

FMOSCP60N65-H

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FMOSCPE60N65-H

60A 650V N-Channel Enhancement Mode Silicon Carbide Power MOSFET

Features

- $V_{DS} = 650V$, $I_D = 60A$.
- $R_{DS(ON)} \leq 26m\Omega$, @ $V_{GS} = 20V$, $I_D = 50A$.
- Low on-resistance and high current density.
- Low capacitance for high frequency operation.
- Low impedance Kelvin source pin-out.
- Ultra-high avalanche ruggedness.
- Positive temperature coefficient device.
- Lead-free parts meet RoHS requirements.
- Halogen-free (IEC61249-2-21).

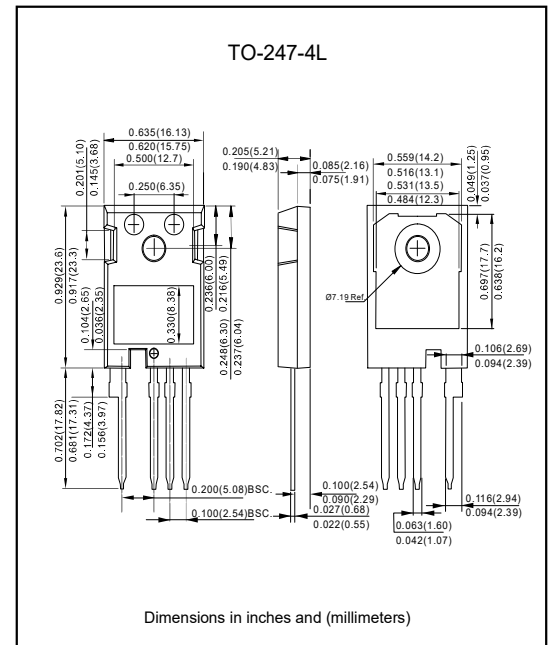
Applications

- Solar/ wind renewable energy, and power inverters.
- DC/DC converters, UPS, and PFC.
- Switching mode power supply, EV charging station, and motor drives.

Mechanical data

- Epoxy: UL94-V0 rated flame retardant.
- Case : Molded plastic, TO-247-4L.
- Terminals : Solder plated, solderable per MIL-STD-750, Method 2026.
- Mounting Position : Any.

Package outline



Maximum ratings (At $T_c = 25^\circ C$ unless otherwise specified)

Parameter	Symbol	Ratings	Unit
Maximum drain to source voltage ($V_{GS}=0V$, $I_D=100\mu A$)	V_{DS}	650	V
Recommend Gate-source voltage Static, recommended DC operating values	$V_{GS(OP)}$	-5 to +20	V
Maximum Gate-source voltage Transient operating limit (AC f > 1Hz, duty cycle < 1%)	$V_{GS(Max)}$	-10 to +25	V
Continuous drain current, @ $V_{GS}=20V$ ($T_c=25^\circ C$) ($T_c=110^\circ C$)	I_D	60	A
		41	
Pulsed drain current, t_{PW} limitation per Fig. 15	$I_{D(pulse)}$	127	A
Avalanche energy, single pulse ($V_{DD}=100V$, $I_D=10A$)	E_{AS}	1.6	J
Power dissipation ($T_c=25^\circ C$)	P_D	250	W
Mounting torque (M3 or 6-32 screw)	M_d	1	Nm
Typical thermal resistance, junction to case	$R_{\theta JC}$	0.6 (Typ.)	$^\circ C/W$
Soldering temperature	T_L	260	$^\circ C$
Junction temperature	T_J	+175	$^\circ C$
Storage temperature range	T_{STG}	-55 to +175	$^\circ C$

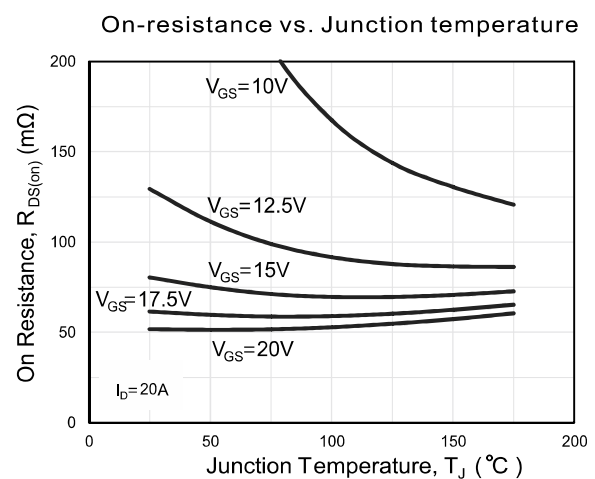
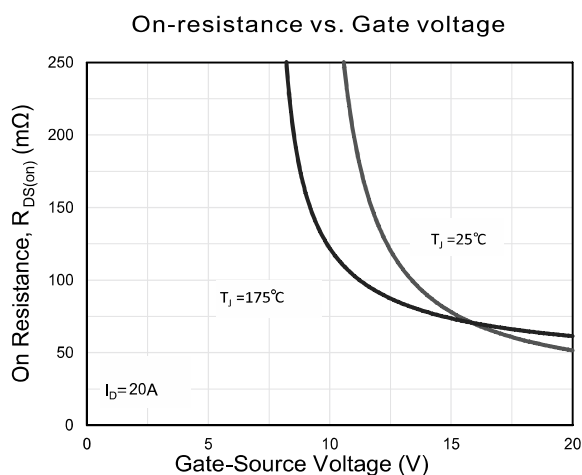
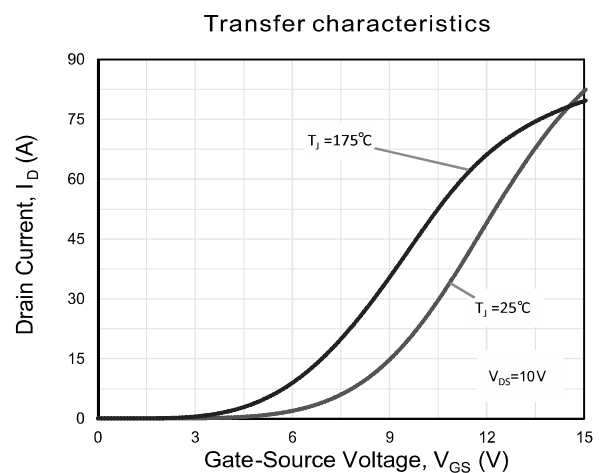
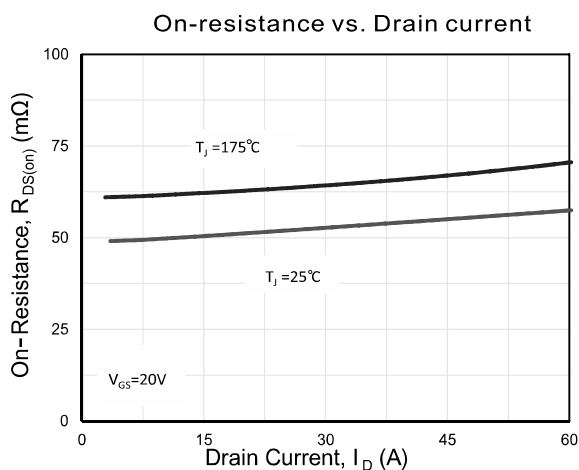
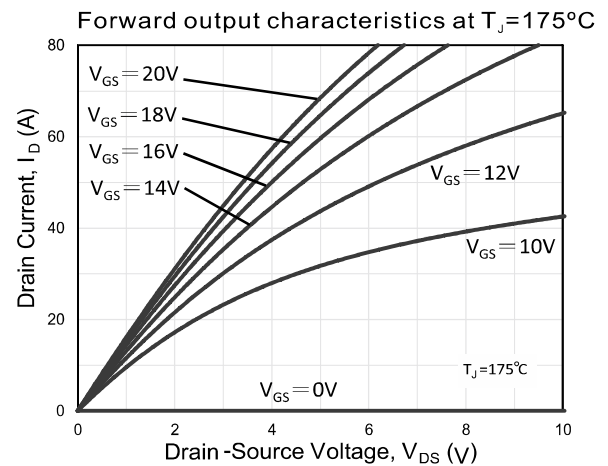
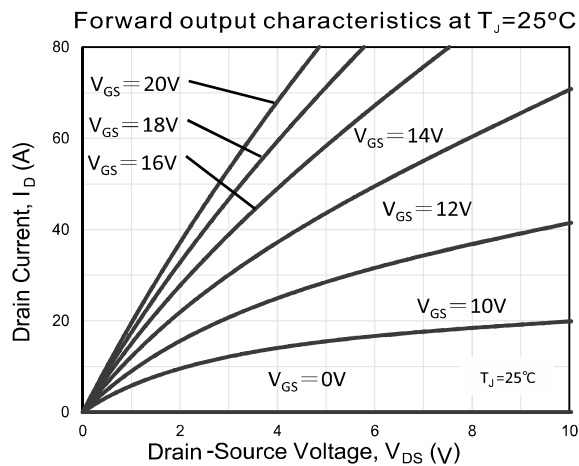
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Electrical characteristics (At $T_c=25^\circ\text{C}$ unless otherwise specified)

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Off characteristics						
Drain-source breakdown voltage	BV_{DSS}	$I_D=100\mu A$, $V_{GS}=0V$	650			V
Drain-source leakage current	I_{DSS}	$V_{DS}=650V$, $V_{GS}=0V$		<1	50	μA
		$V_{DS}=650V$, $V_{GS}=0V$, $T_J=175^{\circ}C$		10	500	
Gate-source leakage current	I_{GSS}	$V_{GS}=20V$, $V_{DS}=0V$			250	nA
On characteristics						
Gate threshold voltage	$V_{GS(TH)}$	$V_{DS}=10V$, $I_{DS}=20mA$	1.5	2.6	3.5	V
Static drain-source on-state resistance	$R_{DS(ON)}$	$V_{GS}=20V$, $I_{DS}=20A$		50	65	m Ω
		$V_{GS}=20V$, $I_{DS}=20A$, $T_J=175^{\circ}C$		65		
Transconductance	g_{FS}	$V_{DS}=15V$, $I_{DS}=40A$		13.2		S
Dynamic parameters						
Input capacitance	C_{iss}	$V_{GS}=0V$, $V_{DS}=400V$, $f=1.0MHz$, $V_{AC}=25mV$		1850		pF
Out capacitance	C_{oss}			208		
Reverse transfer capacitance	C_{rss}			33		
Effective output capacitance, energy related	$C_{o(er)}$		$V_{GS}=0V$, $V_{DS}=0$ to $400V$		237	
Effective output capacitance, time related	$C_{o(tr)}$	$I_D=const.$, $V_{GS}=0V$, $V_{DS}=0$ to $400V$		305		
C_{OSS} Stored energy	E_{OSS}	$V_{GS}=0V$, $V_{DS}=400V$, $f=1.0MHz$, $V_{AC}=25mV$		24		μJ
Turn-on switching energy	E_{ON}	$V_{DS}=400V$, $V_{GS}=0/+20V$, $I_D=12A$, $R_{G(ext)}=2.7\Omega$		42.9		
Turn-off switching energy	E_{OFF}			10.1		
Internal gate resistance	$R_{G(int)}$	$f=1.0MHz$, $V_{AC}=25mV$		1.2		Ω
Gate to source charge	Q_{gs}	$V_{DS}=400V$, $V_{GS}=-5V/+20V$, $I_D=30A$		30		nC
Gate to drain charge	Q_{gd}			43		
Total gate charge	Q_g			121		
Gate plateau voltage	V_{pl}			8.8		V
Short- circuit withstand time	t_{sc}	$V_{GS}=0/15V$, $V_{DS}=400V$, $R_G=100\Omega$		<18		μs
Turn-on delay time	$t_{d(on)}$	$V_{DS}=400V$, $V_{GS}=-4V/+20V$, $I_D=20A$, $R_L=20\Omega$, $R_{G(ext)}=2.7\Omega$		16		ns
Rise time	t_r			17		
Turn-off delay time	$t_{d(off)}$			20		
Fall time	t_f			10		
Built-in SiC diode characteristics						
Diode forward voltage	V_{SD}	$I_{SD}=5A$, $V_{GS}=0V$		3		V
Diode continuous current	I_S	$V_{GS}=0V$, $T_C=25^{\circ}C$		42.5		A
Peak reverse recovery current	I_{rrm}	$V_{GS}=0V$, $I_{SD}=30A$, $V_{DS}=400V$, $di/dt=300A/\mu s$		3.75		A
Reverse recovery time	t_{rr}			58		ns
Reverse recovery charge	Q_{rr}			122		nC

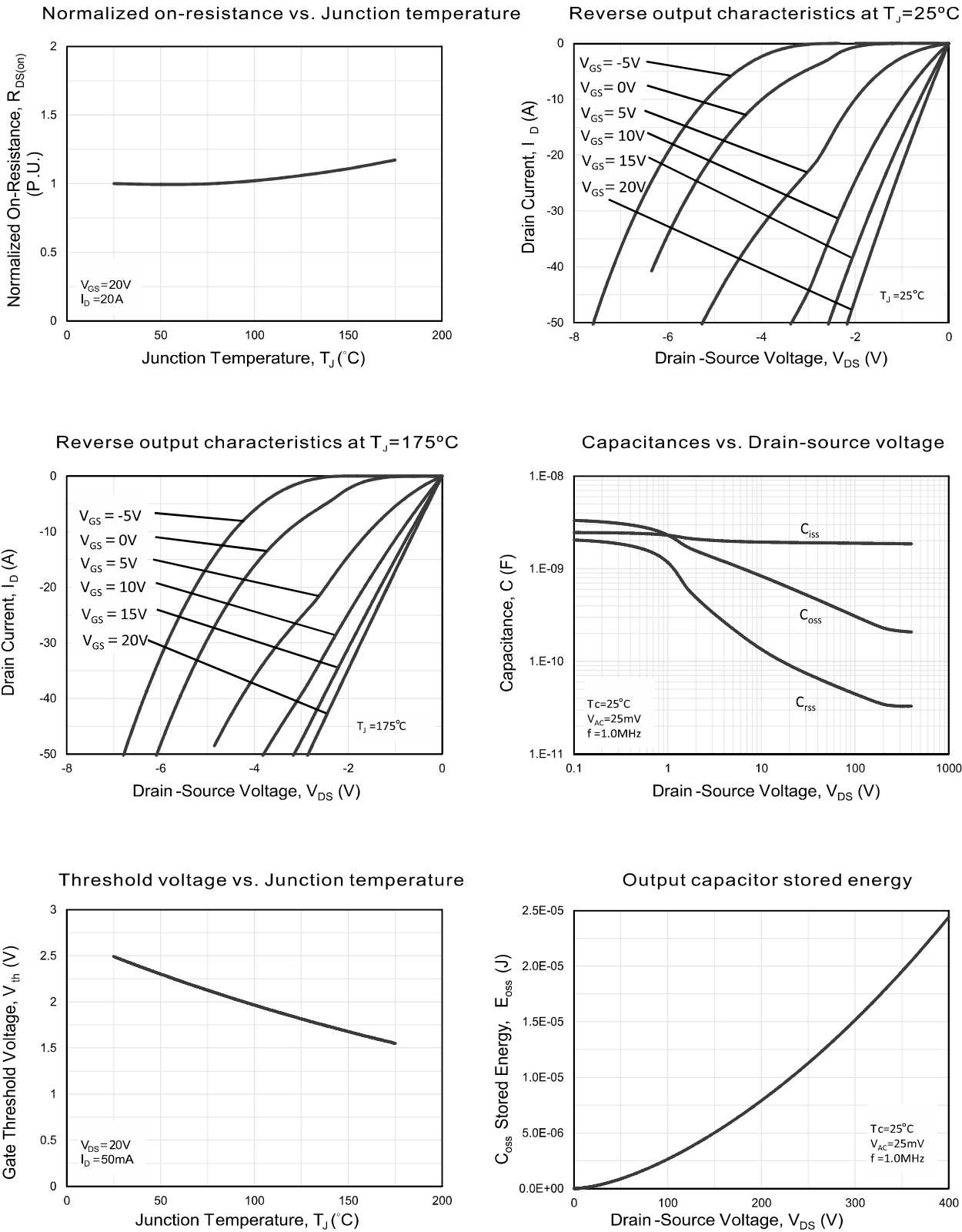
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Rating and characteristic curves



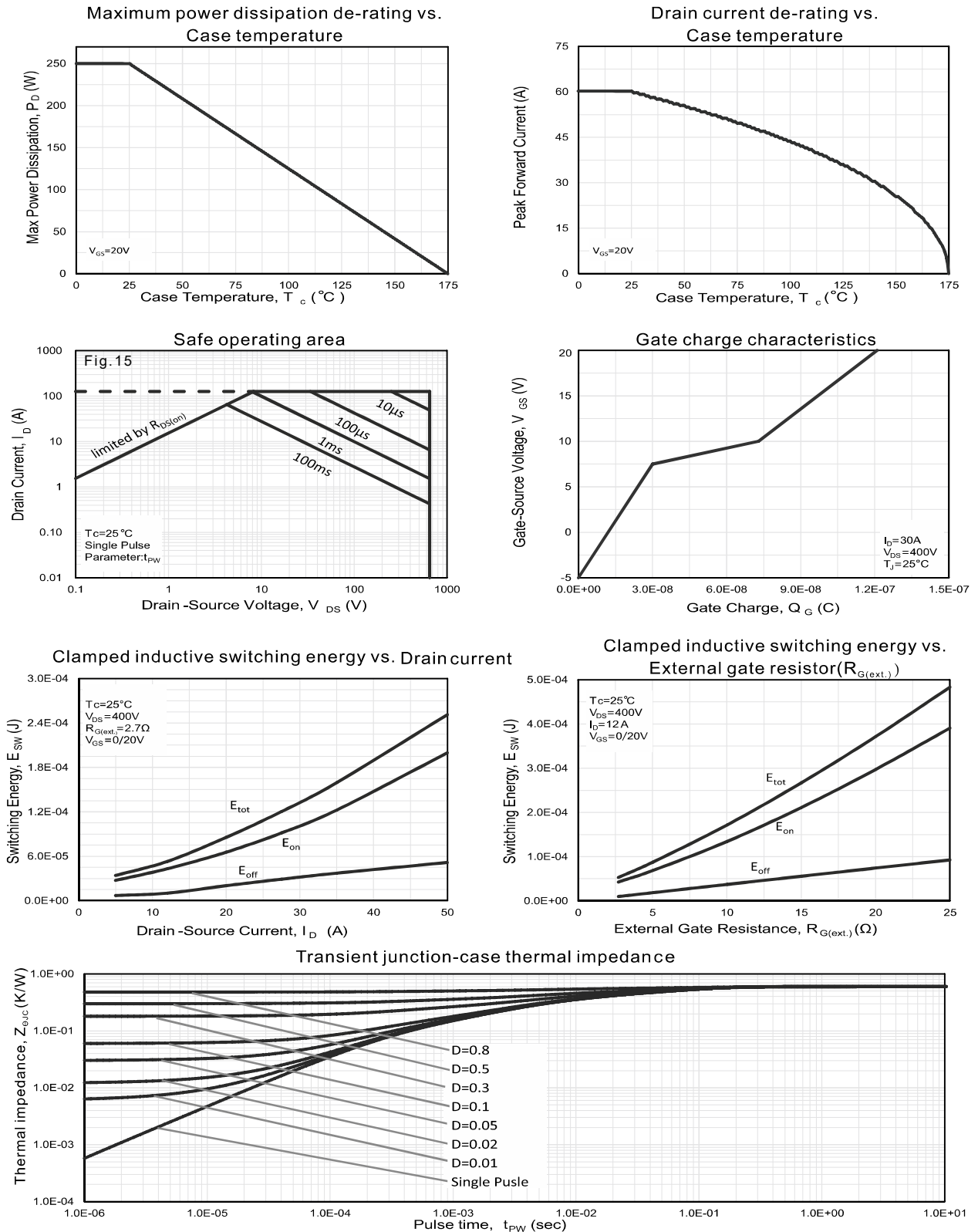
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Rating and characteristic curves



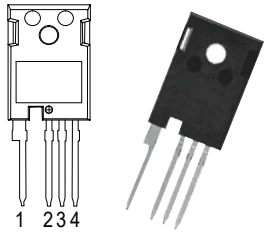
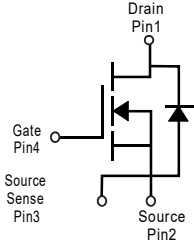
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Rating and characteristic curves



FMOSCPE60N65-H

Pinning information

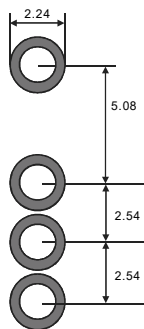
Pin	Simplified outline	Symbol
Pin 1 Drain Pin 2 Source Pin 3 Source sense Pin 4 Gate		

Marking

Type number	Marking code
FMOSCPE60N65-H	CPE60N65

Suggested solder pad layout

TO-247-4L



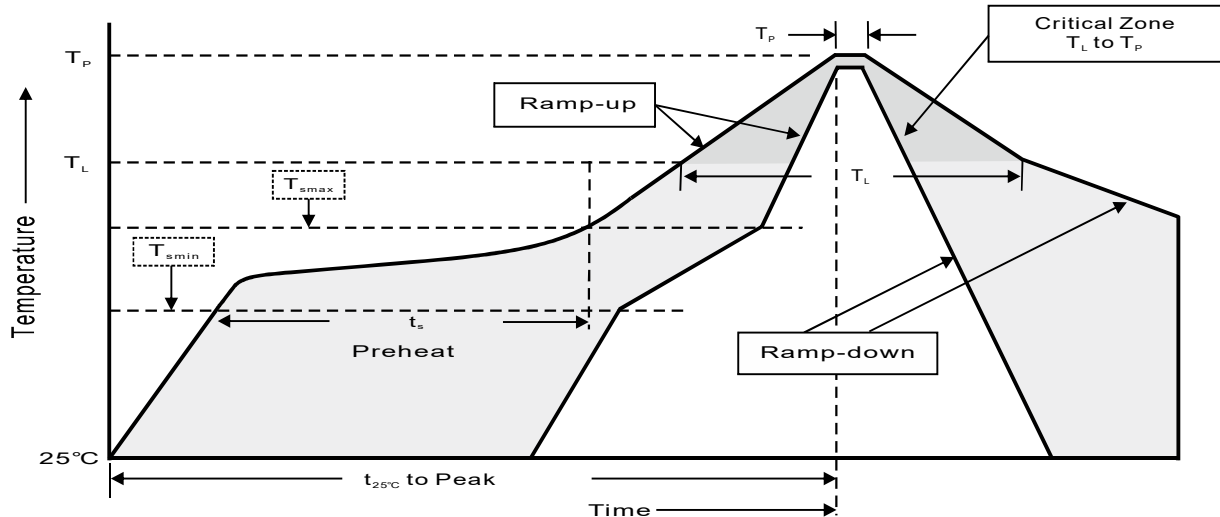
Dimensions in millimeters

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Suggested thermal profiles for soldering processes

1.Storage environment: Temperature = 5°C ~ 40°C Humidity = 55%, ±25%

2.Reflow soldering of surface-mount devices



3.Reflow soldering

Profile feature	Soldering condition
Average ramp-up rate (T_L to T_p)	< 3 °C/sec
Preheat - Temperature Min (T_{smin}) - Temperature Max (T_{smax}) - Time (Min to Max) (t_s)	150°C 200°C 60 ~ 120 sec
T_{smax} to T_L - Ramp-up rate	< 3 °C/sec
Time maintained above : - Temperature (T_L) - Time (T_L)	217°C 60 ~ 260 sec
Peak temperature (T_p)	255 °C -0/+5°C
Time with 5°C of actual peak temperature (T_p)	10 ~30 sec
Ramp-down rate	< 6 °C/sec
Time 25°C to peak temperature	< 6 minutes