 $C = f(V_{DS}); V_{GS} = 0 \text{ V}; f = 100 \text{ kHz}$	 $E_{oss} = f(V_{DS})$

Table 13

Drain-source breakdown voltage	Forward characteristics of reverse diode
 $V_{BR(DSS)} = f(T_j); I_D = 10 \text{ mA}$	 $I_F = f(V_{SD}); \text{parameter: } T_j$

6 Test Circuits

Table 14 Diode characteristics

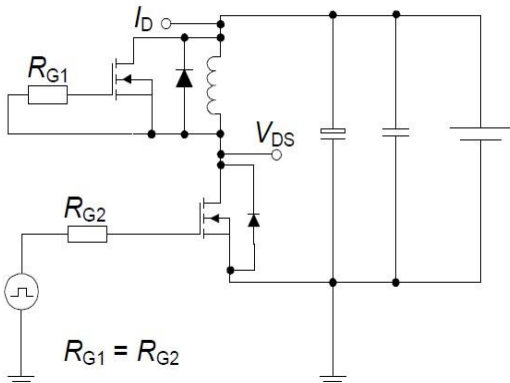
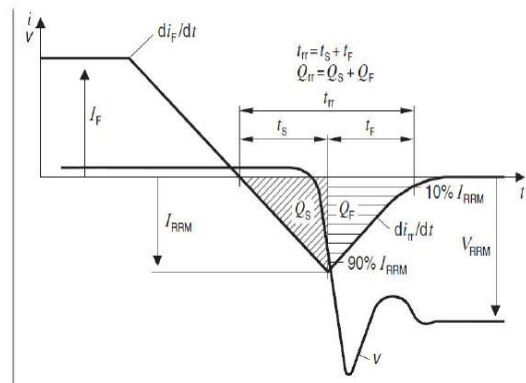
Test circuit for diode characteristics	Diode recovery waveform
 $R_{G1} = R_{G2}$	 $t_R = t_S + t_T$ $Q_R = Q_S + Q_F$

Table 15 Switching times

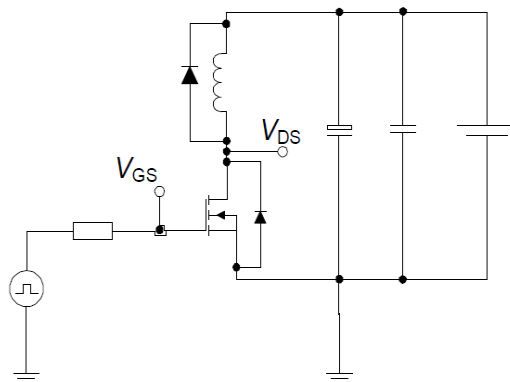
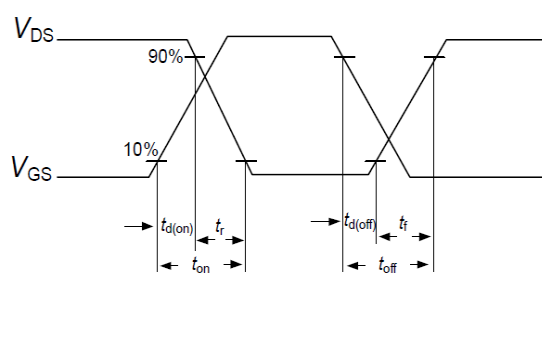
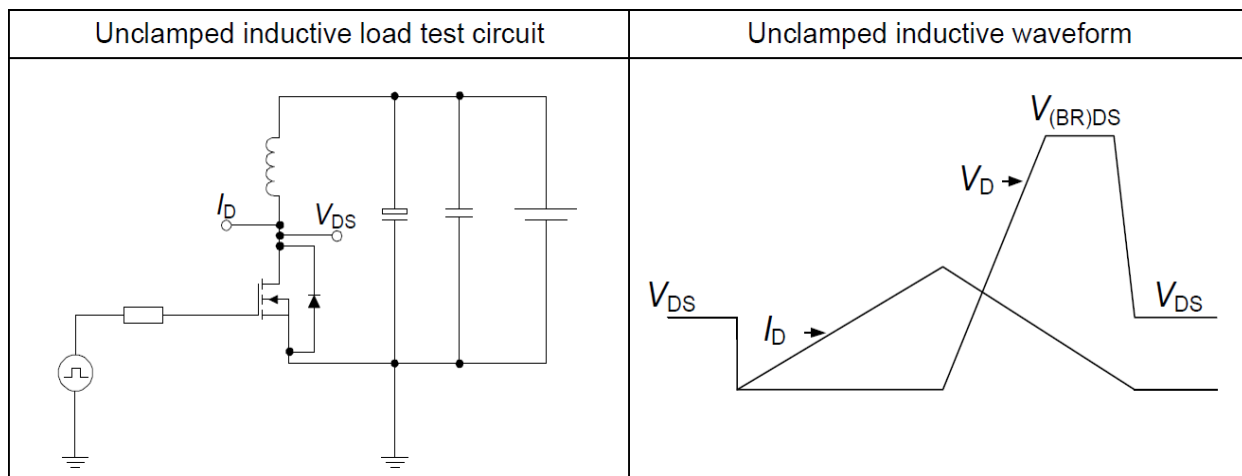
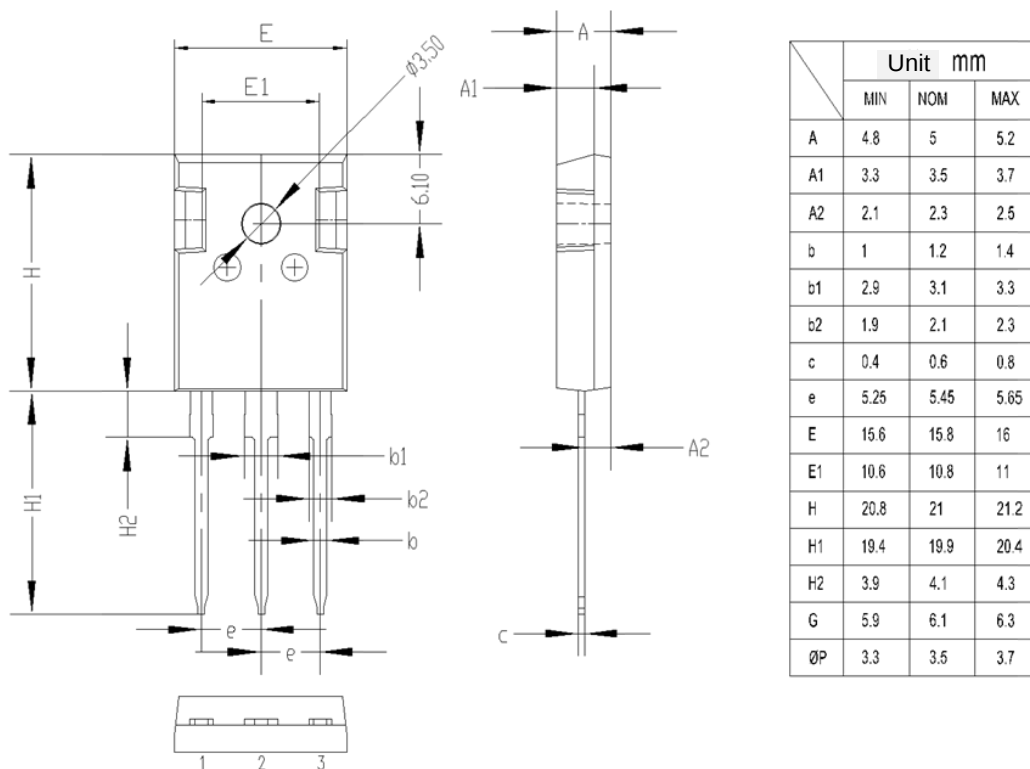
Switching times test circuit for inductive load	Switching times waveform
	

Table16 Unclamped inductive load


7 Package Outlines

Figure1: Outline of PG-T0247


8 Product Code

Figure2: Product number Decode

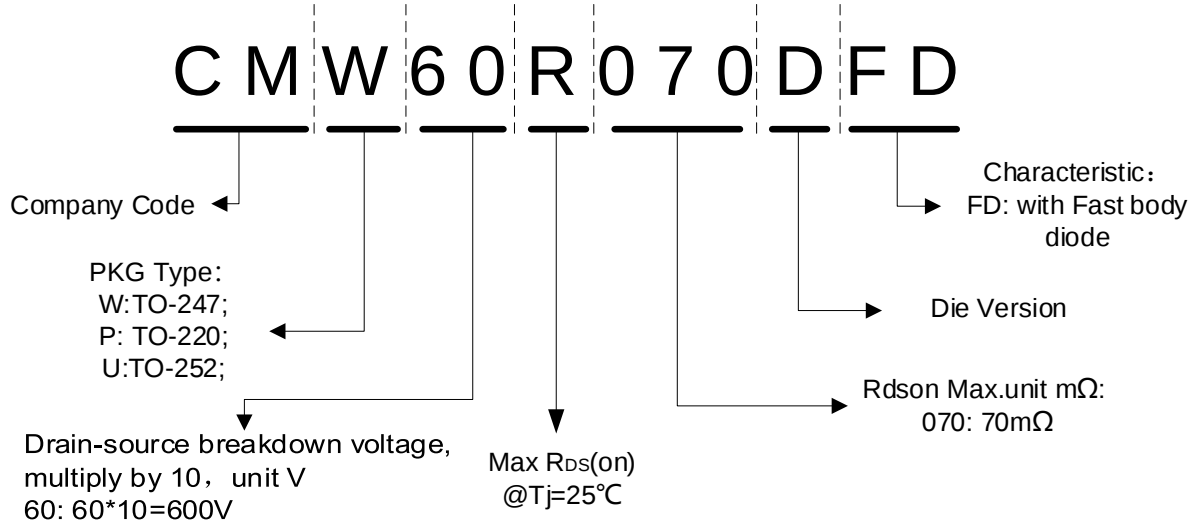
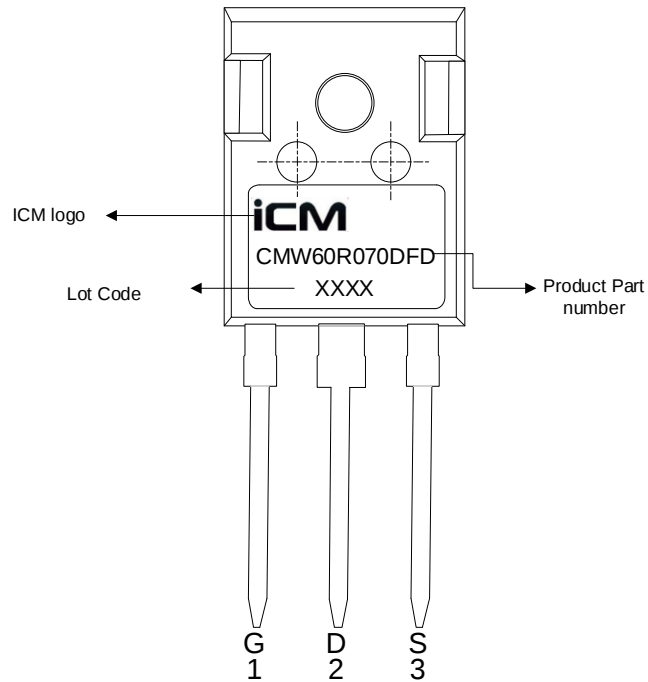


Figure3: Part Marking Information



Revision History

Revision	Date	Subjects (major changes since last revision)
1.0	2022-8-22	Preliminary version