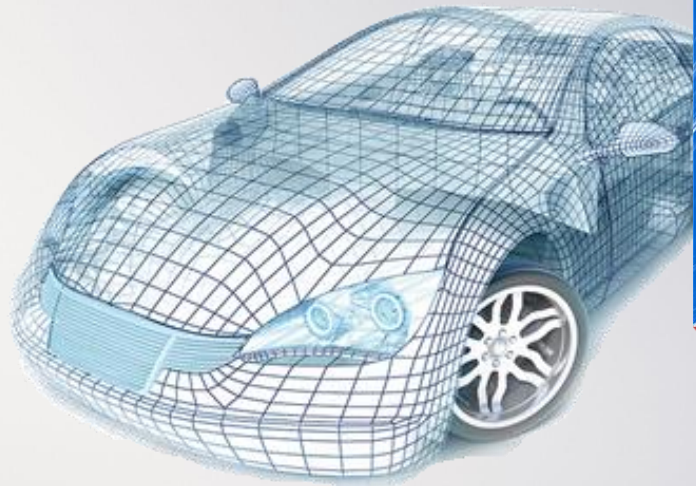


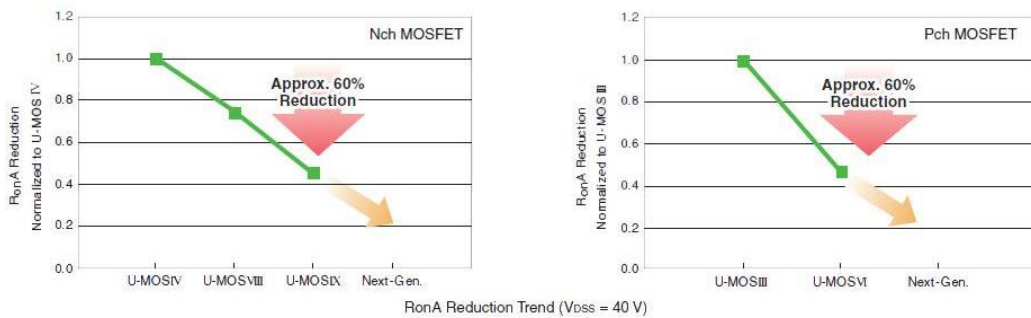
Power MOSFET



For Automotive

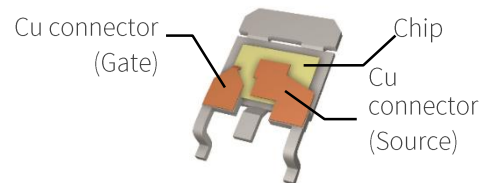
Toshiba offers an extensive line-up of power MOSFETs for various automotive applications including 48V battery systems. The combination of low ON-resistance and advanced package technology makes Toshiba's power MOSFETs an ideal solution for reducing system losses, thereby contributing to energy-saving in automotive applications. All MOSFETs on this leaflet are qualified to AEC-Q101 or are under AEC-Q101 qualification.

Reduced $R_{ON}A$ due to the small-geometry trench process



Copper (Cu) connector bonding

Copper (Cu) connectors are used instead of conventional Aluminium wire bonding in all the MOSFETs mentioned in this flyer. Copper connectors contribute to the reduction of the package resistance and inductance.



Package	Polarity	Process	V_{DS} (V)	Part no.	$R_{DS(ON)}$ max (m Ω)		I_D (DC) (A)	P_D (W)	Qg typ (nC)	AEC-Q101
					$V_{GS}=10\text{V}$ (-10V Pch)	$V_{GS}=6\text{V}$ (-6V Pch)				

TO-220SM(W) Package (10mm x 13mm)


	Nch	UMOS10	100	XK1R9F10QB	1.92	3.31	160	375	184	✓
		UMOS9	40	TKR74F04PB	0.74	0.98	250	375	227	✓
				TK1R4F04PB	1.35	1.90	160	205	103	✓
		UMOS8	40	TK200F04N1L	0.9	1.37	200	375	214	✓
				TK60F10N1L	6.11	9.25	60	205	60	✓
				TK160F10N1L	2.4	3.9	160	375	122	✓
Pch	UMOS6	-40	TJ200F04M3L	1.8	2.6	-200	375	460	✓	

Package	Polarity	Process	V _{DSS} (V)	Part no.	R _{DS(ON)} max (mΩ)		I _D (DC) (A)	P _D (W)	Qg typ (nC)	AEC-Q101
					V _{GS} =10V (-10V Pch)	V _{GS} =4.5V/6V (-4.5V/-6V Pch)				

D2PAK+ Package (10mm x 15mm)

	Nch	UMOS9	40	TK1R5R04PB	1.50	2.05@6V	160	205	103	✓
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
DPAK+ Package (6.5mm x 9.5mm)

	Nch	UMOS9	40	TK1R4S04PB	1.35	1.90@6V	120	180	103	✓	
		UMOS8	40	TK100S04N1L	2.3	4.5@4.5V	100	157	76	✓	
				TK65S04N1L	4.3	7.8@4.5V	65	107	39	✓	
				TK15S04N1L	17.8	37@4.5V	15	46	10	✓	
				TK90S06N1L	3.3	5.2@4.5V	90	157	81	✓	
		UMOS8	60	TK40S06N1L	10.5	18@4.5V	40	88	26	✓	
				TK25S06N1L	18.5	36.8@4.5V	25	57	15	✓	
				100	TK60S10N1L	6.11	9.25@6V	60	180	60	✓
					TK55S10N1	6.5	-	55	157	49	✓
					TK33S10N1Z	9.7	-	33	125	28	✓
	TK33S10N1L				9.7	16.2@4.5V	33	125	33	✓	
	TK11S10N1L	28	50@4.5V	11	65	15	✓				
	TK7S10N1Z	48	-	7	50	7.1	✓				
	Pch	UMOS6	-40	TJ90S04M3L	4.3	6.0@-4.5V	-90	180	172	✓	
				TJ80S04M3L	5.2	7.9@-6V	-80	100	158	✓	
				TJ60S04M3L	6.3	9.4@-6V	-60	90	125	✓	
				TJ40S04M3L	9.1	13@-6V	-40	68	83	✓	
				TJ20S04M3L	22.2	32@-6V	-20	41	37	✓	
				TJ10S04M3L	44	62@-6V	-10	27	19	✓	
			-60	TJ60S06M3L	11.2	14.5@-6V	-60	100	156	✓	
TJ50S06M3L				13.8	17.4@-6V	-50	90	124	✓		
TJ30S06M3L				21.8	28@-6V	-30	68	80	✓		
TJ15S06M3L				50	63@-6V	-15	41	36	✓		
TJ8S06M3L	104	130@-6V	-8	27	19	✓					


* Under development

Package	Polarity	Process	VDSS (V)	Part no.	R _{DS(ON)} max (mΩ)		ID(DC) (A)	PD (W)	Qg typ (nC)	AEC-Q101
					VGS=10V (-10V Pch)	VGS=6V (-4.5V Pch)				


DSOP Advance (WF)L package (5mm x 6mm)

	Nch	UMOS9	40	TPWR7904PB	0.79	1.3	150	170	85	✓
		UMOS8	100	(XPW4R10ANB)	(4.1)	(6.2)	(70)	(170)	(75)	*


DSOP Advance (WF)M package (5mm x 6mm)

	Nch	UMOS9	40	TPW1R104PB	1.14	1.96	120	132	55	✓
		UMOS8	100	XPW6R30ANB	6.3	9.5	45	132	52	✓

SOP Advantage (WF) package (5mm x 6mm)

	Nch	UMOS9	40	TPHR7904PB	0.79	1.3	150	170	85	✓	
				TPH1R104PB	1.14	1.96	120	132	55	✓	
				(XPH2R404PB)	(2.4)	(3.3)	(90)	(93)	(40)	*	
				(XPH3R304PB)	(3.3)	(5.1)	(60)	(76)	(30)	*	
		UMOS8	60	(XPH2R106NC)	(2.1)	(4.1@4.5V)	(110)	(170)	(104)	*	
				(XPH3R206NC)	(3.2)	(6.3@4.5V)	(70)	(132)	(65)	*	
				100	XPH4R10ANB	4.1	6.2	70	170	75	✓
					XPH6R30ANB	6.3	9.5	45	132	52	✓
		Pch	UMOS6	-40	XPH3R114MC	3.1	4.7	-100	170	230	✓
					XHP4R714MC	4.7	6.9	-60	132	160	✓

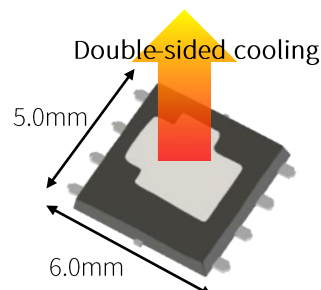
TSON Advance (WF) package (3.3mm x 3.6mm)

	Nch	UMOS8	40	XPN3R804NC	3.8	7.8@4.5V	40	100	35	✓	
				XPN7R104NC	7.1	14.2@4.5V	20	65	21	✓	
			60	XPN6R706NC	6.7	13.3@4.5V	40	100	35	✓	
				XPN12006NC	12.0	23.7@4.5V	20	65	23	✓	
		100	(XPN1300ANC)	(13.3)	(24.2@4.5V)	(30)	(100)	(28)	*		
			(XPN2400ANC)	(23.5)	(42.7@4.5V)	(20)	(65)	(20)	*		
		Pch	UMOS6	-40	XPN9R614MC	9.6	13.4@4.5V	-40	100	64	✓
					(XPN19014MC)	(18.7)	(27.3@4.5V)	(-20)	(65)	(46)	*

* Under development

Double-sided cooling

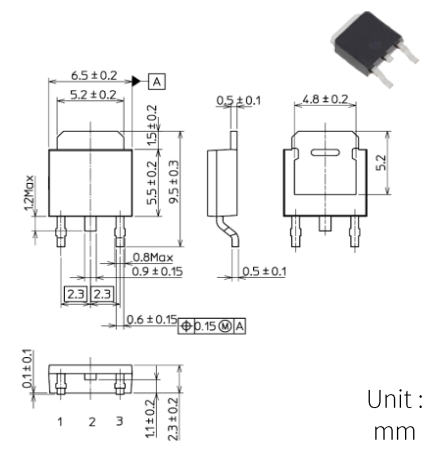
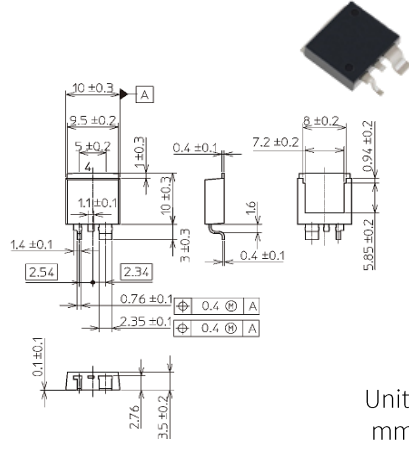
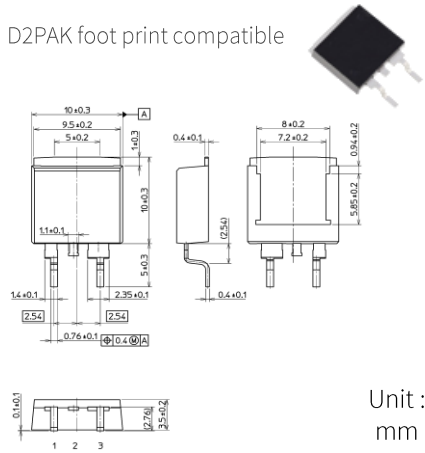
The DSOP advance(WF) double-sided cooling packages fit the same footprint as the SOP advance(WF). Due to the greatly reduced thermal resistance, the maximum load can be increased considerably. Alternatively the MOSFET temperature can be reduced to increase long term reliability.



Power MOSFET package lineup

D2PAK+	TO-220SM(W)	DPAK+
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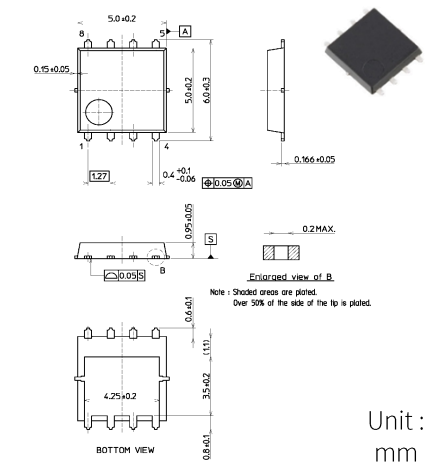
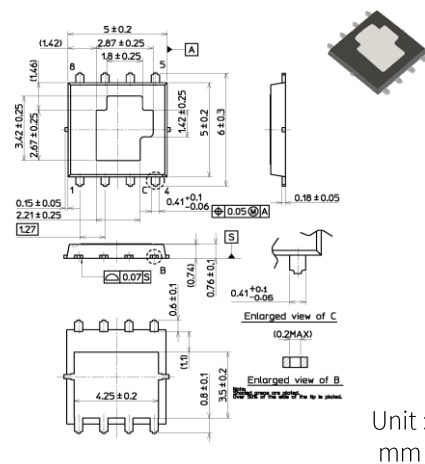
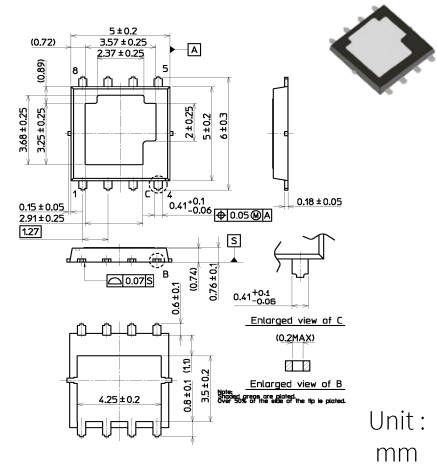
D2PAK foot print compatible



DSOP Advance(WF) L with wettable flanks

DSOP Advance(WF) M with wettable flanks

SOP Advance(WF) with wettable flanks



TSON Advance(WF) with wettable flanks

